TECHNISCHE UNIVERSITÄT MÜNCHEN

TUM School of Engineering and Design

Operational Safety Considerations for the Type Certification of Light Unmanned Aircraft Systems

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Vollständiger Abdruck der von der TUM School of Engineering and Design der Technischen Universität München zur Erlangung des akademischen Grades eines Doktors der Ingenieurwissenschaften genehmigten Dissertation.

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Die Dissertation wurde am 19.07.2021 bei der Technischen Universität München eingereicht und durch die TUM School of Engineering and Design am 30.11.2021 angenommen.

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Kurzfassung

Die Musterzulassung von unbemannten Luftfahrzeugsystemen (Unmanned Aircraft Systems - UAS) trägt dafür Sorge, dass die Sicherheit der überflogenen Gebiete und der Bevölkerung gewahrt wird. Sie ist ein Schlüsselelement für den sicheren Flugbetrieb von UAS. Die vorliegende Arbeit untersucht operationelle Sicherheitsbetrachtungen im Rahmen der Musterzulassung von UAS. Hierzu wird die Hypothese aufgestellt, dass es nicht möglich ist, allein mit Hilfe von operationellen Sicherheitsbetrachtungen den Nachweis der Lufttüchtigkeit eines UAS Musters im Rahmen eines Musterprüfprozesses festzustellen und eine Musterzulassung zu erlangen. Der Fokus liegt dabei auf unbemannten Starrflügler-Luftfahrzeugsystemen welche eine maximale Abflugmasse von weniger als 150 kg aufweisen und über Deutschland operieren sollen.

Im ersten Schritt wurden umfassende Recherchen zu Lufttüchtigkeitsvorschriften und operationellen Risikobewertungen von UAS durchgeführt. Die Ergebnisse werden ausführlich dargestellt. Des Weiteren wird der Prozess der Musterprüfung und Musterzulassung von Luftfahrzeugen erläutert, sowie verantwortliche Behörden und Organisationen der zivilen und militärischen Luftfahrt vorgestellt. Zur Komplettierung des Bildes wird die Geschichte der unbemannten Luftfahrt kurz dargestellt. Im Zuge der Recherche wurde festgestellt, dass die untersuchten operationellen Risikobewertungen für UAS im Einzelnen häufig nicht vollständig und nur bedingt anwendbar auf die vorliegende Fragestellung sind. Basierend auf dieser Erkenntnis wurde O.R.C.U.S. entwickelt.

O.R.C.U.S. – Operational Risk Considerations for Unmanned Aircraft Systems – ist eine MATLAB™ basierte Software, welche das Ziel verfolgt, eine fundierte Einschätzung über das resultierende Risiko für das in einer Operation überflogene Gebiet und die darin lebende Bevölkerung treffen zu können, auch wenn nur rudimentäre Daten über das UAS vorliegen. Hierzu wird die geplante Operation über dem Einsatzgebiet mittels O.R.C.U.S. simuliert und es werden bewusst zufällige, technische Fehler in das fliegende unbemannte Luftfahrzeug eingespeist. Führen diese Fehler zum Absturz der Maschine, prüft O.R.C.U.S. ob Menschen zu Schaden kamen. Die Erzeugung des Operationsgebietes basiert auf frei verfügbarbaren Kartendaten und erfolgt nahezu komplett automatisiert durch O.R.C.U.S. Die Verteilung der Personen im Operationsgebiet erfolgt dynamisch, zeit- und ortsabhängig und basiert auf einer umfangreichen Datenbasis, die aus offiziellen Zensus- und Bewegungsdaten erstellt wurde. O.R.C.U.S. erzeugt nach Abschluss einer Simulationsreihe eine Zusammenfassung welche prägnant darstellt, wie oft pro Flugstunde Personen durch das abstürzende unbemannte Luftfahrzeug getroffen wurde und ob dies in geschützten Bereichen oder ungeschützten Bereichen geschah. Durch die Übertragung der Ergebnisse in der Luftfahrt und Musterprüfung von Luftfahrzeugen üblichen Einheit „pro Flugstunde“ kann ein direkter Vergleich zu Lufttüchtigkeitsforderungen gezogen werden.

Zur Überprüfung der Hypothese wurden im Rahmen einer Prototypen-Implementierung mit O.R.C.U.S. umfassende Simulationsläufe anhand eines exemplarischen, leichten Starrflügler-UAS über repräsentativen Gebieten in Deutschland durchgeführt. Neben der generellen Funktionsfähigkeit von O.R.C.U.S., bestätigten die Resultate der Simulationsläufe die Hypothese. Operationelle Sicherheitsbetrachtungen allein sind nicht ausreichend um die Lufttüchtigkeit eines UAS nachzuweisen, da derartige Betrachtungen immer höchst abhängig von der Operation an sich, der Technik des unbemannten Luftfahrzeugsystems, der Methode der Risikobewertung und den angenommenen Randbedingungen sind. Ein nach den Regeln der Lufttüchtigkeit entwickeltes UAS hingegen, wird immer ein geringeres Risiko darstellen, als eines, welches sich auf operationelle Sicherheitsbetrachtungen abstützen muss.

Nichtsdestotrotz sind derartige Sicherheitsbetrachtungen geeignet um das Bewusstsein hinsichtlich des Risikos des Betriebs bei Betreiber und genehmigender Behörde zu schärfen und präventive Risikominimierung umzusetzen. Insbesondere in Anbetracht der neuen Drohnenregularien in Europa sowie der Möglichkeit der Freigabe von UAS Operationen von der spezifischen Kategorie, ist der in der vorliegenden Arbeit dargestellte Sachverhalt von Gewicht.

Abstract

Type certification of Unmanned Aircraft Systems (UAS) shall ensure the safety of the overflown area and the population. It is one key aspect of safe UAS operations. The present thesis explores operational safety considerations within the context of UAS type certification. In this scope, the hypothesis was developed, that operational safety considerations cannot be used as the only proof of airworthiness of a UAS in an aircraft type inspection process to achieve a type certificate. Focus is given on light fixed-wing UAS with a maximum take-off mass of less than 150 kg, which are intended to operate above Germany.

At first, an extensive research with regard to airworthiness regulations and UAS operational risk assessments was conducted. The results of this research are presented exhaustively. Moreover, the process of aircraft type inspection and certification, as well as the responsible civil and military aviation authorities and organisations are presented. For the complete picture, the history of unmanned aviation is outlined briefly. During the research it was determined that those UAS operational risk assessments are often not complete in themselves and furthermore, are only partially applicable to the issue present. Based on this outcome, O.R.C.U.S. was developed.

O.R.C.U.S. – Operational Risk Considerations for Unmanned Aircraft Systems – is a MATLAB™ based software, which aims to provide a sound estimation of the risk imposed by the UA flight operation to overflown area and inhabitants, even if only few information about the UAS are available. To achieve this, O.R.C.U.S. simulates the planned operation above an area and randomly technical failures are induced into the airborne unmanned aircraft on purpose. In case such failures causing the machine to a crash on the ground, it is checked by O.R.C.U.S. if people got harmed. The creation of the operational area relies on free available map data and is performed by O.R.C.U.S. almost completely automatic. The distribution of inhabitants within the operational area is dynamic and related to time and place, based on a comprehensive database which was composed out of official census and movement data. After completion of a simulation series, O.R.C.U.S. generates a summary which concisely presents how often per flight hour persons got hit by the impacting unmanned aircraft and if those events happened in protected or unprotected areas. By transferring the results into the term "per flight hour", which is mutual within the realm of aviation and aircraft type inspection, a direct comparison with regard to airworthiness requirements can be made.

In order to proof the hypothesis, comprehensive simulation runs were performed within the realm of a prototype implementation of O.R.C.U.S. using an exemplary light fixed-wing UAS above representative areas in Germany. Besides the proof of concept of O.R.C.U.S., the results confirmed the hypothesis. Operational safety considerations alone are not sufficient to proof airworthiness of a UAS, as such considerations are always highly dependent on the operation itself, the technology of the UAS, the method of risk assessment and the assumed boundary conditions. A UAS developed in accordance to the regulations of airworthiness will always impose a lower risk than a UAS which has to rely on operational safety considerations.

Nevertheless, such safety considerations are appropriate to raise the risk awareness of operators and approving authorities and to implement preventive risk minimization. In particular in the view of the new drone regulations in Europe which includes the possibility of the approval of UAS operations in the specific category, the thematic complex of the present work gains importance.

Acknowledgment

I would like to thank Professor Holzapfel for giving me the chance to write the present work, for his invaluable inputs and his never-ending support and patience. It is not self-evident to parent an external doctoral candidate for such a long time.

Furthermore, I would like to thank all my colleagues at work from the UAS type certification section with whom I had many fruitful discussions regarding UAS, that helped me to advance my ideas. In particular, I want to thank Dennis, for proofreading my work and for providing many constructive considerations to me.

I would like to thank my parents, my brother and my entire family, who always believed in me.

And I want to thank my wife Natascha, who always gave me some good thoughts from a completely different point of view. In particular, I want to thank her for her tolerance that I invested so many hours after work over years to create the present work.

Preface

It must be now almost ten years ago that I met Florian during a research and technology project I was in charge of. During this time, I was just before completing my professional training as an aircraft type inspector for UAS, but had already the responsibility for several UAS airworthiness projects in the German Armed Forces and was also part of a dynamic team at NATO that developed airworthiness codes for UAS. Although everyone was talking about the great potential of civil UAS in these days, they were far away from what they are today. In particular, necessary standards to enable the regular participation of UAS in the civil airspaces were not available and it seemed to be, that they maybe never will come. I was, and I still am enthusiastic on UAS, but in 2011, I guess I was even a little bit more, because of my work at NATO, my work for mission critical UAS and the good faith that things in aviation are going to change significantly by the rise of the drones. Driven by this and fascinated by the work of Florian's institute, I approached him with several ideas for a part-time dissertational thesis in the realm of UAS. And one idea resulted in the present work: Would it be possible to deem airworthiness by operational safety considerations? From my background in the military and knowledge about UAS airworthiness and the assigned challenges, I thought that this idea would be worthwhile to research, especially as many UAS around were not developed to airworthiness requirements, but required access to the airspaces. Florian agreed, and here we are.

In the beginning, I thought that I will complete this work within six years or less. Unfortunately, I was wrong. To research and to develop all the ideas I had in my mind parallel to my everyday working life, took me much longer than expected. The good thing was and is, that my regular work always benefited from the findings I had during my research and my dissertational thesis profited from my experience I obtained during my regular work. But, as I said, this costs a lot of time.

Today, many things changed, including my private and professional world. Nevertheless, I am still an aircraft type inspector for UAS, although the projects are slightly more complex and bigger now, than when I started. In parallel, civil unmanned aviation made huge steps forward and regulations are available making not regular, but at least a kind of regular, flight operations possible. However, unmanned aviation is far away from "file and fly" such as it is done in manned aviation.

I could not ignore these developments and had to include them in the present work. Unmanned aviation became dynamic in a dramatic way within the last three years. With UAS regulations which are changing almost every quarter and tons of white papers being issued, dealing all with UAS, the present thesis cannot claim to be entirely exhaustive. Nevertheless, to my best knowledge, besides my research findings and deductions, the present work gives an encompassing picture on UAS, airworthiness and operational safety considerations, enabling the reader to obtain basic knowledge about these broad and complex topics.

Oliver Hirling

June 2021

For my Mom and

for my Dad, who passed away much too early.

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Registers

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Abbreviations

Abbreviation	Designation
A/C	Aircraft (manned)
ACAM	Aircraft Continuing Airworthiness Monitoring
AEH	Airborne electronic hardware
AF	Afternoon
AIB	Accident Investigation Board
AGL	Above ground level
AltMoC	Alternative Means of Compliance
AMC	Acceptable Means of Compliance
AOA	FAA Office of the Administrator
ARC	Air risk class
ATB	At building, indicates that a person is inside a building
BFU	German Federal Bureau of Aircraft Accident Investigation (Bundesstelle für Flugunfalluntersuchung)

BMVI	Federal Ministry for Digital and Transport (Bundesministerium für Digitales und Verkehr)
BRLOS	Beyond radio line of sight
BVLOS	Beyond visual line of sight
C2Link	Command and Control Link
CAA	Civil Aviation Authority
CAAS	Civil Aviation Authority of Singapore
CASA	Civil Aviation Safety Authority (Australia)
CAO	Combined Airworthiness Organisation
CAT	Catastrophic
cf.	“conferatur” - compare
CFIT	Controlled flight into terrain
C.F.R.	Code of Federal Regulations
CM	Countermeasure
Cond	Condition
COU	County
CS	Certification Specification
CT	City Type
DIP	Debris impact
DOJC	Dropped or Jettisoned Components
EA	Early Afternoon
EASA	European Aviation Safety Agency
e.g.	exempli gratia, for example
ELG	Emergency landing
ELF	Emergency landing field
ELS	Electrical System
EM	Early Morning

ENG	Engine
ER	Essential airworthiness requirement
EU	European Union
EV	Evening
EVLOS	Extended visual line of sight
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulation
F	Failure
FC	Failure Condition
FCS	Flight Control System
FP	Flight Path
FS	Federal State
FTI	Flight termination and immediate impact
GMAA	German Military Aviation Authority
GRC	Ground risk class
GS	Ground speed
HALE	High Altitude Long Endurance
HAZ	Hazardous
HLSM	High Level Standardized Mitigations
i.a.w.	in accordance with
IEC	International Electrotechnical Commission
IFD	Impact close to the flight path in forward flight direction
IGR	Impact after glide with best glide-ratio on the flight path
IRP	Impact at a random point on the map
ISO	International Organization for Standardization
LBA	Luftfahrt-Bundesamt (Federal Aviation Office of Germany)
LM	Late Morning / Noon

LOC	Loss Of Control
LOS	Line of sight
LUAS	Light UAS with $m_{UA} \leq$ 150 kg or 330 lbs
LUC	Light UAS operator certificate
MAJ	Major
MIN	Minor
MO	Morning
MoC	Means of Compliance
MSS	Main Sub System
MTOW	Maximum Take-Off Weight
NavSys	Navigation System
NGE	No ground effect
NI	Night
O.R.C.U.S.	Operational Risk Considerations for Unmanned Aircraft Systems
OSM	Open Street Map
OSO	Operational Safety Objective
OTW	On the Way
PPL	People
RLOS	Radio line of sight
SC	Special Condition
Seg	Segment
SMP	Sub map polygon
STR	Structure
sUAS	Small UAS with $m_{UA} \leq 25\ [\mathrm{kg}]$ or $55\ [\mathrm{lbs}]$
SurM	Surrounding Map
SW	Software
TFP	Tangential to the flight path impact

TLS	Target Level of Safety
UA	Unmanned Aircraft
UAS	Unmanned Aircraft System
UCS	Unmanned Control Station
UDS	Unpremeditated Descent
UFIT	Uncontrolled flight into terrain
USAF	United States Air Force
VLOS	Visual line of sight
VO	Visual observer

Units

Unit	Designation
[/]	Unit-less
[°]	Degree
[Fh]	Flight hour
[ft]	Foot
[h]	Hour
[J]	Joule
[lbs]	Pound
[m]	Metre
$[m^2]$	Square metre
$[m^3]$	Cubic metre
[min]	Minute
[ms]	Millisecond
[s]	Second
[t]	Ton

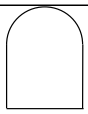
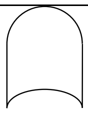
Formula symbols

Symbol	Unit	Designation
α	$[/]$	Significance level
γ	$[°]$	Glide angle
η	$[°]$	Tangential angle to the forward UA flight direction
θ	$[°]$	Angle of inclination to horizontal
θ'	$[°]$	Deviating pitch angle
λ	$[1/\mathrm{Fh}]$	Failure rate
μ_0	$[/]$	Expectation
ρ_{Air}	$[\mathrm{kg/m^3}]$	Air density
$\rho_{Pop_{Air}}$	$[\mathrm{PPL/km^3}]$	Population density of people in the air.
$\rho_{Pop_{Ground}}$	$[\mathrm{PPL/km^2}]$	Population density of people on the ground.
ρ_{PPL}	$[\mathrm{PPL/km^2}]$	Population density: People per square kilometre
ψ'	$[°]$	Deviating yaw angle
A	$[\mathrm{m^2}]$	General area.
$A_{City/Area}$	$[\mathrm{km^2}]$	Size of a city or an area
A_{CTTF}	$[/]$	Percentage number of people who arrived at their destination in a specific city type and time frame
$A_{GlideImpact}$	$[\mathrm{m^2}]$	Affected area in case of an impacting UA that glided into the ground.
A_{Impact}	$[\mathrm{m^2}]$	Affected area in case of an impacting UA
$A_{Mission}$	$[\mathrm{km^2}]$	Total size of a UAS operation area
A_p	$[\mathrm{m^2}]$	Area of an average person
AR	$[/]$	Percentage number of people who arrived at their destination
$A_{UA_{Front}}$	$[\mathrm{m^2}]$	UA Frontal cross-sectional area

$A_{UA_{Ref}}$	$[\mathrm{m}^2]$	UA planform reference area
C_d	[/]	Drag coefficient
CE	[/]	Casualty Expectation in case of a UA crash
C_l	[/]	Lift coefficient
CT	[/]	City type
Day_{UA}	[d]	Days of the UA mission
d_{CIP}	[m]	Distance to central impact point
d_{Debris}	[m]	Maximum debris range of UA debris parts
$d_{GlideGround}$	[m]	Projected glide path on the ground
$d_{Glide\|h_P}$	[m]	Gliding distance from the height of an average person to the ground.
d_{max}	[m]	Characteristic UA dimension
d_{Swath}	[m]	Swath distance with regard to a gliding impact.
d_{travel}	[m]	Travelled distance
E_{Imp}	[J]	Impact energy
E_{Kin}	[J]	Kinetic energy
F_0	[/]	Initiating Failure
F_d	[/]	Force of drag
F_l	[/]	Force of lift
g	$[\mathrm{m/s}^2]$	Gravitational constant
H_0	[/]	Null hypothesis
H_1	[/]	Alternative hypothesis
h_{Alt}	[m] or [ft]	Altitude above the ground
h_p	[m]	Height of an average person
l_{UA}	[m]	UA length
L/D	[/]	Lift to drag ratio: The horizontal distance travelled of the UA while the flying altitude decreased one metre.

m_{UA}	[kg], [lbs], [t]	UA mass
MC_{Debris}	[/]	Debris as a result of a mid-air collision.
n	[/]	Number of samples
$n_{Probes0}$	[/]	Initial number of samples
N_{CatFC}	[/]	Number of expected catastrophic failure conditions
$N_{Day_{UA}}$	[d]	Number of UA mission days
N_{PPL}	[/]	Number of people
$N_{PPLCity/Area}$	[/]	Number of inhabitants in an area or city
N_{PPLHit}	[/]	Number of people hit
$N_{PPLMission}$	[/]	Number of people in an area or city exposed to a UAS operation
N_{simFh}	[Fh]	Number of simulated flight hours
N_{simDay}	[d]	Number of simulated UA mission days
P	[1/Fh]	Probability per Flight Hour
P	[/]	Probability
P_C	[1/Fh]	Probability of casualties due to a UA per flight hour
$P_{C_{Air}}$	[1/Fh]	Probability of casualties in the air due to a UA per flight hour
$P_{C_{Ground}}$	[1/Fh]	Probability of casualties on the ground due to a UA per flight hour
P_{CM_k}	[/]	Probability that the k^{th} countermeasure is successful
$\bar{P}_{CM_k}$	[/]	Probability that the k^{th} countermeasure is not successful
P_{Col}	[/]	Probability of a collision
$P_{DetectF_0}$	[/]	Probability that an initiating failure is detected
P_{Event}	[1/Fh]	Probability that an event occurred
P_{F0}	[1/Fh]	Probability of an initiating failure in the UAS

P_{Fat}	$[/]$	Probability of fatality: The probability that a person suffers lethal injuries after the person got hit by a UA.
$P_{Fat_{Col}}$	$[/]$	Fatality probability in case of an aircraft collides with a UA
P_{FMSS_i}	$[/]$	Probability of the i^{th} failure mode in a main sub system
$P_{FMSSCond_j}$	$[/]$	Probability of the j^{th} specific failure condition in a main sub system
P_{FUA}	$[1/\text{Fh}]$	Probability that a failure occurs within the UAS
P_{Hit}	$[1/\text{Fh}]$	Probability that a person got hit per flight hour
PPL	$[/]$	Percentage number of people
PPL_{ATB}	$[/]$	Percentage number of people inside buildings
PPL_{OTW}	$[/]$	Percentage number of people on a way/in the outside
P_{MAC}	$[1/\text{Fh}]$	Probability of a mid-air collision
$P_{Mit_{Col}}$	$[/]$	Mitigation measures against collision
P_{Pen}	$[/]$	Penetration probability
r_P	$[\text{m}]$	Radius of an average person
s	$[/]$	Standard deviation
S	$[/]$	Shelter factor
SA	$[/]$	Percentage number of people who started a way
t	$[/]$	t value
t_{Crit}	$[/]$	Critical t value
t_{Miss}	$[\text{s}]$, $[\text{min}]$ or $[\text{h}]$	Mission duration
t_{seg}	$[\text{s}]$, $[\text{min}]$ or $[\text{h}]$	Time segment
t_{travel}	$[\text{s}]$, $[\text{min}]$ or $[\text{h}]$	Time travelled
t_{Seg}	$[\text{h}]$	Time segment
v	$[\text{m/s}], [\text{km/h}]$ or $[\text{kts}]$	Velocity
V_{Air}	$[\text{m}^3]$ or $[\text{km}^3]$	Airspace volume

v_{MO}	$[\mathrm{m/s}], [\mathrm{km/h}]$ or $[\mathrm{kts}]$	Maximum operating velocity
v_{NE}	$[\mathrm{m/s}], [\mathrm{km/h}]$ or $[\mathrm{kts}]$	Never exceed speed
v_{Stall}	$[\mathrm{m/s}], [\mathrm{km/h}]$ or $[\mathrm{kts}]$	Stall speed
w_P	$[\mathrm{m}]$	Width of an average person
w_{UA}	$[\mathrm{m}]$	UA width, if not otherwise described, the wingspan
$\bar{x}$	$[/]$	Mean value of samples
	AND	Logical AND gate in fault tree analysis
	OR	Logical OR gate in fault tree analysis

1 Introduction

1.1 Motivation and Background

"No aircraft capable of being flown without a pilot shall be flown without a pilot over the territory of a contracting State without special authorization by that State and in accordance with the terms of such authorization. Each contracting State undertakes to insure that the flight of such aircraft without a pilot in regions open to civil aircraft shall be so controlled as to obviate danger to civil aircraft."

ICAO Convention on International Civil Aviation, Article 8, page 5, [1]

The above-mentioned article, quoted from the Convention on International Civil Aviation, was written more than 75 years ago. During the time the Convention was created, aircraft emerged in a rapid way. Although the creators of the convention were focused on manned aviation, they also had foreseen the possibility of unmanned flight. But probably no one of the authors had in mind that aviation will face an emerge of Unmanned Aircraft Systems (UAS) as aviation faces it today [2, 3].

Figure 1-1 shows the development of the number of passengers transported in aviation from year 1944 up to 2017. This number can be seen as an indicator for the density of aircraft in the airspace. While between the 1940s and 1980s passenger numbers increased constantly, the increase of passengers in the late 20th Century and the first decade of the 21st Century is almost of exponential nature. This significant increase is remarkable. It could be said, that the skies were empty in the late 1940s whilst in the present times the airspace is crowed. And in addition to the increasing fleet of manned aircraft, today also a fleet of UAS shall be integrated into the same airspace.

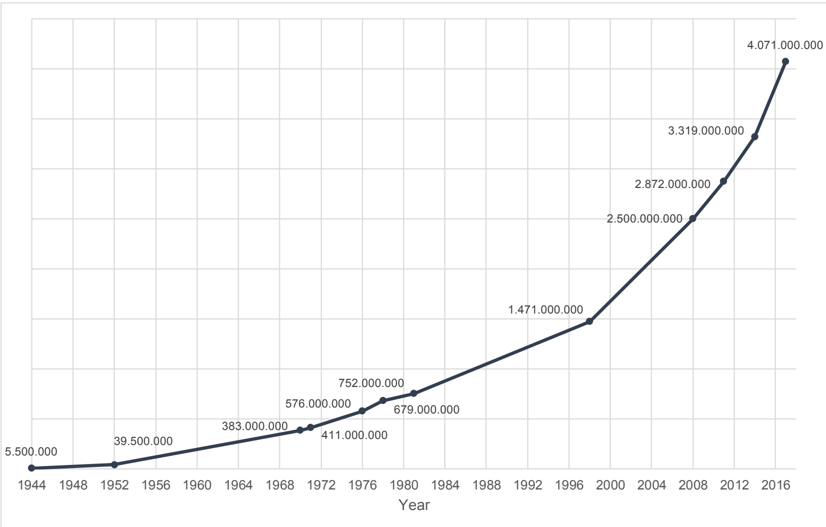


Figure 1-1. Aviation passengers from 1944 to 2017 [4, 5]

In contrast to the technological evolution of manned aircraft in their beginning, the evolution of UAS became even faster. Looking back roughly two decades, civil UAS could be seen as a niche, like a side effect of model aircraft. A toy for technical enthusiasts. The only professional users were foremost military forces. Nevertheless, the potential of civil UAS was already acknowledged and seen as one key driving element for the future of aviation [6-8].

Nowadays, civil UAS can be bought ready to use in commercial electronic markets at prices that are affordable for the broad public. No intense and challenging training is needed and anyone is able to learn how to control them in short time and start to fly almost immediately after unboxing the machine. The numbers of civil UAS for the private market are already within the range of millions and they will further increase. Besides leisure purposes, civil UAS are becoming a more and more growing factor for different professional usages. At the moment, the most important growth for UAS applications is predicted in surveying and inspecting of agriculture, buildings, energy installations, police and emergency situation or for observing regional developments. The possible economic growth and benefit of this new aviation field tends to billions of Euros. Therefore, it is not surprising that there is a lot of pressure applied by the industrial sector on the governmental entities and the regulatory authorities to enable a fast and smooth access for UAS into the national airspaces of the states across the globe [9-12].

Despite the fact that UAS are not that new on the aviation field as it might look like, the desired integration of UAS into the airspace took a long way and time to be realized and is still not completed yet. Compared to civil UAS, military UAS are in regular use within military forces since the 1960s. Currently, usual civil UAS models range foremost in the size of model aircraft only, whereas the sizes of military UAS comprise the whole spectrum one can think about: From only a few grams, up to tons of Maximum Take Off Weight (MTOW), with wingspans from a few centimetres up to more than 20 meters.

Unfortunately, the military is not yet able to operate its UAS in a comparable way to manned aircraft in the airspaces, although there is an obvious need to unlock this capability. In accordance with the articles of the Chicago Convention related to UAS and military aircraft, it takes a lot of bureaucratic work to permit flights of military UAS through the airspaces of different states. Especially for Europe, this leads to the fact that regular international flight operations from one state to another state, in sense of “file and fly”, are hardly possible for military UAS. The same applied to all civil UAS in Europe by the end of 2018.

Having recognized the great potential of UAS for aviation and also emphasized by the enormous interest of different stakeholders in the field of unmanned aviation, governments and their political leaders pushed the development of the integration of UAS continuously forward during the last decade. Eventually, this long-term continuous push led to the development of the necessary regulations to enable a successive integration of civil UAS into the airspaces. This new regulatory environment represents a sound and sophisticated set of encompassing UAS regulations. These regulations will reflect the necessary technical safety of the UAS, the qualification of the operator, the quality of the manufactures and the operation of the UAS itself, in order to ensure safe UAS operations appropriate to the specific UAS design [13-25].

The holistic approach of the new UAS regulations evolved from the acknowledgement that the four core aspects of a UAS operation, - machine, man, environment and the kind of operation itself, - must be taken into account in order to ensure safe UAS flights while concurrently creating appropriate requirements. The comprehensive contemplation of the interconnected core aspects shall serve the overall target, to maintain the safety of people, albeit UAS shall now also fly in the skies.

Safety has many definitions and varies with the related context. One very general definition is provided by the International Organization for Standardization, ISO, and the International Electrotechnical Commission, IEC:

“safety - freedom from risk […] which is not tolerable”

ISO, IEC Guide 51 Safety aspects - Guidelines for their inclusion in standards, Definition 3.14, p. 2, [26]

This broad definition of ISO and IEC underlines that safety is always bound to current circumstances and situations, which define what is “tolerable”. ISO and IEC consequently emphasize this by their definition of “tolerable risk”:

“tolerable risk - level of risk […] that is accepted in a given context based on the current values of society”

ISO, IEC Guide 51 Safety aspects - Guidelines for their inclusion in standards, Definition 3.15, p. 2, [26]

With respect to UAS, ICAO provided an adjusted definition of safety:

“Safety. The state in which risks associated with aviation activities, related to, or in direct support of the operation of aircraft, are reduced and controlled to an acceptable level.”

ICAO Manual on RPAS, p. xix, [27]

Based on these definitions, it can be said that safety represents a function dependent upon the current situation of an individual person and the perception of the situation by the person itself. Within the context of aviation, this definition can be deduced further to the point that a safe operation of an aircraft is given when a person arrives at its destination without getting harmed and if during the flight no person on the ground was harmed by the flying aircraft.

Obviously, the most probable event that causes persons getting hurt during a flight with an aircraft is if the aircraft crashes. Either in a controlled manner during an emergency landing or in an uncontrolled manner if the pilot loses the control of the aircraft. In the latter case, the probability that uninvolved persons on the ground will be affected is higher than in the first case, under the assumption that a pilot in control will do anything to avoid injuring people on the ground in case he has to perform an emergency landing. In contrast to manned aviation, the crash of an unmanned aircraft (UA) which is out of control of the remote pilot might, but must not lead to the worst case: the death of people. In manned aviation, in case of an out of control scenario which ends in a crash, it is assumed that people on board the aircraft will not survive [28, 29].

Safety of an aircraft and the people on board and therefore, also the inherent safety of the people overflown, is formally witnessed within the Certificate of Airworthiness (CofA). The CofA is the official confirmation that the aircraft is in an "airworthy" state and therefore in a state for safe operation. The CofA is always related to the Type certificate of the aircraft design, which proofs that the aircraft type has been designed in accordance to the appropriate airworthiness requirements. The Type certificate consequently confirms that the entire design of an aircraft type is safe for operation [30].

The most obvious difference between manned and unmanned aviation is the extraction of the pilot and passengers out of the airborne vehicle. Without the need to protect people onboard an aircraft, almost infinite design possibilities arise. While the airworthiness of manned aircraft is primary focused on the protection of people in the aircraft, as long as UAS do not transport passengers, airworthiness of UA should be focused on the protection of overflown people on the ground and other airspace participants. As outlined above, upcoming regulations for UAS will take the environment where the UAS is flown as well as the kind of operation more into account. Therefore, the focus change has already been done by the competent authorities (e.g. [13, 16, 21, 23-25]).

These changes regarding design of the UA and primary protection of third parties instead of onboard passengers lead to the fact that operational safety considerations are probably becoming one of the most important factors for every UAS operation. Out of this deduction, the fundamental and driving question of the present dissertation was born:

Is it possible to prove the airworthiness of a UAS with operational safety considerations instead of traditional airworthiness requirements, in order to obtain a type certificate?

To assess this question in a systematic way, it is essential to start with a short look into the current UAS regulation approaches, which will be done in the next subchapter.

1.2 State of the Art

As outlined before, civil UAS are still seen as a relatively new field in aviation with unique features, which cannot be compared to manned aviation. The regulation authorities were forced to react on these "new" objects in the skies, in order to maintain the high level of safety in aviation which has been achieved since the promulgation of the Chicago Convention. The long development phase for UAS regulation, which will take much more years to be completed, witnesses the complexity of UAS and the handling of them. Reflecting all efforts of all regulation authorities around the globe would probably fill books. Therefore, the present thesis focuses on three civilian main players and one military main player:

- ICAO
- FAA
- EASA
- NATO

NATO already published several UAS airworthiness standards, which are harmonized and recognized throughout the alliance. The reasons why NATO was a forerunner in this field will be shown later. The current approaches of the other three stakeholders have one driving aspect in common: The obvious need to take more into account than just the aircraft and the passengers and to encompass this in adequate regulations ensuring safe flight operations, resulted or will result in so-called *risk-based regulations*. This new approach imposes a new mindset in contrast to traditional airworthiness certification. Traditional airworthiness certification follows the strict path of clear, prescriptive requirements for which compliance must be shown in order to prove the airworthiness of an aircraft, while risk-based regulations focus on the risk which is posed to the environment when the (unmanned) aircraft is operated within this environment. This risk shall be reduced to an adequate and acceptable level for the public. To achieve this, UAS regulations need to take into account four cornerstones, which affect safe UAS operations:

- UAS design
- Qualification of the pilot of the UA
- Competence of the UAS designer
- Operational area where the UA is flown

These four cornerstones are of interacting nature and influence each other. For example, it might be acceptable to apply less severe technical requirements if the UAS is operated in an environment where it can be reasonably expected that no uninvolved person gets hurt if the UA crashes. Furthermore, instead of limiting an applicant to strict requirements which need to be fulfilled in an exact way, the applicant is given more freedom regarding the fulfilment of requirements in order to achieve the desired level of safety.

These risk-based regulation approaches in combination with a performance-based implementation are seen as a promising way forward in order to ensure an adequate and proportionate way to regulate UAS in a safe manner on the one hand while on the other hand unnecessary burdens for an evolving aviation sector are avoided. A further and much more detailed elaborated analysis is presented in dedicated chapters of this thesis, including a discussion with respect to the approach of NATO, which on first sight, followed the traditional approach in terms of airworthiness, but on second sight implicitly used a risk-based approach [23-25, 28, 31, 32].

1.3 Dissertation Objective

Based on the fundamental question if it is possible to prove the airworthiness of a UAS with operational safety considerations instead of traditional airworthiness requirements in order to obtain a type certificate, the hypothesis of the dissertation was developed:

Operational safety considerations cannot be used as the only proof of airworthiness of a UAS in an aircraft type inspection process to achieve a type certificate.

In order to obtain an answer to the fundamental question as well as a proof for the hypothesis, three main research questions were developed:

1. What are relevant operational safety considerations in the context of UAS operations?
2. How can these operational safety considerations be modelled?
3. How reliable are such operational safety considerations?

During the research, it became obvious that the three determined research questions were too broad and a more precise specification was needed. In order to further specify the three research questions, following additional aspects were taken into account. Focusing on how every country or organisation related to aviation applies operational safety aspects might lead on the one hand to a tremendous work, but which probably would also result in a too generic work. This led to the conclusion that focus shall be given to three civil stakeholders, ICAO, EASA, FAA as well as to the military stakeholder NATO, as it was already outlined above.

In addition to this first reflection, the question arose which UAS would be beneficial for the research and therefore which kind of UAS should be taken into account. While nowadays relatively clear differentiations of UAS are available, this was not the case, when the research for this thesis began several years ago. During this time, around 2013, the civil laws for UAS of today were probably not even written as a scratch. One of the most prominent differentiation in these times could be found in European law, which mandated UAS with a MTOW of more than 150 kg to Type Certification in the regime of EASA. UAS below this mass felt under the regime of national aviation law and specific regulations without type certification, which led to an immense set of different regulations across the countries for this kind of UAS [33].

While the civil world was struggling with this burden, the military world was several steps ahead. NATO already had published one harmonized UAS Airworthiness Requirements (USAR) Standardization Agreement (STANAG) for fixed-wing UAS with a MTOW above 150 kg. Furthermore, the next two USAR STANAGs, one for rotary-wing UAS above 150 kg and one for light fixed-wing UAS below 150 kg MTOW, were on their way to official promulgation [34, 35].

In conclusion, one can say that in these past days, the civil world had not put light UAS below 150 kg MTOW under the umbrella of airworthiness, while the military world already did. This polarity resulted in the next refinement of the research questions, by focusing them on light UAS.

Additionally, it was found necessary by the author, that the research should be applied to a concrete environment. As it was outlined before, the environment where the UAS is operated becomes of more importance in the new regulation approaches. Less research was done before regarding the application of UAS operational safety considerations to Germany. Therefore, it was decided to apply the research on and the developed tool for UAS operational safety considerations UAS on Germany as example.

With these adjustments, the fundamental research question and the subsequent detailed research questions were refined as follows:

Is it possible to proof the airworthiness of a light UAS with operational safety considerations instead of traditional airworthiness requirements in order to obtain a type certificate?

1. What are relevant operational safety considerations in the context of light UAS operations in Germany?
2. How can these operational safety considerations for light UAS be modelled?
3. How reliable are such operational safety considerations for light UAS?

Based on those more precise research questions, the hypothesis was amended:

Operational safety considerations cannot be used as the only proof of airworthiness of a light UAS in an aircraft type inspection process to achieve a type certificate.

The resulting contributions of the research on these questions, which led to the present thesis, are presented briefly in the next chapter.

1.4 Dissertation Contributions

1.4.1 Contribution C1: Summary and Analysis of UAS Regulations Framework and UAS Risk Models

In order to assess the research questions, an intense literature review was conducted. Primary focus was given on the activities of the designated main stakeholders. Because in the beginning foremost only guidance and policy documents of official authorities were available, but only few official UAS regulations, attention was also given on white papers from different authors and groups. This led to an encompassing overview of the past and current state of the art on approaches, principles, directives and standards regarding the handling of UAS. By providing an extensive compassing résumé and comparison of current UAS airworthiness regulation approaches from civil and military entities, a comprehensive picture about unmanned aviation is provided.

Soon it became obvious that this lack of official UAS regulation caused many studies with respect to the UAS operational risk studies and related risk models, for example [36-50]. However, it was found that those models often missed to discuss the point if the results could be a path for determining airworthiness of light UAS. Besides, studies that specifically were focused on the determination of UAS risk assessments with respect to Germany could not be identified. The present thesis overcomes these misses and discusses exactly those points.

1.4.2 Contribution C2: O.R.C.U.S. – a Self-Developed UAS Operations Risk Model from the Scratch

To achieve the aims described afore, it was seen necessary to develop an own risk assessment tool which takes into account all relevant operational safety aspects that need to be considered for estimating the risk of light UAS operations. This decision resulted in the O.R.C.U.S. tool. O.R.C.U.S. - Operational Risk Considerations for Unmanned Aircraft Systems is a unique software simulation tool chain which is able to estimate the risk of a light UAS operation above any area in Germany. O.R.C.U.S. calculates predictions regarding the hit probability of a person in the vicinity of a UAS operation, in case the Unmanned Aircraft (UA) crashes.

The basic advantage of O.R.C.U.S. is that it enables the user to generate risk predictions of an intended operation with a light UAS over a designated operational zone in Germany by using a default model and to combine it only with elementary data about the UAS. While the studied risk models usually concentrated on the crash of a UAS itself, the benefit of O.R.C.U.S. is that a complete event chain beginning with the technical failures in the airborne UA which eventually cause the crash on the ground and the possible outcomes is included. Although the behaviour of a failed light UAS is highly dependent upon the specific UAS design, it is possible to define high level and common assumptions about the behaviour. Therefore, the default model of O.R.C.U.S. defines failure conditions based on main subsystems of the UA which might lead to different outcome scenarios.

Furthermore, in contrast to most UAS risk simulation models which have been reviewed, O.R.C.U.S. uses a time and place dependent population algorithm based on official and up to date statistics, instead of a uniform and static population density model. The application of this algorithm provides the current population density in relation to the time when the UA impacts the ground and the area where the UA crashes [51].

1.4.3 Contribution C3: Determination of a Relationship between Operational Safety Considerations and Airworthiness

Once the basic programming and testing of O.R.C.U.S. was completed, an example light UAS operation was defined and applied to several representative cities and areas in Germany in accordance with an upfront determined simulation and validation plan. After completion of each of those simulation runs, the results produced by O.R.C.U.S. where evaluated in detail with respect to the research questions and the hypothesis. To ease the evaluation, O.R.C.U.S. includes an automatic examination and validation function, which produces evaluation spread sheets. In total, the example mission was applied on fourteen cities, with 39,200 simulated flight hours in summary per city or area, leading to more than half a million simulated flight hours.

The evaluation of the simulation results from O.R.C.U.S. confirmed the hypothesis that airworthiness of a light UAS cannot be proven by operational safety considerations only. However, it was found that operational safety considerations might be used as mitigation to compensate lacking airworthiness evidences or non-compliances within a type inspection process of a light UAS in order to conduct an operation safely even with a UAS deemed not to be airworthy. Assessment tools like O.R.C.U.S., in particular the included algorithms to predict people densities in accordance to time and place, are able to increase the risk awareness of UAS operators substantially in order to avoid critical daytimes of densely people movement. Subsequently, the potential risk of overflown people might be reduced.

Nevertheless, a software-based tool like O.R.C.U.S. forms a solid base for planning specific UAS operations. For regular operations with unmanned aircraft, a UAS design, which is based on proven methods and sound development technologies in order to show compliance to the applicable type certification basis will always be superior to a UAS which needs operational safety considerations to achieve an acceptable safety level. These conclusive deductions are seen as the main contributions of the present thesis, as to the authors best knowledge, a comprehensive assessment of operational safety considerations and the relation to traditional airworthiness approaches as it was done, has not performed to the extent as it was done here.

1.4.4 Further Contributions

Besides the already outlined wide-ranging inputs, the further contributions of the present thesis are:

C4. The present thesis includes a conclusive summary of the history of unmanned aviation as it was felt, that it is necessary to be aware about the origins of UAS in order to better understand the concept of unmanned aviation.

C5. Open Simulation Environment for a UAS operation above Germany

The provision of a comprehensive open simulation environment for a UAS operation above Germany, allowing the assessment of different UAS failure modes, leading in worst case to an uncontrolled ground impact.

C6. The determination of resulting risk for people overflown in Germany, by applying different impact scenarios in combination with a time and place dependent algorithm regarding population distribution in a way that was not done before.

C7. The possibility to estimate if a UAS operation is sufficiently safe or not in congested areas, although only few information about the UAS is available and without the need to conduct an extensive assessment.

C8. A method to validate the results of the UAS operation risk assessment.

Much more details regarding the contributions of this thesis will be presented within the following chapters of the core text. The next and last chapter of the introduction outlines the content structure of the present thesis.

1.5 Content Structure

The present work contains ten chapters including the bibliography and one appendices chapter. After the current introduction, chapter 2 illustrates the origins of UAS in order to get an idea about the general principles of unmanned flying and where they are coming from.

In Chapter 3, the concept of aviation safety will be summarised. This includes a short summary about the four denominated key entities, ICAO, FAA, EASA and NATO with the intent to raise the awareness regarding the meaning of those entities in the context of aviation safety. One of the core aspects of aviation safety and the key driving aspect of this thesis, airworthiness, will also be elaborated in a dedicated subchapter. To provide a complete picture, the process to determine airworthiness, the so-called type inspection process (of aircraft), is also presented.

Within chapter 4, the principles of aircraft type inspection will further be applied to UAS. Due to their unique nature, certain specialities and challenges related to the type inspection of UAS are brought to the fore. In addition, the chapter contains a summary of the current UAS regulation efforts of the four designated stakeholders. The chapter will be concluded by the determination of points to be considered in order to answer research question 1.

Subsequent to the conclusion of chapter 4, chapter 5 pursues an assessment of selected UAS Operations Risk studies which were available prior to current regulations. The reviewed UAS risk assessment studies will be presented briefly. Based on the results of the previous chapter, the assessment will start with general aspects to be considered before conducting a UAS flight operation as well as special factors and challenging aspects that have to be taken into account additionally. Those derived general aspects served as guidance of the reviewed studies in order to determine advantages, shortcomings and potential mitigations. The found shortcomings and potential mitigations are then presented in chapter 6. While chapter 5 completes the first research question, chapter 6 gives the introduction to answering the second research question which will be completed by chapter 7.

Chapter 7 focuses on the UAS risk assessment tool which was created for this thesis: O.R.C.U.S. At first, the general aim of O.R.C.U.S. will be outlined, followed by a description of the capabilities of the tool, the background of the different functional capacities and the resulting main algorithms. The chapter is completed with an illustration of the standard O.R.C.U.S. simulation based on the integrated default settings.

This depiction in the end of chapter 7 serves as entrance to chapter 8, which illustrates the application of O.R.C.U.S. in the course of the research for this thesis on operational safety considerations in the context UAS type inspection and airworthiness and shall serve as answer to research question. This includes the determination of the simulations with respect to the UAS operation itself as well as the representative areas above which the simulated UAS operation took place. Before the results of the conducted simulation series will be discussed, the approach regarding the validation of O.R.C.U.S. is reviewed.

After the presentation of the O.R.C.U.S. simulation results, these results are going to be discussed in the last subchapter of chapter 8. Within this discussion, the results will be assessed with a focus on deductions regarding airworthiness aspects in order to answer research question 3 and to substantiate the hypothesis.

Within chapter 9, which represents the last main chapter, an encompassing conclusion will be presented, summarizing the results of the research and the thesis. Furthermore, the conclusion will be complemented by an outlook of possible further developments and improvements of O.R.C.U.S.

For the sake of completeness, within the appendices that follow chapter ten, a brief O.R.C.U.S. manual, a glossary with a description of each O.R.C.U.S. function, all areas that have applied within the conducted simulation series as well as associated evaluation tables are included. The source code of O.R.C.U.S. is not part of the text itself but is stored at the Institute of Flight System Dynamics and can be retrieved there.

2 Origins of Unmanned Aircraft Systems

In January 2013 the Chinese based company DJI released the Phantom drone. The quadcopter design became iconic for the mass consumer market of drones. With the ability to fly automatically and to hold the position even in case of a complete loss of the command and control link, the UAS represented a major difference to other available consumer drones in these days. Accompanied by a control device instead of relying on users' smartphones and combined with an affordable price, one could say that the Phantom marked a game changer in the civil UAS market [52].

Although the evolution of the civil UAS market started not that long ago, the beginning of UAS started much earlier. Basically, the history of UAS begun in the mid of the 19th Century. A lot of technology enhancement in mankind's history was driven by wars and military developments. For the technology of UAS this is even more true than for other technologies as it was developed strictly for military applications only and this continued until the early 21st Century [20, 53].

Figure 2-1. DJI Phantom 4 Advanced[1], one of the latest DJIs Phantom UAS series generation.

If today a random person is asked how drones look, it can reasonably be assumed that he or she would describe either the shape of a quadcopter or the shape of a Reaper UAS from the US Forces. Like the quadcopter design of the Phantom became iconic and an immanent symbol for civil UAS to the public, so did the design of the Reaper for military UAS as well.

[1] Figure credit: DJI, retrieved from https://www3.djicdn.com/assets/images/products/phantom-4-adv/s1/s1-img-2103a7274a03d031f129b9cd360c2ee3.png?from=cdnMap

Figure 2-2. US Air Force MQ-9 Reaper on a mission[2].

Driven by the actions taken by the United States with their fleet of UAS in the global war on terror, the public reception of unmanned aviation is foremost negative. It is quite an irony of fate, that the first usage was also a military one, similar to the capabilities of todays armed UAS.

The present chapter represents contribution C4 as it outlines the history of UAS in order to provide an idea how they evolved to their current state. In the context of the research questions, this aspect was seen necessary to get an encompassing overview on unmanned aviation. By doing so, it also helps to better understand the later outlined regulation framework and therefore serves as support for contribution C1.

2.1 Unmanned Balloons and the Birth of Remote Control

During the siege of Venice by the Austrians in 1849, unmanned balloons should carry explosive devices over the lagoon to the city because the range of the Austrian artillery cannons was not enough to reach the city. The success of this attempt is not clear and the reviewed sources are inconsistent. It is obvious that unmanned balloons are highly vulnerable to environmental effects, especially wind, nevertheless there was a psychological effect regarding the death from the sky which probably supported the success of the Austrian Forces [20, 54-56].

The technology of the 19th century had not the means needed to enable flight with machines heavier than air, nor essential elements for unmanned aviation like remote control. However, in 1898 the inventor Nikola Tesla got a patent granted by the United States Patent Office on his “method and apparatus for controlling mechanism of moving vessels or vehicles” [57]. Tesla proved the concept of wireless control of vehicles and laid down one cornerstone for unmanned aviation.

A real application of a remote control for a flying vehicle was demonstrated in 1910. Thomas R. Phillips, a British engineer, showed the remote control of a model sized Airship in London. He flew it above the audience and dropped a small load of paper doves. The purpose of his demonstration was to advertise his idea of so-called Torpedo Airships, which should be able to bomb any city by remote control. Unfortunately, he had no technical solution regarding the determination when the Airship would have reached its aim. To overcome this issue, he only

[2] Figure credit: US Air Force, retrieved from https://www.af.mil/News/Photos/igphoto/2000608254/

had a vague idea what he called “telephotographic lenses”, however this idea was much ahead of technological feasibility of the early 20th Century [20, 58].

2.2 The Predecessors of Modern UAS

Also because of technological constraints and only very limited success of several projects, the further development of wireless controlled machines was quite low. This changed in 1917 when the successful first flight of the Curtiss-Sperry Aerial Torpedo took place. Developed clandestinely as “Aerial Target”, the aircraft impersonated the real first remotely piloted weaponized aircraft, which was flown successfully. With respect to common definitions of UAS of today, the unmanned aircraft was rather a very early predecessor of the modern cruise missiles than of a UAS. A short synopsis regarding the modern definitions of UAS and their origins will be provided in chapter 2.7. During the foundation years of UAS development, UAS were always close to missiles development [53].

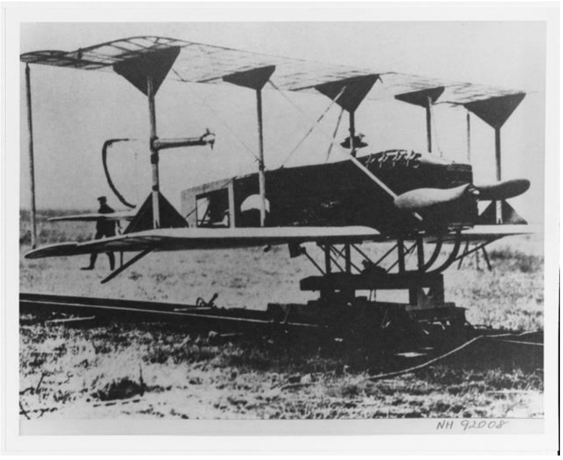


Figure 2-3. Curtiss-Sperry Aerial Torpedo around 1918[3].

Besides the remote control, the Curtiss-Sperry Aerial Torpedo included another cornerstone of UAS technology: Inertial Navigation with for these times very small gyros. This led to an impressive increase of the aircraft’s accuracy. The harbingers of the first World War pushed the development of several other UAS comparable to the Curtiss-Sperry vehicle. However, only few fulfilled the expected capacities. One of them was the Kettering Bug, shown in Figure 2-4, which was invented and developed for the US Air Force also in 1917. The technological constraints of the early 20th century concluded in the recognition that no effective UAS could be realized. Therefore, focus was given on target drones for the purpose to train antiaircraft gun operators and very early guided missiles [20, 53, 59].

[3] Figure credit: Naval History and Heritage Command, retrieved from https://www.history.navy.mil/our-collections/photography/numerical-list-of-images/nhhc-series/nh-series/NH-92000/NH-92008.html

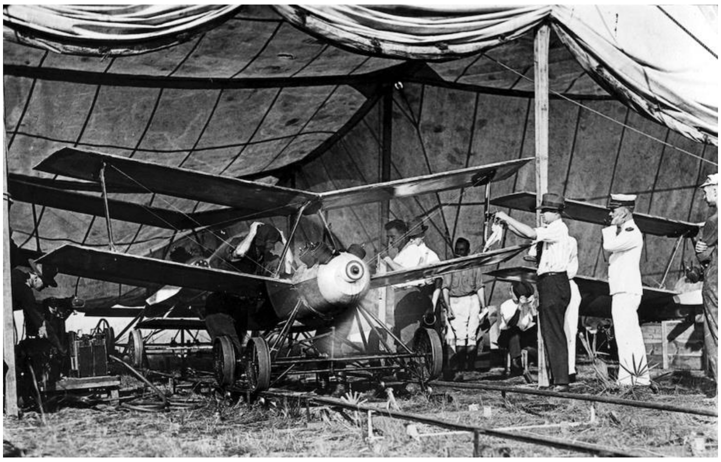


Figure 2-4. Kettering Aerial Torpedo, nickname “Bug”, year unknown[4].

2.3 Technological Evolution in the Dawn of and during World War 2

Whilst the UAS development saw a stagnation after the first World War, it increased again as the world had to face the raise of the German Reich and the growing threat of a second World War. After Tesla had demonstrated the capability to control vehicles wireless, and the development of gyros for inertial navigation continued, another inventor applied for a patent, which made it possible to send Torpedoes or other devices fully automatic to a target. In 1931 the patent application of the Hungarian Engineer Koloman Tihanyi about an “Automatic Sighting and Directing Devices for Torpedoes, Guns and other Apparatus” was accepted in the United Kingdom. Tihanyi closed a gap, about which no one thinks about today any more: The ability for a vehicle or aircraft to fly automatically and to detect or “to see”. However, the real benefit of this invention, the ability of the UA to see, was objected by the not yet sufficient technology to downstream the data [20, 60].

Figure 2-5. Winston Churchill upfront a Queen Bee under preparation for flight, 06 June 1941[5].

[4] Figure credit: National Museum of the US Air Force™, retrieved from https://www.nationalmuseum.af.mil/Visit/Museum-Exhibits/Fact-Sheets/Display/Article/198095/kettering-aerial-torpedo-bug/
[5] Figure credit: Imperial War Museums, retrieved from https://www.iwm.org.uk/collections/item/object/205195356

Although UAS suffered of this deficiency, the already started development of target drones continued. Based on the De Haviland DA.82 Tiger Moth, the DA.82B was developed, a remote-controlled version of the DA.82. The DA.82 B should become the first UAS of mass production as the Royal Navy of the United Kingdom procured around 400 of those “Queen Bees” called drones between 1934 to 1943. At the Royal Navy, the Queen Bees were used as target drones. The name “Queen Bee” is also one of the rare clear links were the relation of UAS and drone might come from. In parallel, the US American Reginald Denny, developed his remote controlled Radioplane-1. This target drone did not gain a lot of attention of potential customers at first. However, this changed with the outbreak of the second World War. Until the end of the war, more than 15,000 different drones of Reginald Denny Industries were manufactured [53, 54, 59].

But the US and UK models where not the only attempts to foster UA. In the German Reich, the Argus AS 292 reconnaissance UAS was developed. Similar to the Curtiss-Sperry Aerial Torpedo, it was developed secretly as Aerial Target for antiaircraft Gunnery under the camouflaged name “FZG-43 – Flak Zielgerät 43”. The real purpose of this small-sized remotely piloted aircraft was to provide close range aerial photography to the German troops. Furthermore, after the successful proof of concept, the manufacturing company Argus, proposed the so-called “Fernfeuer” program. The concept foresaw a UAS controlled from another aircraft. Furthermore, it should be capable to carry one ton of disposable explosives and return to base after disposal. However, this idea remained a concept only. Nevertheless, the basic idea led to the development of the famous infamous “FZG-76”, or better known as the “V-1”.

Figure 2-6. Soldiers moving a V-1 on a transport wagon to the start ramp, 1944/45[6].

Similar to the Aerial Torpedoes earlier, also the V-1 does not match with the modern definition of UAS. V-1 was a more advanced ancestor of cruise missile than the Kettering Bug or the Curtiss-Sperry Aerial Torpedo. Nevertheless, V-1 needs to be mentioned because this machine contained fundamental elements of modern UAS. For example, the system was comprised of an autopilot, gyroscope-based feedback mechanisms to steer the control

[6] Figure credit: Bundesarchiv, Bild 146-1973-029A-24A, Photograph by Bruno Lysiak, Original Title “V1 vor dem Start”

surfaces and to stabilize the aircraft, an anemometric system as well as transmitter to provide the position to German ground stations [53, 59, 61].

While V-1 was developed and deployed on the German side, the United States Navy started a development of UAS which should not only be able to act like a missile, but also be able to drop bombs over a target area. Based on a proposal of a Navy commander to utilize Target Drones as kind of battering ram against enemy aircraft, the development of the first Unmanned Combat Aircraft System (UCAS) emerged in 1941. The resulting TDR-1 drones should be controlled by another aircraft mothership, the TBF Avenger. They were intended to serve either as kind of guided missile or as bomb carrying transport aircraft. Test trials included a television camera and a sufficient transmitter to improve the accuracy to the most extent. The tests were successful and proofed that the television transmission worked sufficiently. Another successful test series incorporated a new radar-based guidance system, enabling all-weather operations.

Figure 2-7. Flight preparations of a TDR-1, 1944[7].

After subsequent delays because of the technical modifications, the UAS were deployed to the battlefield in early 1944. Navigated by their motherships, the TDR-1s flew to their targets, deployed the bombs and on the way back they dove into enemy ships (formally speaking, this “one-time” usage rejects the definition as UCAS). However, the US Navy was not satisfied with the results and cancelled the program later in 1944. Notably, it is worth to say that the TDR-1s operated more than six miles away from their remote pilots and no one of the motherships and the crews was lost [53, 61].

2.4 The New Standard Role

The two World Wars caused a jump in the development of manned and unmanned aviation technology. Although seen as exotic and also hindered by the limitations of the technology in these years, UAS were already deemed as beneficial asset to armed forces. In the post-war years, development in the area of unmanned aviation continued to concentrate on target drones for training purposes as well as on guided missiles [53].

However, as the divergence of the former allies began and the Cold War manifested permanently, the need to have an effective reconnaissance in the air became apparent.

[7] Figure credit: Naval History and Heritage Command, retrieved from https://www.history.navy.mil/our-collections/photography/numerical-list-of-images/nara-series/usn/USN-1050000/USN-1053775.html

Another driver was the potential necessity to explore battlefields in a dirty environment, e.g. after a nuclear detonation. Consequently, it became obvious that such kind of aerial reconnaissance should be unmanned. The loss of two manned U-2 airplanes over the Soviet Union in the 1960s increased the development even more. Reconnaissance should became the new standard role for UAS remain until today [53, 54, 59].

One of the first attempt was made by the US Air Force, which planned a high-flying UAV, the B-67 Crossbow. Due to financial and insufficient performance, the program never made it to real service. Another approach was driven by the US Army, which wanted to carry out battlefield assessment. Therefore, a target drone of the Northrop Radioplane Company was modified in order to carry either a daylight or infrared night camera.

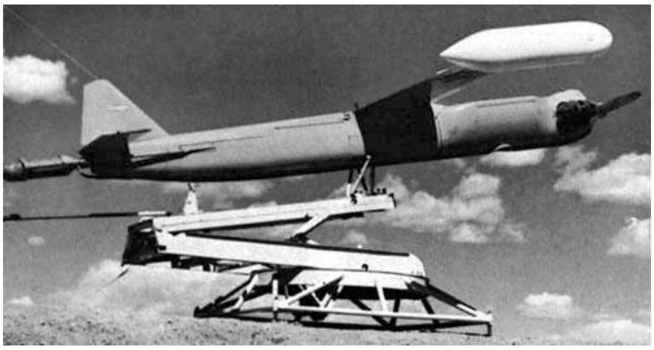


Figure 2-8. Northrop Radioplane SD-1, year unknown[8].

Tracking of the SD-1 UAS was done via Radar while it was piloted with radio control. The UAS was able to fly 30 minutes with an operational radius of up to 65 km and to take and store up to 95 photos at daylight, respectively up to 10 at night. The SD-1 was used for many years throughout different military forces and in fact, it was one of the real first UAS for reconnaissance [53, 59, 62].

While during the Korean War UAS still remained a side-asset by the US Forces, they became much more present during the Vietnam War. The AQM-34 Lightning Bug, a series of jet driven UAS of the Ryan Company, conducted more than 3,400 missions over the territories of China, Vietnam and North-Korea. It was developed secretly and based on the former target drone models Firefly and Firebee.

[8] Figure credit: Dr Russell Naughton, retrieved from http://www.ctie.monash.edu.au/hargrave/rpav_radioplane6.html

Figure 2-9. AQM-34L Lightning Bug, year 1969[9].

The Lightning Bugs finally proved the benefits of UAS for the US Forces. Besides their reconnaissance function, the UAS were fitted also for Signal and Communication Intelligence (SIGINT/COMINT) and electronic warfare purposes. It should be noted that some Lightning Bugs were given credit for the down-shooting of hostile aircraft. Actually, the enemy's aircraft were lost foremost during intercepts or due to wrong guided anti-aircraft missiles of their own forces. Another remarkable attribute of the Lightning Bug system was the capability to be retained in the air by a helicopter while the UA was hanging on the parachute [53, 59].

Figure 2-10. AQM-34 - Medium Air Retrieval System illustration, year unknown[10].

Another notably development was the D-21 "Tagboard". This system should act as means for strategic intelligence. The concept foresaw the launch of the unmanned aircraft from a A-12 mothership, a modified version of famous SR-71 reconnaissance aircraft. Capable of flying at supersonic speed of up to Mach 3 in high altitudes, D-21 would have been able to overcome hostile air defense. Four test flights were conducted including missions over foreign areas. However, none of them was entirely successful. This was one but not the only reason which lead to the stop of the program.

[9] Figure credit: National Museum of the US Air Force™, photo 140114-F-DW547-004.JPG
[10] Figure credit: National Museum of the US Air Force™, photo 140114-F-DW547-008.JPG

Figure 2-11. D-21 on its mothership, year unknown[11].

Although the United States were the forerunners in unmanned aviation, it should also be noted that there were several developments in other nations. For example, the German Army received their first reconnaissance CL-89 in the mid 1960s. The drone was developed by Canadair for the military forces of the United Kingdom and France at first. Launched by a rocket booster, the system operated entirely automatic. The successor of this UAS, the CL-289, which was very similar in its design, was flown by the German Army until the late 2000s. It should be noted that the most systems of these days did not contain a real time video imagery as current UAS provide. Usually, pictures taken by the UAS were stored in a capsule inside the aircraft, which had to be evaluated after landing of the UA [53, 59].

Like the United States, the Soviet Union as the main antagonist in the Cold War developed several UAS. However, only few information is available to the public. Known examples are the TBR-1, the Tu-123 or the Tu-143. Although the development of Soviet UAS was kind of similar to the programs in the western world regarding the linkage to target drones, it was even more linked to the development of ballistic missiles.

Figure 2-12. Rocket-assisted launch of Tu-143, 2016 [12].

[11] Figure credit: National Museum of the US Air Force™, photo 151009-F-DW547-003.JPG
[12] Figure credit: Andrii Klymenko, retrieved from https://www.kyivpost.com/ukraine-politics/ukraine-today-ukrainian-missile-tests-near-crimea-details-map-revealed.html

While the TBR-1 was a smaller UAS which had a design comparable to an aircraft, the two other listed systems based on missiles. Capable of flying at supersonic speeds in order to operate behind the enemy's lines, Tu-123 ejected the sensor payload with the pictures taken, while the remaining aircraft crashed into the ground from a high altitude. Resulting in high usage costs, this deficiency ultimately led to Tu-143 "Reys", which is still used. The UA is launched with by rocket-assist and incorporates the ability to fly back to a safe landing zone and to land by parachute. Early Tu-143 had an endurance of only 13 minutes, but with a speed of around 925 km/h it still had an operational radius of roughly 100 km [53].

With the end of the 1970s and the beginning of the 1980s, another stakeholder of UAS evolved. Israel, who had been observing UAS operations of other nations during the 1970s, yet not applying UAS extensively in their own forces, began to deploy tactical UAS. In contrast to the first UAS flying in Israel who were bought ready to use from the United States, these new UAS were developed and produced in Israel. The UAS were comparable to larger model aircraft and of a robust and not complicated design, but reliable and not expensive.

Figure 2-13. IAF Scout UAV illustration[13].

One big advantage was, that those UAS carried video cameras which provided real-time video streams for the troops on the ground. The characteristic twin-boom design of the Scout UAS with the engine located between the booms should remain iconic for Israeli UAS up to today. Within the following years, the military forces of Israel increased the usage of UAS intensively, which led to the fact that Israel continued in the further development of their UAS and to become one of the UAS world market leaders. Other notably UAS were for example the Hunter with a pull and a push propeller at the fuselage or the Heron, a Medium Altitude Long Endurance (MALE) UAS which was able to fly 51 hours and which reached an altitude of 32,000 ft [53, 59, 63].

2.5 Wherever, Whenever

In the previous chapter, the Heron UAS was mentioned. Heron, which is still flying for several air forces, was one of several outcomes of a need to have another type of intelligence than the available manned reconnaissance measures as for example the U-2 or unmanned systems like Satellites. In the US, by end of the 1960s, research programs started with the aim to generate airborne intelligence without endangering a human pilot while in parallel ensure long endurance. Several experimental systems were tested by the US Air Force in the next decade.

[13] Figure credit: Israeli Air Force, retrieved from https://www.iaf.org.il/215-en/IAF.aspx

Those experimental systems proved that the requirements could be met. For example, the XQM-93A of E-Systems or the YQM-98A of Teledyne Ryan, were able to fly more than 22 hours at altitudes above 50,000 ft. Although those aircraft proved that UAS could fulfill the required performance, no one was developed further to series production. The lack of an adequate measure to provide real time reconnaissance over long distances but also bureaucratic efforts in the US Forces hampered the development.

Roughly by the beginning of the next decade, the Defense Advanced Research Projects Agency (DARPA) took over the oversight of the development of long endurance UAS. One of the results was the funding of the Amber called aircraft from the Leading Systems.

Figure 2-14. Amber UAV, 1988[14].

As can be seen in Figure 2-14, Amber had an inverted V-tail, as well as a push propeller at the back. It is not a coincidence that one might be reminded of General Atomics Predator™. Amber should become the grandfather of General Atomics Predator™ UAV. Already in this early phase, the UAS included a high-band data link for real-time transmission and the capacity to carry weapons under the wing. After several successful demonstrations, the Leading Systems decided to go one step further and started to develop the advanced Gnat-750™ UAS.

Figure 2-15. MQ-1 Predator, 2007[15].

[14] Figure credit: DARPA, retrieved from https://www.darpa.mil/about-us/timeline/amber-predator-golden-hawk-predator
[15] Figure credit: US Air Force photo by Staff Sgt. Brian Ferguson, photo 070511-F-2185F-595.JPG

In 1993, now under the flag of General Atomics who bought Leading Systems, the Gnat UAS conducted a 40 hours flight. Furthermore, besides daylight video, an infrared video camera system was part of the UAS as well as a satellite data link. Developed as a larger version of the Gnat-750™ in order to operate 24 hours at a range of 500 miles from the control station, the Predator™ made its' maiden take-off by mid of 1994. In 1996 the UAS was deployed to the theatre of operations in Bosnia. While the first deployed versions did not carry bombs, the following ones provided besides the ability of real-time imaginary also strike-capabilities. With those capabilities Predator™ and the follow-up versions became a persistent part on the battlefields. While in 2018 the first version of the Predator™ is retired, the descendants of this UAS are still flying and will continue to fly for many forces around the globe. The most notably one is probably the MQ-9 Reaper, as already mentioned at the beginning of this chapter [53, 59, 64].

Another outcome of the DARPA take-over was the development of a UAS that should be able to operate at much higher altitudes than Amber and its successors were able to operate, while carrying very capable sensors. The aim was to close gaps in the intelligence chain which the U.S. had observed during Desert Storm. Evolved from experimental programs in the 1980s, two further UAS programs should become the solution. Therefore, a review of different designs of several manufacturers took place. The final chosen UAS designs were Northrop Grumman's Global Hawk and Lockheed/Boeing's DarkStar.

Figure 2-16. RQ-3 DarkStar, 1995[16].

The design approaches of the Global Hawk and the DarkStar were completely different. While DarkStar was focused on a stealthy design, the design of the Global Hawk was a more conventional one. This two-way approach should enable operations in either very hostile airspaces or in low/moderate hostile airspace. While DarkStar on the one hand had only one third of Global Hawks performance with respect to endurance, mainly because of the stealth design, it was also pursued by mishaps and one complete loss of an aircraft. In contrast, Global Hawk showed high reliability and the desired capacity to fly lengthy at very high altitudes above 60,000 ft. DarkStar was dismissed in 1998 and Global Hawk was given from DARPA to the US Air Force. Since then, comparable to Predator, Global Hawk was developed continuously

[16] Figure credit: NASA, Tony Landis, photo EC95-43303-7

further and became a versatile asset of the US Forces and the icon for the High Altitude Long Endurance (HALE) UAS [53, 59].

Figure 2-17. Global Hawk in the US Navy variant MQ-4C, 2014[17].

Global Hawk and Predator can be seen as role models for modern UAS applications in military forces around the globe. While in the beginning of unmanned aviation, operations of UAS were limited to the radio line of sight between Ground Control Station (GCS) and UA, Satellite Communication is nowadays state of the art, allowing worldwide operations with near real-time control. Miniaturization of complex electronic components allow to carry much more advanced capable sensors and equipment in the aircraft than it was thinkable in the beginning of unmanned aviation. Furthermore, it allows that also small UAS are set up with very sophisticated equipment and algorithms [53, 59].

2.6 Rise of the Civil Drones

One could think that civil UAS had their first appearance in the 21st century and up to this time only military appliances were present (cf. the introduction to chapter 2). This might be true for the broad civil consumer market, but for example, civil UAS were already used for decades in Japan. Since the end of the 1980s, rotary wing UAS are used in Japan for agricultural appliances [65].

Figure 2-18. Yamaha RMAX, one example for civil UAS application [18].

[17] Figure credit: U.S. Navy photo by Erik Hildebrand, photo 140918-N-UZ648-008.JPG
[18] Figure credit: Yamaha Motorsports, retrieved from https://www.yamahamotorsports.com/motorsports/pages/precision-agriculture-rmax

Furthermore, in the field of science, a lot of effort was put into pure solar powered UAS which should enable unlimited flying at heights close to 100,000 ft in order to collect data of the atmosphere or to act as pseudo-satellites. First attempts were done in the mid of 1970s with the UAS Sunrise I. Like the conventional powered UAS of these days, the solar powered systems were also constrained by the available technology. Nevertheless, these early experimental flights set the fundamentals for later solar powered UAS like the NASA Pathfinder or Helios which were part of the NASA Environmental Research Aircraft Technology program or the QuinetiQ, later Airbus, Zephyr program.

Another noteworthy civil UAS is the AeroSonde. This 30 lbs weighing UA was designed for the purpose of weather monitoring in oceanic regions. In order to provide an advantage against weather balloons, AeroSonde was designed for very long endurance flight above 30 hours. Furthermore, in 1998 AeroSonde “Laima” was the first UA that made the first transatlantic flight [59].

Figure 2-19. AeroSonde “Laima” [19].

Nowadays, civil UAS are much more present than during the times of the transatlantic crossing of “Laima”. On-going miniaturization and reduction of production costs as well as faster development led to the trend that civil UAS became much more than a niche for some model enthusiasts. This resulted not only in the mass production of UAS for hobbyists like the Phantom drone, it also led to much a lot of business cases more. These are for example power-line inspections, applications in the film industry, building inspections, forestry services, delivery services and many more [11].

2.7 UAS, UAV, RPAS, Drones

For the sake of completeness, no work about UAS is complete without a discussion of the terminology. As already can be seen by the title of this subsection there is not only one term for aircraft that are capable to fly without a pilot on-board. During the last years numerous abbreviations and designations for unmanned aircraft have been used.

The probably simplest term for unmanned aircraft is just drone. Raised during the early 20th century, this designation seems to be one of the oldest terms. But even if it is one of the oldest designations, it is apparently one of the most common definitions in mind of the broad public due to usage throughout press and media.

Around the 1980s, the expression Unmanned Aerial Vehicle became mutual. Up to now this one is still used sometimes. For the sake of political correctness, it was also tried to establish

[19] Figure credit: Washington Museum of Flight, retrieved from https://www.museumofflight.org/aircraft/insitu-areosonde-laima

the neutral terms Uninhabited Aerial Vehicle and Unpiloted Aerial Vehicle. But these terminologies did not persist. Other known designations that least only a short time were Remotely Piloted Vehicle - RPA and Remotely Operated Vehicle – ROA [2, 31, 46, 66].

In fact, they are all meaning the same. However, all of them are missing one major point. They are addressing only the flying vehicle, but it is not just the flying part that has to be taken into account for dealing with this kind of aircraft. It is the whole system that must be dealt with. In this attempt, the current nomenclature of Unmanned Aircraft System – UAS and Remotely Piloted Aircraft System – RPAS have been raised. The system definition covers all aspects that are necessary for handling unmanned aircraft, which is reflected by current valid definitions of different civil and military organizations.

"*Remotely piloted aircraft system (RPAS). A remotely piloted aircraft, its associated remote pilot station(s), the required command and control links and any other components as specified in the type design."*

ICAO Annex 2 - Rules of the Air, 2016, page 1-8, [67]

"'unmanned aircraft system' ('UAS') means an unmanned aircraft and the equipment to control it remotely;"

Commission Delegated Regulation (EU) 2019/945, Article 3 (3), [23]

"A system whose components include the Unmanned Aircraft (UA), the UA control station and any other UA System elements necessary to enable flight such as a command and control data link, communication system and take-off and landing element. There may be multiple UA, UCS, or take-off and landing elements within a UAS."

NATO AEP-4671, Edition B, Version 1, 2019, page A-5, [68]

On first sight, this seems to be just a formal aspect. But the fundamental understanding of unmanned aircraft as system raises crucial consequences, especially from an airworthiness point of view, which will be further discussed in chapter 4.

Furthermore, the system definition that includes components external components external to the airborne system marks one of the fundamental differences to manned aircraft. For the framework of this thesis, it was chosen to use the UAS definition of NATO as shown above including the definitions of the UAS components defined below.

"Unmanned Aircraft (UA)

An aircraft that does not carry a human operator and is operated remotely using varying levels of automated functions. Moreover a UA:

- *Is capable of sustained flight by aerodynamic means,*
- *Is remotely piloted or automatically flies a pre-programmed flight profile,*
- *Is reusable,*
- *Is not classified as a guided weapon or similar one shot device designed for the delivery of munitions."*

NATO AEP-4671, Edition B, Version 1, 2019, page A-5, [68]

"UA Control Station (UCS)

A facility or device from which the UA is controlled and/or monitored for all phases of flight considering USAR.U2 (a)."

NATO AEP-4671, Edition B, Version 1, 2019, page A-5, [68]

"Command and Control Link

A data transmission used for control of the UA that transmits UA crew commands from the UCS to the UA (uplink) and UA status data from the UA to the UCS (downlink)."

NATO AEP-4671, Edition B, Version 1, 2019, page A-1, [68]

Already by the several definitions of UAS, it can clearly be deducted hat UAS are much more than just a control station and a flying aircraft. For example, there might be different forms of the Command and Control Link (C2Link). The C2Link might be realized either by a direct radio line of sight (RLOS, Figure 1-1) connection or via a Satellite relayed connection in order to realize a beyond radio line of sight (BRLOS, Figure 2-21) connection. The UCS might be cable connected to another UCS in order to expand the range of the UAS without a Satellite (Figure 2-22) or another UA might act as relay transmitter in order to overcome physical obstacles for a RLOS like Mountains (Figure 2-23). Furthermore, the UCS must not be fixed to the ground. It could also be on a ship or in another aircraft. The main elements of a UAS can be applied in many ways. Some possible configurations are shown in the following figures which represent generic UAS architectures.

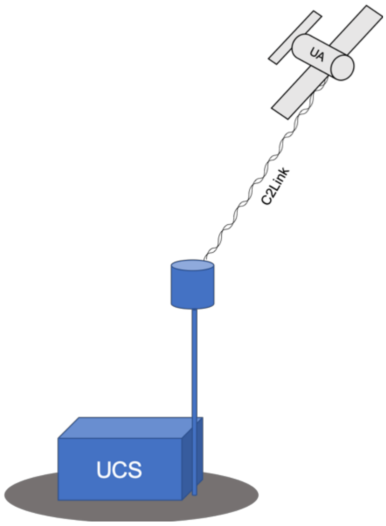


Figure 2-20. Generic UAS with a RLOS C2Link.

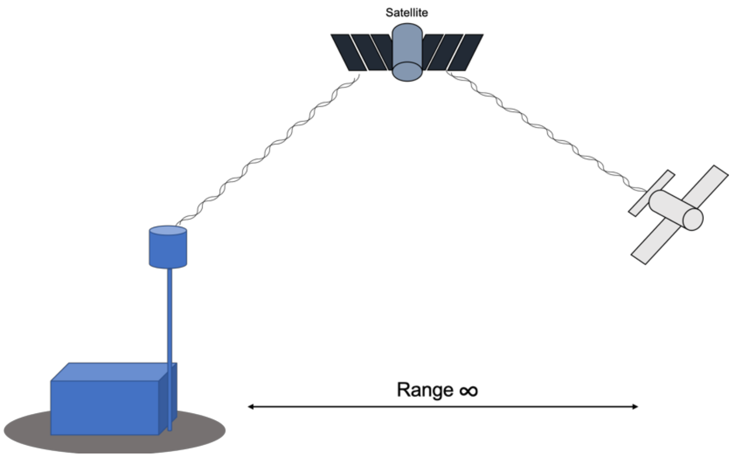


Figure 2-21. Generic UAS with BRLOS SatCom C2Link.

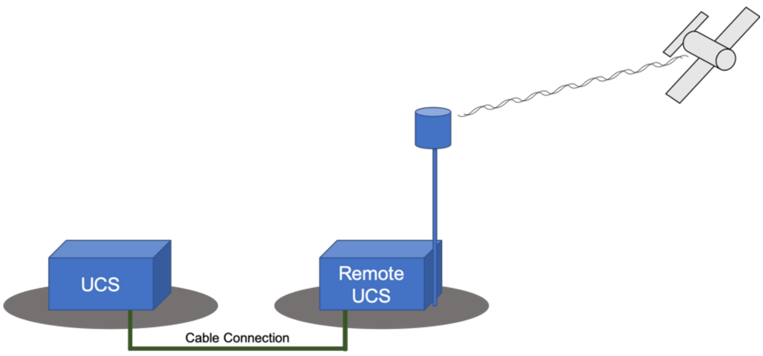


Figure 2-22. Generic UAS with a remote UCS and RLOS C2Link.

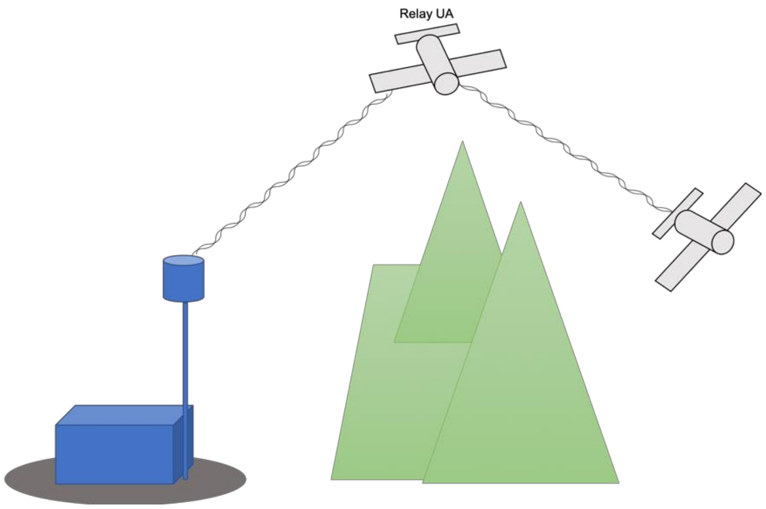


Figure 2-23. Generic BRLOS UAS with a relay UA.

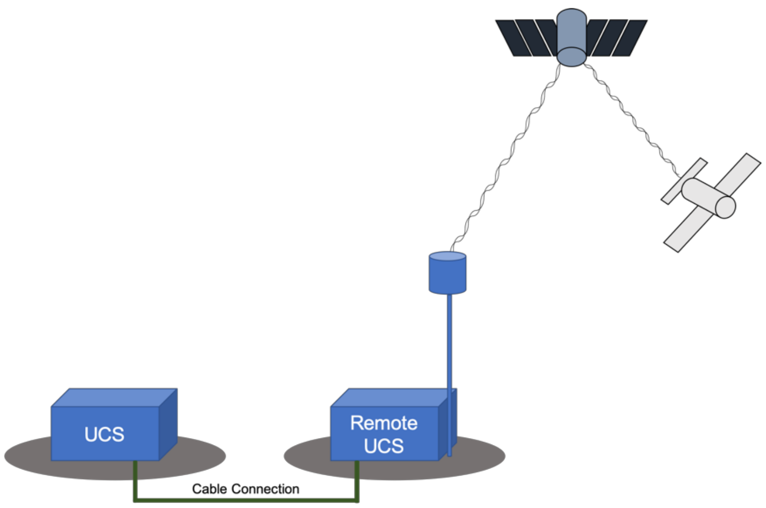


Figure 2-24. Generic cable based BRLOS UAS with a remote UCS and SatCom.

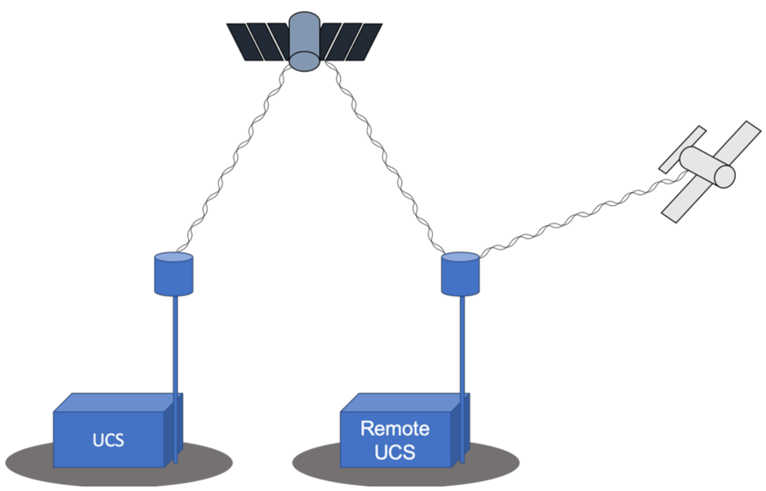


Figure 2-25. Generic BRLOS SatCom UAS with a remote UCS.

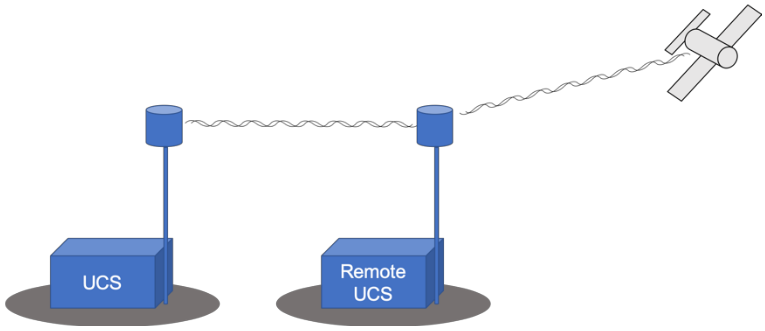


Figure 2-26. Generic RLOS UAS with a remote UCS.

The depiction of the example UAS architecture concludes the present chapter. A brief recaption of unmanned aviation and the presentation of notably examples as well as the definition of the UAS terminology used in this thesis was given. By looking at the history of UAS and their military origin, as well as their “shadow” existence of manned aviation, one could say that it is obvious why unmanned aviation always lacked one step behind within the realm of airworthiness regulations. The next chapter will deal with aviation safety, the origins of it and the introduction of some key players. Focus will be given on airworthiness of aircraft and the general process how airworthiness is achieved.

3 Aviation Safety

"Every aircraft engaged in international navigation shall be provided with a certificate of airworthiness issued or rendered valid by the State in which it is registered."

ICAO Convention on International Civil Aviation, Article 31, page 14, [1]

The quotation above outlines the fundamental need of a certificate of airworthiness for every single aircraft that is involved in international flight operations. An airworthiness certificate of an aircraft documents that the aircraft complies with the fundamental type certificate and the underlying airworthiness standards.

The fundamental significance of type certificates and the corresponding certificates of airworthiness was already introduced briefly in chapter 1.1. Because of the importance, the core statement of an aircraft type certificate shall be repeated here. The type certificate of an aircraft states, that the specific type of aircraft described in the certificate was developed and proven to be in accordance with rigorous airworthiness standards. Furthermore, this matter of fact was inspected and verified by a competent authority during the type certification process.

The type certification process can be seen basically as an interaction between two stakeholders: the authority and the applicant. Whereas the applicant designs the aircraft or an aircraft related part, the airworthiness authorities are laying down the regulations, requirements, procedures etc. that have to be fulfilled.

Type certification is one part of the concept of aviation safety. In order to achieve aviation safety for an aircraft, aviation safety must be seen as an interacting and continuing process throughout the whole life of an aircraft. This process affects internal and external stakeholders and not only the aircraft. Airworthiness is one keystone in this concept. As it was written in the chapter before and in line with the present thesis, focus will be given on this certain aspect.

But before going into the details of type certification of aircraft in general and especially the type certification of UAS, it is necessary to introduce the concept of aviation safety in general and to present some of the main organizations that represent the authorities and how they are linked to each other [2, 69]. Therefore, the present chapter is part of contribution C1, as it provides the beneficial background to better understand the roles of aviation entities who define the rules.

3.1 Organizations

The next subchapters will briefly introduce key organizations in aviation. Focus will be given on the big three as they are to the author's best knowledge fundamental to all other aviation organizations: ICAO, FAA and EASA. Because Unmanned Aviation emerged out of the military world, a short summary regarding NATO and Military Aviation Authorities will be also presented. Additionally, a brief introduction to JARUS will be given, a group of numerous aviation authorities that became an important organization for UAS during the last decade.

3.1.1 ICAO

After the flight of the Wright Brothers in the early 20th century, aviation faced a steady development, which was boosted by the two world wars. As it became more and more obvious that this new transportation mean would maintain, efforts were made to streamline the development on international level. A first attempt was done at the Paris Conference on Peace in 1919, which concluded in a first International Commission for Air Navigation and an International Air Convention.

In 1944, representatives of 54 nations invited by the United States came together in Chicago and created the Convention on International Civil Aviation. This milestone document set up the International Civil Aviation Organization – ICAO. Aim of this remarkable reunion was to foster the peaceful partnership between the nations by the future development of civil aviation in a safe and regulated manner. After the ratification of the Chicago Convention, ICAO became officially operational in 1947 as Specialized Agency of the United Nations. Today, 193 states are contracting members of ICAO.

Based on the aim of the Chicago Convention, the overarching aim of ICAO then and now is to promote and to ensure the safe and organised progression of international civil aviation. Driven by this aim, ICAO issues International Standards and Recommended Practices. The Standards are also known as the 19 Annexes to the Chicago Convention. Those Annexes include all aspects of aviation and represent the absolute minimum standard to ensure safe flight operations. Although ICAO is not a legislative body, the contracting states oblige themselves to follow the standards issued by ICAO and to transfer them into their national regulations [1, 2, 34, 69-71].

Seen from a top-level point of view, ICAO is composed out of four main bodies:

- ICAO Assembly
- ICAO Council
- Air Navigation Commission
- Office of the Secretary General

The Assembly is constituted by all member states and assembles at least every three years. It is a non-permanent body of ICAO. Figure 3-1 presents a generic picture of an ICAO Assembly. The entities are set up during an Assembly convention as required, marked by the dashed lines. Main powers of the Assembly are the election of ICAO Council member states, the tasking of the Council or commissions, the general review of ICAO's work in all relevant areas and the examination of the reports of the Council. The probably most important ability of the Assembly is to approve changes to the Chicago Convention [1, 72-74].

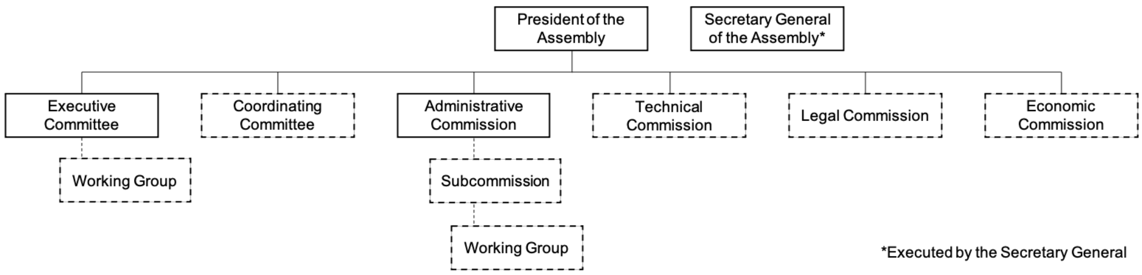


Figure 3-1. ICAO Assembly.

In contrast to the Assembly, the Council is a permanent body at ICAO. It consists of 36 member states, elected for a three-year duration by the assembly. The member states of the Council are grouped in three parts, as shown in Figure 3-2. Besides its' function to govern and to provide direction to ICAO and administrative duties in the organization as well as the execution of tasks given by the Assembly, such as reporting, the Council appoints the Secretary General. A core responsibility of the Council is the approval or modification of International Standards and Recommended Practices and their inclusion as Annexes into the Chicago Convention. To fulfill this important task, the Council appoints the *Air Navigation Commission* based on nominees proposed by the member states. The Air Navigation Commission and its' sub commissions act as neutral expert working groups to further develop the International Standards and Recommended Practices [1, 75, 76].

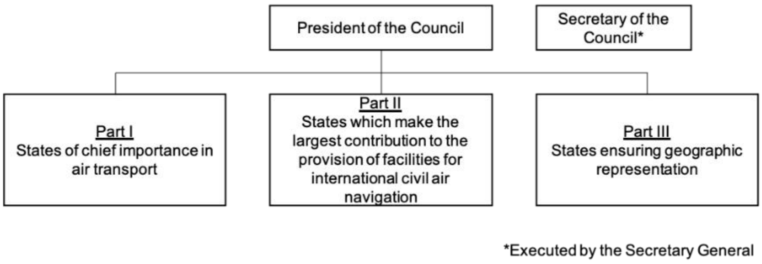


Figure 3-2. ICAO Council.

The Office of the Secretary General, led by the Secretary General, can be seen as the working muscle of ICAO. It is shown in Figure 3-3. With its' five bureaus and in total seven regional offices, the Office of the Secretary General helps the Organization and the Member States to deploy the Standards and Recommended Practices and to foster the overarching aim. In addition, the Secretary General acts as Secretary to the Council and as President and Secretary of the Assembly until the Assembly has elected their President. [1, 77, 78].

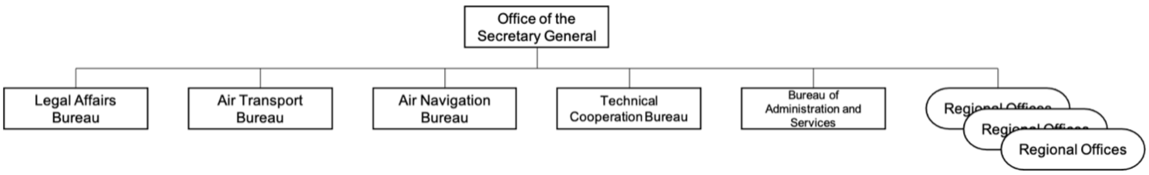


Figure 3-3. ICAO Office of the Secretary General.

As UAS became more and more prominent within the aviation community, also ICAO started to pay attention on this topic. Consequently, ICAO did numerous steps during the past years, which will be outlined in chapter 4.5.1.

3.1.2 FAA

The Federal Aviation Administration (FAA), which was founded in 1958 as Federal Aviation Agency, is the competent authority in the United States for aviation safety. FAAs foundation was the result of several severe aircraft incidents in the late 1940s and 1950s. By its enactment, FAA was given a comprehensive portfolio, including almost all aspects of aviation in the United States. For a very extensive description regarding the development of the FAA, it is recommended to refer to sources [79] and [80].

Nowadays, the FAA is the focal point in the United States for civil aviation and to maintain and further develop the safety of the aviation system. Figure 3-4 provides a high level organizational chart of the FAA [2, 69, 81].

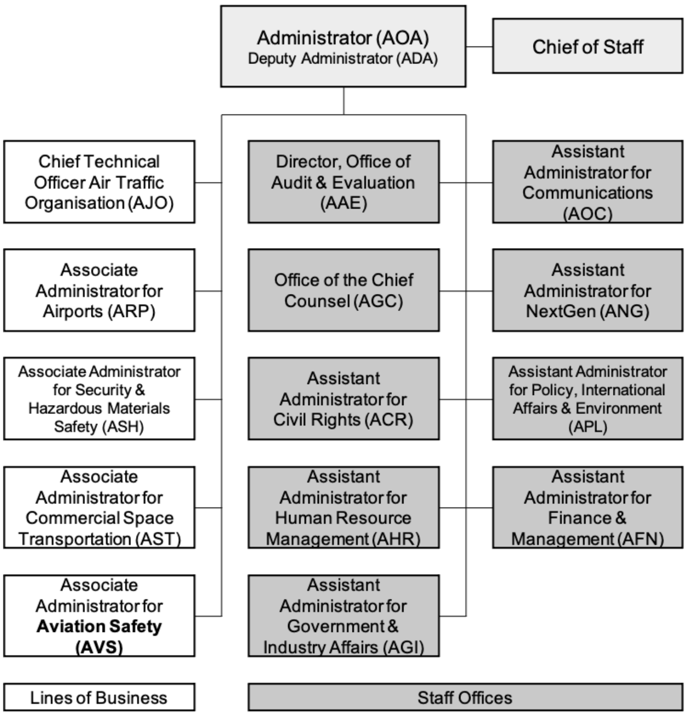


Figure 3-4. FAA high level organizational chart.

As can be seen by Figure 3-4, FAA is headed by the Administrator and the Deputy Administrator who are supported by the Chief of Staff. The Administration is further divided into the Staff Offices and the so-called Lines of Business. While the Lines of Business represent the technical aspect regarding FAAs task, the Staff Offices are responsible for the management of the FAA itself and general aspects, for example communications with other authorities or the government. Lines of Business encompass the organisation of the air traffic in the US, the regulation and continuous certification of airports, the supervision of commercial space transport, as well as the regulation of hazardous material in aviation. For airworthiness, the responsible line of business at FAA is Aviation Safety AVS. In accordance with the scope of the present thesis, this area will be further elaborated [82, 83].

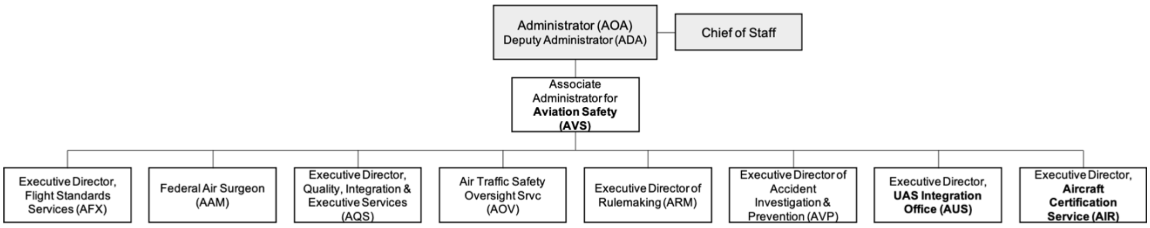


Figure 3-5. FAA AVS high level organizational chart.

Figure 3-5 presents the FAA AVS section. As the other lines of business, AVS reports directly to the administrator. Within AVS, the Aircraft Certification Service (AIR) conducts the type inspection of aircraft. Furthermore, AIR is also responsible for continued airworthiness of aircraft as well as the approval of design and production approvals. Therefore, AIR encompasses the complete spectrum of an aircraft lifecycle with respect to development, production and service life.

It should be noted that FAA AVS is not limited to certification of aircraft only. The business area embodies also offices for the investigation of aircraft accidents, aerospace medicine and for aircraft traffic safety. Furthermore, AVS hosts a rulemaking part for aviation standards in the regime of air transportation, licensing and airworthiness. Additionally, AVS upholds an office for the integration of UAS [2, 84, 85].

3.1.3 EASA

Until foundation of European Aviation Safety Agency (EASA), the entire sovereignty with respect to aviation, including the type certification of aircraft, was under the responsibility of every single nation within the EU, leading to a fragmented set of regulations, hindering a prosperous development of aviation in Europe. European Civil Aviation Authorities (CAA) tried to overcome this issue by establishing the Joint Aviation Authorities (JAA) group in the 1970s. In their beginnings, this group had the goal to achieve mutual standards regarding airworthiness of large aircraft and engines comparable to those of the FAA. At later stages this was extended to certification of other aircraft, maintenance, personnel and operations. Although the idea of JAA was a straight-forward one, the execution turned out to be quite problematic as for example any JAA standard was only mandatory if all of the up to 35 members agreed on them. Nevertheless, the idea paved the way for the EASA, which should become the focal point for aviation safety in Europe and also should overcome the issues JAA had [2, 34, 69].

The foundation of EASA took place in 2002 by EU legislation. First limited to certification of aircraft, EASA became step by step to the competent authority for all aspects regarding flight safety in the European Union. On this way, besides the type certification of aircraft, engines and aeronautical parts, EASA took over several other tasks from the CAAs. The core tasks of EASA are, but are not limited to, the

- consultation of the European Commission and the EU Member States regarding aviation legislation and technical aspects for implementing the recommendations from ICAO
- approval of air operators, design organisations, non-EU production, -maintenance and -continuing airworthiness organisations.
- definition of the regulatory framework for aviation in the EASA regime, including airworthiness standards, acceptable means of compliance and guidance materiel.
- continuing supervision of aviation data to improve aviation safety in order to establish and maintain a very high aviation safety level.

Besides the 27 Member States of the European Union, Iceland, Liechtenstein, Norway and Switzerland are also EASA members[20] [2, 33, 69, 87-89].

EASA consists of five Directorates of which one is the Executive Directorate. The Agency is led by the Executive Director who also heads the Executive Directorate. Figure 3-6 shows the current organizational structure of EASA from a top-level point of view. Besides the Executive Directorate, the four other Directorates are divided into Strategy & Safety Management, Certification, Flight Standards and Resources and Support. Although the Executive Directorate

[20] By completing Brexit, the United Kingdom will no longer be an EASA member. Consequently, it will become a third country [86].

embodies more tiles and functions than the four other Directorates, this Directorate is very limited regarding the number of people. Besides staff functions like legal or communication aspects, the Executive Directorate provides expertise and support to the Executive Director. For example, the Chief Engineer who is the highest senior technical expert and also coordinator of all senior technical experts at EASA or the Senior Military Advisor for exchange between EASA and military stakeholders at state level. It is noteworthy, that also Drones are represented in the Executive Directorate, which indicates the growing importance of this aviation field for EASA [2, 90-92]. As it was done for FAA, with respect to the scope of the present thesis, next a short summary will be provided on the EASA entity that is responsible for certification.

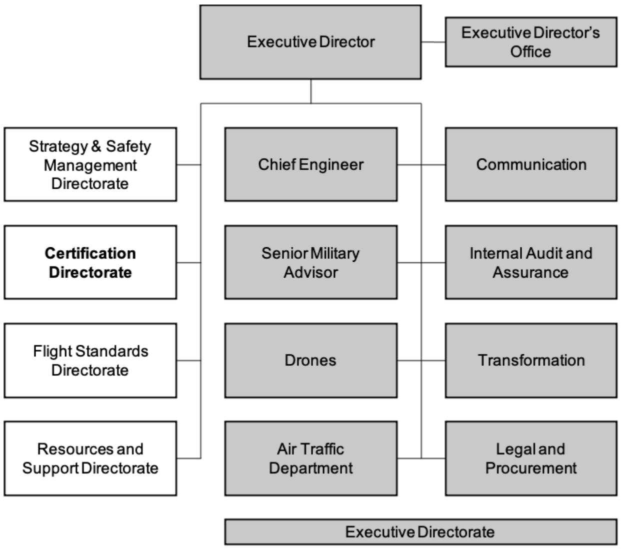


Figure 3-6. EASA high level organizational chart.

The Certification Directorate is the responsible entity at EASA for the certification of aircraft, engines, aeronautical parts and appliances. Figure 3-7 presents the organizational chart of this Directorate.

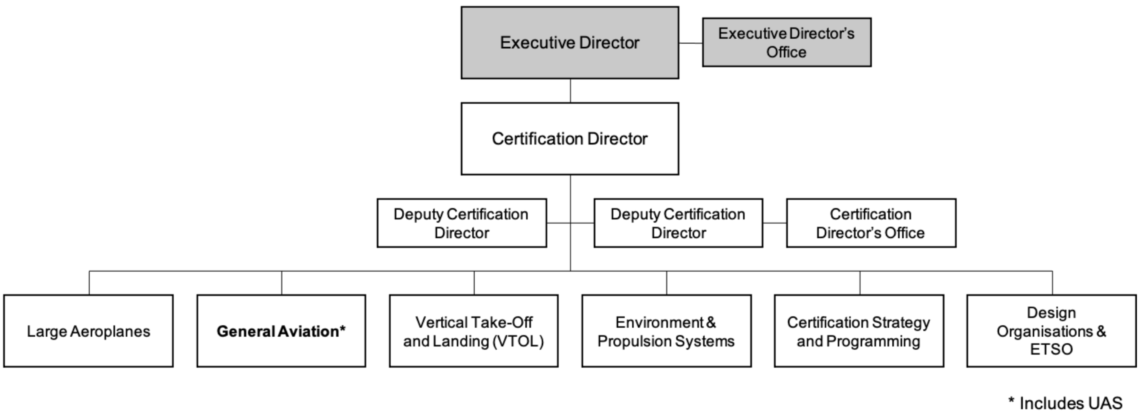


Figure 3-7. EASA Certification Directorate high level organizational chart.

The Certification Directorate is headed by the Certification Director, the two Deputy Directors and supported by the Director's Office and consists of six specific sections. These sections are divided between the certification sections for aircraft, propulsion and the section for Certification Strategy, which is responsible for airworthiness regulations and the Design

Organization and ETSO section, which is responsible for the approval of Design Organizations and the European Technical Standard Orders. It is noteworthy, that the General Aviation section is also responsible for UAS. The fact that the Certification Directorate is also responsible for Design Organizations and rulemaking in the realm of certification ensures a holistic spectrum in the Directorate.

EASA's Certification Directorate is similar to FAA's AVS Line of Business. Notable differences are for example that the Certification Directorate does not incorporate Flight Standards as this is an own Directorate, while AVS does include this directly. Additionally, it should be noted that there is no specific rulemaking directory at all at EASA. This follows the approach that EASA decided that rulemaking shall take place in the specific Directorates directly in order to ensure that the necessary knowledge is available [2, 90, 91, 93].

3.1.4 European Civil Aviation Authorities

For the sake of completeness, a few lines about the Civil Aviation Authorities (CAA) in Europe shall be given. As most nations in the world, most nations in Europe have their own CAAs or comparable entities. Although EASA took over a vast of responsibilities from them, they are still in place and have several duties, also to support EASA, for example the approval of aircraft production organisations or Continuing Airworthiness and Maintenance Organisations (CAMO) in accordance to Part 21/G and Part M. Especially during the early years of EASA and the task transition from national aviation authorities to the agency, the national aviation were needed to maintain safety throughout aviation. All of these activities are performed in close relationship to EASA and have the goal to ensure the high level of aviation safety in Europe [2, 69].

To provide an example of a CAA, the Federal Aviation Office of Germany, the *Luftfahrt-Bundesamt (LBA)*, is presented briefly. The LBA was chosen also because of the focus of the present thesis on Germany. It was founded in 1954 as a higher federal authority and executive agency of the former German Federal Ministry of Transport, which is nowadays the German Federal Ministry for Digital and Transport (BMVI). As can be seen by Figure 3-8, the LBA is headed by a President together with the Vice President and the related Staff Unit. The authority encompasses five divisions as well as an independent office for air navigation services which is the supervising unit of the BMVI. Additionally, six regional offices across Germany belong to the LBA [88, 94-97].

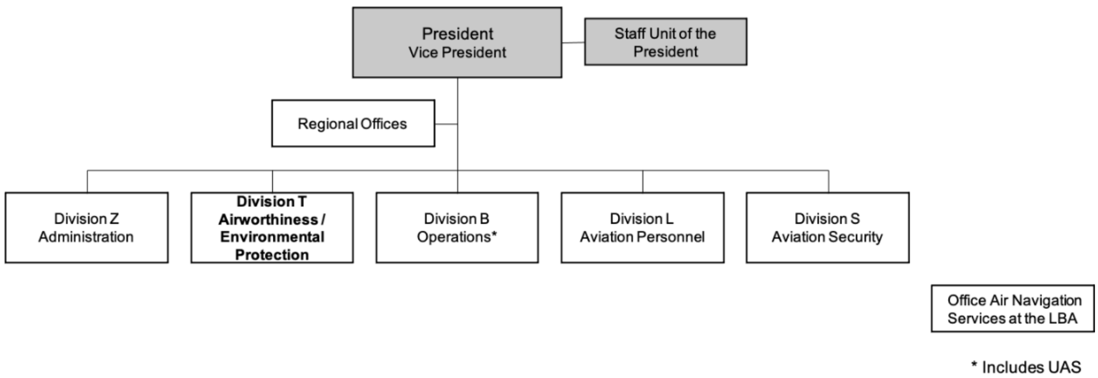


Figure 3-8. LBA high level organizational chart.

The LBA divisions are divided into administrative, airworthiness, operational, personnel and aviation security tasks. With respect to airworthiness, Division T is the responsible unit. Figure 3-9 presents the organizational chart of Division T.

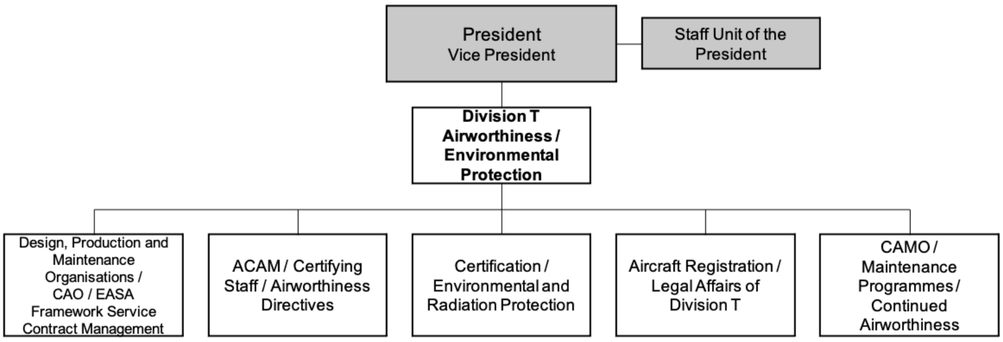


Figure 3-9. LBA Division T organizational chart.

As can be seen by Figure 3-9, the airworthiness division of LBA still contains a certification element. However, it should be noted that this element is only responsible for aircraft types explicitly excluded from EASA's responsibility, for example historical or experimental aircraft. Anyhow, the organizational chart of the airworthiness division of LBA obviously endorses the new focus on the supervision of aviation organizations and continued and continuing airworthiness, resulting out of the foundation of EASA [88].

3.1.5 JARUS

The Joint Aviation Authorities on Unmanned Systems (JARUS) group was founded in 2007 by an initiative of the CAA of the Netherlands after a type certification request for a light VTOL UAS. The primary goal of this group is to develop harmonized rules and recommendations with respect to airworthiness certification and operational requirements for airspace integration of UAS. To achieve this, JARUS has established the following working groups:

- WG 1 – Flight Crew Licencing
- WG 2 – Operations
- WG 3 – Airworthiness
- WG 4 – Detect and Avoid
- WG 5 – Command and Control
- WG 6 – Safety and Risk Management
- WG 7 – Concepts of Operations

Today, 61 countries are participating on voluntary basis in JARUS. Furthermore, an industry stakeholder body is part of JARUS in order to have also their expertise present in the group.

JARUS does not have legal power to issue mandatory regulations like EASA. In the course of enabling UAS operations in Europe and the United States, EASA and FAA recognized the benefits of the work of JARUS. In order to support the group and to take further advantage of the work results, EASA and FAA decided to take over more responsibilities within JARUS. Subsequently, the recommendations of JARUS have a direct influence on fundamental civil UAS regulations in Europe and the United States [98-100].

3.1.6 NATO and Military Aviation Authorities

Chapter 2 outlined the fact, that the development of UAS is indivisibly linked to military aviation. Consequently, also a very short recap on NATO and its' aviation entities as well as on the German Military Aviation Authority as an example for a military aviation authority is provided. In particular NATO has done very noticeable efforts with respect to airworthiness certification and integration of UAS into the airspace, therefore it is worth to have a short look on NATO as one key player in the field of unmanned aviation.

Before doing so, some general remarks regarding military aviation are needed. Civil and military aviation both pursue the target of mission fulfilment. To give an example, civil air operators aim to transport passengers in due time to their destination and military air operators aim to deliver supplies into a specific theatre of operation also in due time. In civil aviation, the loss of an aircraft and the subsequent loss of passenger life is reduced to an absolute minimum by a rigor set of airworthiness regulations. As military aircraft might operate with atypical functions introducing a higher risk to the aircraft, such as the opening of the tail doors in order to drop supplies, the loss of an aircraft is more probable. Although not part of the airworthiness certification, it should be considered that military aircraft also may operate in hostile areas, making the loss of the aircraft even more probable than the loss of an aircraft in the civil world.

Furthermore, military aircraft might transport weapons or operate at much more extreme conditions than civil aircraft, for example fighter jets. Although military aviation obviously also strives to reduce the risk to passengers and aircraft to the utmost, the first aim is to fulfil operational targets, which leads to the need to balance between operational and safety requirements for military aircraft. A military aircraft might comply to all requirements of the specification of an air force but might not comply to a civil airworthiness standard. In particular this is valid for features such as ejection seats that are not covered by civil airworthiness standards. Nevertheless, also military aviation converges more and more to civil airworthiness requirements. For example, in Germany, the armed forces shall provide a safety level similar to civil aviation. Despite these attempts, it must be said that in conclusion, military aviation and civil aviation, should not be seen equal, especially the aspect of airworthiness [28, 34].

Consequently, military aircraft are excluded from the Chicago Convention and subsequent basic civil aviation regulations, for example [88]. With respect to the Chicago Convention, the exemption for military aircraft is written down in article 3 of the Convention, which defines military aircraft as “state aircraft”. Though, article 3 also mandates all contracting nations to have a permit from another contracting nation if a state aircraft shall be flown in another than the own airspace [1].

In order to grant sufficient safe military aircraft who also comply to the specific needs of their users, Nations, have established independent Military Aviation Authorities (MAA) within their forces or comparable entities, which are subordinate bodies to other entities of the forces. To provide an example, the structure of the German Military Aviation Authority (GMAA) is shown below in Figure 3-10. As can be seen by this organizational chart, the structure of GMAA is similar to EASA and LBA. Headed by a Major General who acts as the Director General of GMAA and by a high-ranked civil servant civil deputy, GMAA encompasses all aspects of military aviation to ensure flight safety in the German Forces. The four technical divisions are responsible for the rulemaking, certification, operations and organization approvals [101-103].

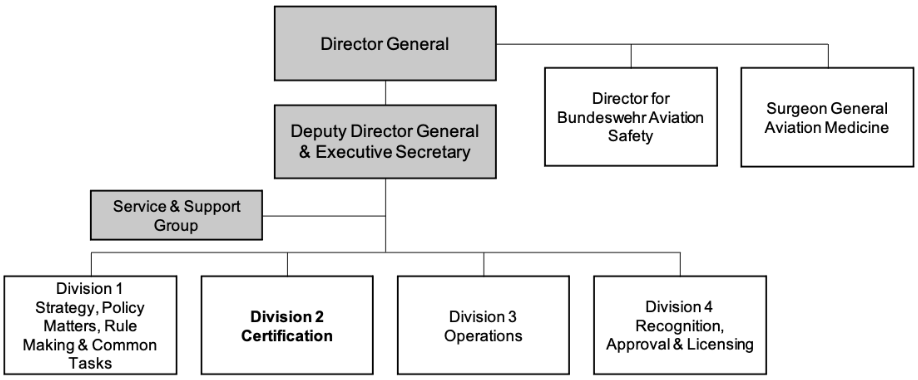


Figure 3-10. GMAA high level organizational chart.

For the scope of the present thesis, Figure 3-11 presents the structure of the Certification Division at GMAA. The Division is divided into three sub-divisions, where the Type Certification section is responsible for the issuance of Type certificates and all related documents, for example Permits to Flight. The other two sub-divisions are responsible for the type inspection of all military aircraft. They are divided into a fixed-wing and a rotary-wing section, which also includes all types of UAS [101-103].

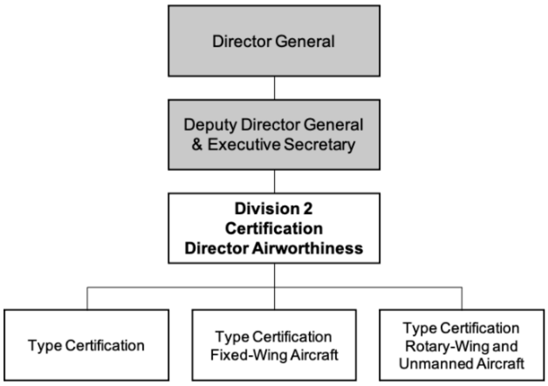


Figure 3-11. GMAA Division 2 organizational chart.

As discussed, military aviation is very specific and there is no standard military aircraft. Furthermore, the regulation regimes of each military force might differ. Therefore, the afore mentioned permit to fly in foreign nations airspaces might result in lengthy bureaucratic processes. To overcome this, GMAA and other MAAs recognize each other as competent authorities by approving the general and product specific processes, in order to approve the certification results of each other.

NATO as a key-player in military aviation recognized the benefits of such workarounds and introduced the Aviation Committee as a single point to foster recognition processes and to grant MAAs the title *NATO Recognized Airworthiness Authority*. The establishment was the result of the NATO Airworthiness Policy which pursues a holistic approach to ensure military aviation safety. The AVC reports to the North Atlantic Council (NAC) which is the political lead body of NATO.

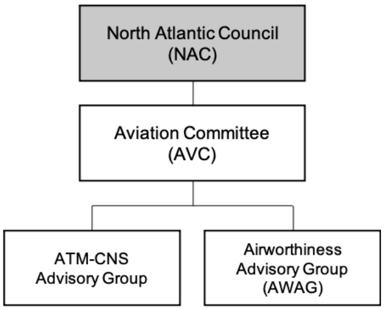


Figure 3-12. NATO AVC organizational chart.

The AVCs' core responsibility is to counsel the NAC on all relevant aspects of aviation in the scope of NATO operations. Therefore, it is the focal point for communications between national and international aviation authorities and NATO. The two subgroups for ATM-CNS and airworthiness ensure a complete picture within in the AVC. At NATO itself, the AVC is supported by the *NATO Airworthiness Executive* and the related staff, who is mainly responsible for the inspection of MAAs and follow-on recommendation to AVC on the approval as NATO Recognized Airworthiness Authority [104, 105]

It is noteworthy that the NATO AVC is only one point on a long way of NATO to harmonize military aviation amongst the alliance. Since decades, NATO fosters harmonization across the allied nations in order to establish interoperability where ever possible. The more interoperable the nations are, the more the nations can profit from each other within military operations. One very good example are the UAS Standardization Agreements from NATO, which represent one of the first international airworthiness standards for UAS ever published [31, 32, 68, 106-109]. A further elaboration of this aspect will be given in chapter 4.5.

This summary about NATO and MAAs concludes the chapter about aviation organizations. In the next chapter, one key parameter of aviation safety will be discussed: airworthiness.

3.2 Airworthiness

As defined by Article 31 of the Chicago Convention, any aircraft intended to participate in international aviation shall have a valid Certificate of Airworthiness issued by the state of its registry. Although this fundamental document applies the term 'airworthiness', the term is not further defined within. This was overcome by ICAO in 1949 with the first publication of Annex 8 to the Convention on International Civil Aviation – Airworthiness of Aircraft [1, 30]. Within Annex 8, the definition of airworthiness in terms of "airworthy" can be found:

"Airworthy. The status of an aircraft, engine, propeller or part when it conforms to its approved design and is in a condition for safe operation."

ICAO Annex 8 to the Convention on International Civil Aviation – Airworthiness of Aircraft, page I-1 [30]

By the nature of ICAO, the organization can only provide minimum and standards and general procedures. The transfer into nation related requirements lies within the responsibility of the contracting states. Consequently, this leads to the aspect that, although there is a common understanding about the term airworthiness or airworthy within aviation, there are several definitions present, which are similar but slightly different. For example, the United States defines airworthy as follows:

“Airworthy means the aircraft conforms to its type design and is in a condition for safe operation.”

C.F.R. Title 14 Chapter I Subchapter A Part 3 Subpart A § 3.5 [110]

To give another example, the definition provided within the Canadian Aviation Regulations is shown below:

“airworthy, in respect of an aeronautical product, means in a fit and safe state for flight and in conformity with its type design; (en état de navigabilité)”

Canadian Aviation Regulations SOR/96-433 Part I Subpart 1 § 101.01 (1) [111]

For military aviation, the NATO definition of airworthiness can be taken:

“airworthiness / navigabilité

The ability of an aircraft or other airborne equipment or system to operate in flight or on the ground without significant hazard to aircrew, ground crew, passengers or other third parties.”

NATO Glossary of Terms and Definitions [112]

In contrast to the other given examples, the NATO definition of airworthiness is not only related to the technical item e.g., the aircraft, and its correct functioning. The NATO airworthiness definition does directly include also the avoidance of unacceptable hazards to people on and offboard the aircraft. As this is of significant importance in particular for UAS, this will be further discussed in chapter 4.4.

Within the EU legislative act for the setup of EASA, no direct definition of airworthiness is provided. However, in Annex II of the regulation, a list with essential airworthiness requirements is provided which is valid for all aircraft other than UAS the scope of the legislative act. Annex IX of the regulation provides essential requirements for UAS, which also contains airworthiness [88].

Although the NATO definition expands the term of airworthiness to a broader range than the civil definitions, out of the different definitions it can be deduced that airworthiness is primary linked to the certified or approved aircraft design and the functional status of the aircraft and all installed or related equipment which enables a safe operation and flight. Both aspects are interrelated and determined within the process of aircraft type certification, the so-called type inspection. This process will be outlined in the next chapter [2, 69].

3.3 Aircraft Type Certification

In order to achieve and maintain the high level of safety in aviation, aircraft, engines, propellers and aeronautical equipment are subject of a rigor inspection process which builds the foundation for the issuance of the type certificate and the related certificates of airworthiness. Type certification is mandatory for aircraft, engines and propellers. Within ICAO Annex 8 and the ICAO Airworthiness Manual the type certification process is defined in a generic way from a top-level point of view [30, 113].

The process of type certification is also known as type inspection process, in particular on the side of the authority. Type inspection processes, especially those for new aircraft types, are of comprehensive nature and may differ between the aviation authorities, nevertheless, the aim is always identical: the verification that the type design complies with the defined airworthiness requirements.

With respect to EASA, the regulatory foundation for the type certification process is laid down in European law and for FAA in federal law of the United States. The full titles of the legislative acts are named below:

- For EASA: COMMISSION REGULATION (EU) No 748/2012 of 3 August 2012 laying down implementing rules for the airworthiness and environmental certification of aircraft and related products, parts and appliances, as well as for the certification of design and production organisations [96, 97, 114]
- For FAA: Code of Federal Regulations, Title 14, Chapter I, Subchapter C, Part 21: Certification Procedures for Products and Articles [110]

The widely-used short title for both processes is called *Part 21*. For EASA, Part 21 is Annex I of the EU Regulation 748/2012. Other CAAs, for example the Australian Civil Aviation Safety Authority (CASA) or the CAA of Singapore (CAAS), also apply a Part 21 called regulation for the certification of aircraft and aeronautical products [115, 116]. For the present text, if Part 21 is called and no further specification is given, the European version is meant.

It is important to note that Part 21 does not contain airworthiness requirements itself. The regulation contains requirements for design and production organizations in Section A, Subpart J and G, as well as requirements for aviation authorities in Section B. Only design organizations approved by the Agency are eligible to apply for a type certificate. Consequently, only approved production organizations are eligible to manufacture products in accordance to a type certificate issued by the competent authority. To highlight one difference between Part 21 in Europe and the U.S., the U.S. Part 21 does not contain a specific part for development organizations. The difference is based on the aspect that FAA focuses more on singular development projects while EASA focuses more on the general development processes within an organization. However, this shall not indicate that the U.S. Part 21 is less safe than the European version. Both Part 21 have an equal demand with respect to the quality and safety of the aeronautical product.

The underlying principle of Part 21 is the compliance to strict development and manufacturing processes within design and production organizations and the oversight by a competent authority. With respect to the scope of the present thesis, this brief summary regarding the general principles of Part 21 is deemed as sufficient. For further reading, references [2] and [69] are recommended as those provide in-depth discussions of Part 21 of the two authorities EASA and FAA. To the extent of the current text, focus will be given on an actual type inspection process. This will be done in a general way, without focusing on EASA or FAA.

It must be noted that there are differences between the two authorities EASA and FAA with regard to type certification processes. For example, FAA and an applicant define and agree a

Partnership for Safety Plan (PSP) which encompasses the entire development as well as post development activities. EASA does not know such a document, as this is covered within the development organization approval. In the process of FAA, part of the PSP is the *Project Specific Certification Plan (PSCP)* which is an equivalent to a Certification Program and which is subject to the acceptance of FAA. It can be said, that from a top-level point of view, the fundamental actions of authorities and applicants during an aircraft type certification process are similar, without regard on the specific authority [2, 69, 96, 97, 117, 118].

Figure 3-13 summarizes the first phase of a type certification process. The applicant defines the extent of the development for which a certification shall be achieved. In this context, development is related to a major change of an existing product or to a completely new type certification. Any change which is not considered as minor change is considered as major change and consequently subject to type inspection by the competent authority. Minor changes are defined as changes which only have a neglectable effect for example on the mass, structural strength, reliability, operational characteristics or other characteristics touching the airworthiness of the product. One could also say, that a minor change does not affect the airworthiness of the product[21]. Minor changes can be approved by the developer itself, if the organization has obtained the appropriate privileges from the competent authority[22]. After the definition as major change, the applicant needs to establish the certification program. Focal point for this task, as well as for the assessment of the change itself, is the so-called Office of Airworthiness within the applicant's organization.

The certification program is a document of fundamental nature within the process of aircraft type certification. Within the FAA regime, the certification program for a specific development is the afore-mentioned PSCP. Besides a summary of the intended development and a system description, one part of the core of a certification program are the proposed certification specifications and environmental protection regulations, which form the type certification basis. Furthermore, special conditions might be defined in case an unconventional or novel aircraft design is presented for type certification. In such a case, the intended airworthiness standards might not contain adequate requirements to prove the safety of the aircraft. Consequently, EASA needs to define appropriate specific requirements, the so-called special conditions.

Another core part within a certification program are the intended methods to demonstrate the compliance to the type certification basis. These so called means of compliance encompass statements, design reviews, analysis, laboratory tests, ground and flight tests, as well as means to qualify equipment. For every requirement that is applicable to the aircraft type design, a mean of compliance needs to be defined. The complete set of requirements and means of compliance is also called type inspection program.

[21] Annex to Regulation (EU) 2019/897 [114] § 21.A.91: "Changes to a type-certificate are classified as minor and major. A "minor change" has no appreciable effect on the mass, balance, structural strength, reliability, operational characteristics, operational suitability data, or other characteristics affecting the airworthiness of the product or its environmental characteristics. Without prejudice to point 21.A.19, all other changes are "major changes" under this Subpart. […]"

[22] Annex to Regulation (EU) 2019/897 [114] § 21.A.263 or § 21.A.319 of C.F.R. Title 14, Chapter I, Subchapter C, Part 21 [110]

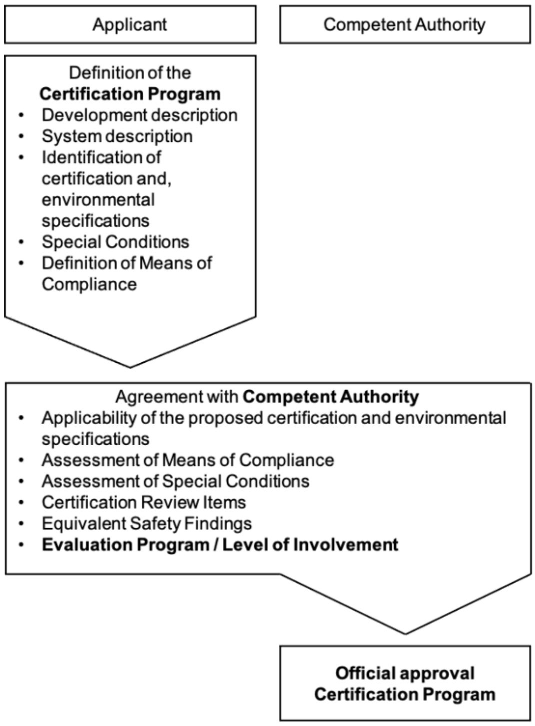


Figure 3-13. Type certification: Approval of the Certification Program.

The certification program is encompassing and of fundamental nature, as it defines the course of actions to be taken in order to achieve a type certificate. Because of its' importance, the certification program must be approved by the responsible aviation authority, which is in Europe EASA. During the approval procedure, the authority assesses at first the applicability of the proposed certification standards and proposed special conditions. Afterwards the eligibility of the suggested means of compliance (MoC) for each airworthiness requirement. If the authority finds it necessary to expand the range of tests for requirements, this will be communicated. Furthermore, in case an applicant wants to apply alternative airworthiness requirements or has a specific interpretation of airworthiness requirements, this might be documented within certification review items or equivalent safety findings. The latter applies in case of deviations to airworthiness requirements but which were proved to have still an equivalent level of safety as intended by the requirement. For example, in case new manufacturing technologies are applied, such as 3-D printing.

Another core aspect within the negotiations on a certification program is the definition of the authorities' evaluation program. The evaluation program outlines the level of involvement of the authority during the type certification. For example, it defines which tests the authority plans to witness or how substantiation documents are reviewed.

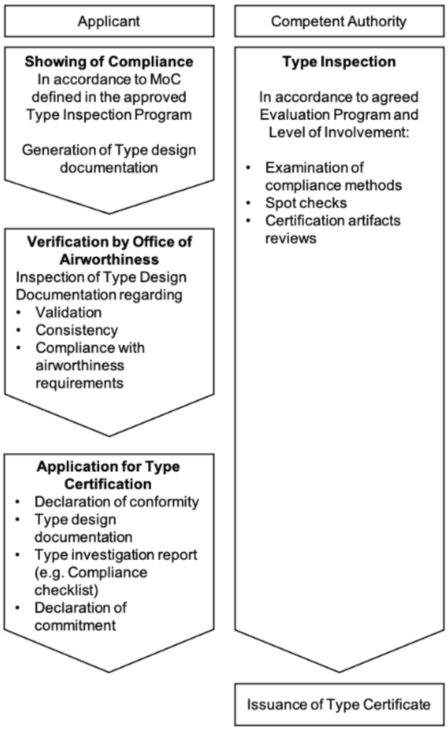


Figure 3-14. Type certification: Showing of compliance and issuance of the TC.

After official approval of the certification program has been granted, the next steps are to generate the compliance evidences, the verification of them and the final application for type certification of the applicant. The Office of Airworthiness is responsible for the orderly execution of the type certification program. Figure 3-14 concludes these steps. As can be seen by this figure, the competent authority participates in these steps as agreed in the evaluation program or the PSP agreement. On the authority side, the entire process is called type inspection process.

In this phase of type certification, the Office of Airworthiness is a key element as it has to fulfill core tasks as for example the verification and validation of the compliance evidences and the recommendation for application of type certification to the head of the design organization. Additionally, the Office of Airworthiness is the focal point for communications with the competent authority.

In particular, validation and verification of compliance evidences against the approved certification basis is complex and crucial, because almost no system installed in an aircraft can be seen as independent and free from connections to other installed systems. Furthermore, airworthiness requirements within certification specifications have usually a high level of interaction and affect each other. To proof eventually the compliance to the certification basis, a type investigation report, e.g., a compliance checklist, must be provided to the authority. Ideally, this document clearly relates any airworthiness requirement to the compliance evidence and vice versa.

Once all evidences are completed, validated and verified, the Office of Airworthiness recommends the declaration of fulfillment of the type certification basis to the responsible aviation authority by the head of the design organization. The application encompasses, besides the compliance checklist, the type design documentation, which represents all necessary documents and data for the definition of the type design. This includes also all relevant information on continued and continuing airworthiness, manuals and operating limitations. The extent of the type design documentation must be of a kind, that it enables the production of airworthy aircraft based on this documentation. Furthermore, the applicant must submit declarations of commitment which ensures that the design organization will provide instructions for continued airworthiness to all operators of the aircraft type.

If the authority finds that the applicant has provided sufficient compliance evidence and that conformity of the aircraft type to the approved certification basis is given, the type certificate will be issued. The type certificate is the official confirmation from the authority that the aircraft type is airworthy and that the type certification basis is fulfilled. By issuing the type certificate, data submitted to the authority for achieving the type certificate becomes *approved data*. It is noteworthy, that after issuance of the type certificate, the design organization becomes the type certificate holder. For a comprehensive description of type certification processes and the principles, it is recommended to refer to sources [2, 30, 69, 110, 113, 114, 118].

Although the fundamental principles of manned and unmanned aircraft type certification processes are similar, there are some significant differences, which will further be elaborated in chapter 4. In order to provide a wider picture and a better understanding, a short discussion regarding the terms briefly used in the present chapter *airworthiness requirement*, *means of compliance* and additionally *acceptable means of compliance* will follow.

3.4 Airworthiness Requirements, AMC, MoC

As it was discussed in the previous chapter, the determination if an aeronautical design is airworthy is based on the fulfillment of airworthiness requirements, which are defined in standards, specifications or regulations. Chapter 4.5 will provide an insight into such documents with focus on UAS. However, upfront some clarifications are seen beneficial.

Assuming an entire new aircraft development. The selection of the applicable airworthiness standard can be done as soon as the kind of aircraft and basic usage spectrum is defined. For example, if a helicopter with 1,500 kg MTOW and a capacity of eight passengers including crew shall be developed, the appropriate certification specification from EASA would be CS-27 [119] or for FAA, it would be Part 27 [120].

While the airworthiness requirements from FAA are laid down in federal law, known as *Federal Aviation Regulations (FAR)*, EASA's aircraft specific airworthiness requirements are published in the *Certification Specifications (CS)* by the agency directly. These specifications consist usually of so-called books. In book 1, the *airworthiness requirements* are defined. Book 2 provides *acceptable means of compliance (AMC)*. The AMC are means to show compliance to a requirement acceptable to the authority. If the applicant applies such an AMC, the authority will not discuss if the mean is appropriate or not. It is up to the applicant to follow the AMC. Alternative MoC (AltMoC) can always be suggested, but in such a case, discussions are necessary if the AltMoC is appropriate or not. For FAA, the AMC are defined in extra documents outside the CFR, the *Advisory Circulars (AC)*. It is noteworthy, that besides the AMC included in the different CS, EASA also publishes additional AMC documents to several EU aviation and airworthiness regulations. In addition, both authorities issue *Guidance Materiel (GM)*, which shall support the application of airworthiness requirements and AMC.

An applicant must propose Means of Compliance, MoC, which define the methods to prove the fulfillment of requirements and AMCs. This will be discussed now as conclusion of the present chapter. A brief example is given how airworthiness requirements, AMC and MoC can be linked within a type certification program. Table 3-1 quotes an airworthiness requirement from CS-25, the certification specification for large aeroplanes. Note that the requirement is identical within FAR 25, however no explicit AC is provided [121].

Airworthiness Requirement	*AMC*
CS 25.609 Protection of structure (See AMC 25.609) Each part of the structure must - (a) Be suitably protected against deterioration or loss of strength in service due to any cause, including – (1) Weathering; (2) Corrosion; and (3) Abrasion; and (b) Have provisions for ventilation and drainage where necessary for protection. [Amdt No: 25/18]	AMC 25.609 Protection of Structure The comprehensive and detailed material standards accepted in the member states will be accepted as satisfying the requirement of CS 25.609.

Table 3-1 Example for an airworthiness requirement and an AMC [29].

In order to show compliance to the example requirement, the applicant will need to adequate Means of Compliance (MoC). For the MoC, there is a common code definition, which is shown in Table 3-2. However, the applicant can also choose another code for the MoC.

MoC code	*Designation*	*Related compliance documents*
0	Compliance statement	Type design documents; recorded statements
1	Design review	Descriptions; drawings
2	Calculation/Analysis	Substantiation reports
3	Safety assessment	Safety analysis
4	Laboratory test	Test program;
5	Ground test	test report;
6	Flight test	test interpretation
7	Design inspection/audit	Inspection or audit reports
8	Simulation	Test program; test report; test interpretation
9	Equipment qualification	Separate process which might contain all other MoCs

Table 3-2 MoC code quoted from Appendix to AMC 21.A.20 (b) in [122].

The MoC code shown in Table 3-2 will be used in Table 3-3 for the example airworthiness requirement. This table shall provide an idea how airworthiness requirements are related to MoC within a certification program. Note that Table 3-3 is only an example. It is up to the applicant how the type certification program is set up and which MoCs are proposed.

Airworthiness Requirement	*MoC*										*Compliance Evidence*
	0	1	2	3	4	5	6	7	8	9	
CS 25.609 (a)	X	X	X								Declaration on design materials Aircraft design description Material analysis
CS 25.609 (b)		X						X			Aircraft design description Aircraft inspection report

Table 3-3 Example for airworthiness requirement and MoC relation in a type inspection program.

Within a certification program, all airworthiness requirements must be related to MoCs and a reference to the compliance evidence to be generated should be given. The extent of type certification programs, especially for entire new aircraft types, can become very extensive. It is important to note that, for example several compliance evidences might be needed to show the compliance for one requirement, or that compliance evidences might be linked to each other or might be in succession. As discussed before, this is a challenging aspect, in particular for the CCL. Therefore, a sound requirement tracing indispensable. If this is not given, showing of compliance and the necessary documentation can become uncontrollable, leading to delays in the type certification process and in worst-case, this might lead to a failed type certification process [2, 69].

These notes about requirement tracing in the light of showing compliance to airworthiness requirements, the present chapter is concluded. The next chapter will discuss UAS type certification and the differences to manned aviation, which have to be considered and which consequences arise out of these differences.

4 UAS Type Certification

The present chapter will discuss the characteristics of a UAS type certification. As the preceding chapter, it is also part of contribution C1. First, the differences between manned and unmanned aircraft certification will be assessed. Afterwards two concepts of achieving airworthiness will be debated: airworthy by design and airworthy by operation. In particular the latter one has become of growing importance for UAS. The chapter concludes with a review of UAS airworthiness regulations, published so far by the civil authorities ICAO, EASA and FAA. Additionally, NATO's regulation efforts will be presented, in order to cover also military aviation.

4.1 More than an Aircraft

Since their invention, aircraft evolved constantly regarding their capabilities and characteristics. Consequently, the complexity of aircraft increased and aircraft became system of systems. The same applies to unmanned aviation as can be deduced out of the historical development of UAS given in chapter 2. However, since the beginning, UAS could not be seen as unmanned aircraft only. Based on the fact that at least one UA, one UCS and one C2Link form a UAS, they had to be seen as a system of systems right from the start (cf. Figure 2-20 to Figure 2-26). These characteristics of UAS have a significant influence on the type certification.

In order to proof a UAS type design as airworthy, all components of the system must be assessed with respect to their influence on airworthiness of the overall system. This also incorporates ground-based equipment like the UCS or components of the C2Link, which leads to the fact that components which cannot fly and which will not be an installed part in the airborne component also have to comply with aeronautical standards. Furthermore, aspects like link latencies, in particular for satellite based C2Links, must be taken account. The consequence of this overall system approach is a much more complex system that needs to be assessed within a type certification process then it would be in case of the type certification process of a manned aircraft. By considering this, it should not be forgotten that the UA itself, e.g., within MALE or HALE UAS, has a similar complexity as a commuter aircraft or even as a large aircraft. Subsequently, potential failure sources that might cause a hazard within the UAS leading to an accident are a priori potentially higher than in a manned aircraft. Such potential failure sources and resulting failure conditions are of fundamental importance within the design and the type certification of UAS. The next chapter will discuss this aspect as it is one key component for an airworthy design [2, 27, 46, 68, 106, 107].

4.2 Airworthy by Design

One design driver within the design process of an aircraft, no matter if manned or unmanned, are the intended functions of the overall system and the various sub systems. During the safety assessment process, each function needs to be classified with respect to loss or failure of the function, an undetected loss or failure of the function, or an unintended function execution and the resulting condition on the aircraft. Although there might be different paragraph numberings across the various airworthiness standards, the safety related airworthiness requirements and AMCs are best known as the so-called 1309 paragraphs.

The classification of failure conditions is done in accordance to the severity of the potential outcome for aircraft, people on board, third parties and property. Table 4-1 presents the definitions of the five failure conditions from CS-25 as representative for a manned airworthiness standard and from AEP-4671 and AEP-83 [68, 107] as representative airworthiness standards for UAS.

As can be seen by Table 4-1 the potential outcome of each failure condition increases from *no safety effect* to *catastrophic*. While the outcome at first does not have any consequences, the last outcome is always related to fatalities. These qualitative definitions are also related to quantitative probabilities, which represent the acceptable probability per flight hour a specific failure condition occurs. The quantitative numbers are also described in terms throughout different airworthiness codes. Additionally, the functional failure conditions are assigned to the so-called functional development assurance levels (FDAL), that define the development level of rigor for software and complex electronic hardware which may cause functional failures. Table 4-2 provides the relation between the descriptive terms of quantitative numbers and their relation to the qualitative failure condition while Table 4-3 provides an example of quantitative safety numbers.

In addition to the failure conditions and the related acceptable failure probabilities, AEP-4671 as well as other STANAGs for UAS airworthiness, specify a requirement for the aggregated probability of all catastrophic failure conditions in a UAS. The so-called P_{CumCat} is defined as:

"The cumulative probability resulting from the probabilities per flight hour of all Individual Catastrophic Failure Conditions caused by all system."

AEP-4671, Annex A to USAR Introduction: Glossary, page A-4

As presented in Table 4-3, the acceptable failure condition probabilities in AEP-4671 are separated by an MTOW value of 5,670 kg. In the same way, it is done for P_{CumCat}, shown in Table 4-4.

It is noteworthy that quantitative probabilities of failure conditions vary across the numerous airworthiness standards. Besides the common linkage to MTOW, there are also other drivers for the probability requirements. For example, AEP-83 [107], the NATO airworthiness code for fixed-wing UAS below 150 kg MTOW, pursues an approach which is based on P_{CumCat}, the MTOW and the expected number of catastrophic failure conditions. By this approach, the acceptable failure probabilities become more flexible and the airworthiness code does not oblige from all UAS of this class the same safety requirements and therefore, provides a balanced approach. This aspect is of significant importance in particular for light UAS as they cannot compared that easy to manned aircraft as for example MALE or HALE UAS. For example, a light UA with a very low MTOW but a high number of catastrophic failure conditions must fulfil similar probability requirements as a light UA with a high MTOW and a low number of catastrophic failure conditions. Table 4-5 to Table 4-7 illustrate the AEP-83 approach and give some examples for resulting acceptable failure probabilities.

Failure condition	*CS-25*	*AEP-4671 / AEP-83*
No safety effect	Failure conditions that would have no effect on safety; for example, Failure Conditions that would not affect the operational capability of the aeroplane or increase crew workload.	Failure conditions that have no effect on safety.
Minor	Failure conditions which would not significantly reduce aeroplane safety, and which involve crew actions that are well within their capabilities. Minor failure conditions may include, for example, a slight reduction in safety margins or functional capabilities, a slight increase in crew workload, such as routine flight plan changes, or some physical discomfort to passengers or cabin crew.	Failure conditions that do not significantly reduce UAS safety and involve UAS crew actions that are well within their capabilities. These conditions may include a slight reduction in safety margins or functional capabilities and a slight increase in UAS crew workload.
Major	Failure conditions which would reduce the capability of the aeroplane or the ability of the crew to cope with adverse operating conditions to the extent that there would be, for example, a significant reduction in safety margins or functional capabilities, a significant increase in crew workload or in conditions impairing crew efficiency, or discomfort to the flight crew, or physical distress to passengers or cabin crew, possibly including injuries.	Failure conditions that either by themselves or in conjunction with increased crew workload are expected to result in an emergency landing of the UA on predefined site where it can be reasonably expected that a serious injury will not occur. Or Failure conditions which could potentially result in injury to UAS crew, ground staff, or third parties.
Hazardous	Failure conditions, which would reduce the capability of the aeroplane or the ability of the crew to cope with adverse operating conditions to the extent that there would be: (i) A large reduction in safety margins or functional capabilities; (ii) Physical distress or excessive workload such that the flight crew cannot be relied upon to perform their tasks accurately or completely; or (iii) Serious or fatal injury to a relatively small number of the occupants other than the flight crew.	Failure conditions that either by themselves or in conjunction with increased workload are expected to result in a controlled trajectory termination or forced landing potentially leading to loss of the UA where it can be reasonably expected that a fatality will not occur. Or, Failure conditions for which it can be reasonably expected that a fatality to UAS crew, ground staff, or third parties will not occur.
Catastrophic	Failure conditions, which would result in multiple fatalities, usually with the loss of the aeroplane.	Failure conditions that are expected to result in at least uncontrolled flight (including flight outside of pre-planned or contingency flight profiles/areas), and/or uncontrolled crash, Or Failure conditions which may result in a fatality to UAS crew, ground staff, or third parties.

Table 4-1 Definitions of failure conditions from CS-25, AEP-4671 and AEP-83 [29, 68]

	Catastrophic	*Hazardous*	*Major*	*Minor*	*No safety effect*
Frequent	Not acceptable	Not acceptable	Not acceptable	Not acceptable	Acceptable
Probable	Not acceptable	Not acceptable	Not acceptable	Acceptable	Acceptable
Remote	Not acceptable	Not acceptable	Acceptable	Acceptable	Acceptable
Extremely remote	Not acceptable	Acceptable	Acceptable	Acceptable	Acceptable
Extremely improbable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

Table 4-2 Generic relation between quantitative terms and failure conditions.

	CS-25		AEP-4671			
			$m_{UA} \leq 5{,}670$ [kg]		$m_{UA} > 5{,}670$ [kg]	
Failure condition	P [1/Fh]	FDAL	P [1/Fh]	FDAL	P [1/Fh]	FDAL
No safety effect	N/A	N/A	N/A	E	N/A	E
Minor	$< 10^{-3}$	D	$\leq 10^{-3}$	D	$\leq 10^{-3}$	D
Major	$< 10^{-5}$	C	$\leq 10^{-4}$	C	$\leq 10^{-4}$	C
Hazardous	$< 10^{-7}$	B	$\leq 10^{-5}$	C	$\leq 10^{-6}$	B
Catastrophic	$< 10^{-9}$	A	$\leq 10^{-6}$	B	$\leq 10^{-7}$	A

Table 4-3 Acceptable failure condition probabilities from CS-25 and AEP-4671 [29, 68]

	AEP-4671	
	$m_{UA} \leq 5{,}670$ [kg]	$m_{UA} > 5{,}670$ [kg]
Failure condition	P [1/Fh]	P [1/Fh]
P_{CumCat}	$\leq 10^{-5}$	$\leq 10^{-6}$

Table 4-4 Acceptable cumulative failure condition probabilities from AEP-4671 [29, 68]

	$m_{UA} \leq 15$ [kg]	$m_{UA} \leq 150$ [kg]
Failure condition	P [1/Fh]	P [1/Fh]
P_{CumCat}	10^{-4}	$\frac{0.0015}{MTOM}$

Table 4-5 Acceptable cumulative failure condition probabilities from AEP-83 [107].

Failure condition	FDAL	P [1/Fh]
No safety effect	N/A	$> P_{Cat} \cdot 1000$
Minor	D	$\leq P_{Cat} \cdot 1000$
Major	D	$\leq P_{Cat} \cdot 100$
Hazardous	C	$\leq P_{Cat} \cdot 10$
Catastrophic	B	$\leq \frac{P_{CumCat}}{N_{CatFC}}$

Table 4-6 Acceptable failure condition probabilities from AEP-83 [107].

MTOW	40 [kg]	80 [kg]	120 [kg]
P_{CumCat}	$3.75 \cdot 10^{-5}$ [1/Fh]	$1.88 \cdot 10^{-5}$ [1/Fh]	$1.25 \cdot 10^{-5}$ [1/Fh]
N_{Cat}	15	8	5
Failure condition	P [1/Fh]	P [1/Fh]	P [1/Fh]
No safety effect	$> 2.5 \cdot 10^{-3}$	$> 2.34 \cdot 10^{-3}$	$> 2.5 \cdot 10^{-3}$
Minor	$\leq 2.5 \cdot 10^{-3}$	$\leq 2.34 \cdot 10^{-3}$	$\leq 2.5 \cdot 10^{-3}$
Major	$\leq 2.5 \cdot 10^{-4}$	$\leq 2.34 \cdot 10^{-4}$	$\leq 2.5 \cdot 10^{-4}$
Hazardous	$\leq 2.5 \cdot 10^{-5}$	$\leq 2.34 \cdot 10^{-5}$	$\leq 2.5 \cdot 10^{-5}$
Catastrophic	$\leq 2.5 \cdot 10^{-6}$	$\leq 2.34 \cdot 10^{-6}$	$\leq 2.5 \cdot 10^{-6}$

Table 4-7 Acceptable failure condition probabilities for different LUAS from AEP-83 [107].

Functional safety represents a fundamental aspect within an aircraft type certification process. The resulting compliance evidences, in particular the Aircraft System Safety Assessment, form a cornerstone for the whole lifecycle of an aircraft as in case of changes to the type design, the SSA always will be conducted to classify the change. Even if the importance of safety airworthiness requirements is undisputed, an airworthy aircraft is not only driven by them.

To determine the airworthiness of an aircraft type, it is required to assess every aspect of the design. Consequently, airworthiness standards include requirements for all of them. The basis is defined within the essential airworthiness requirements provided by ICAO in Annex 8 to the Convention [30]. Independent of type and MTOW, the following aspects have to be covered:

- Flight: encompasses all phases of a flight, performance, stability, controllability and characteristics of the aircraft.
- Structure: structural design of the aircraft in order to withstand all loads occurring during operation.

- Design and construction: precautions with respect to design techniques, substantiation, manufacturing, layout and handling of the aircraft to ensure that the aircraft will function as intended during all foreseen operating conditions.
- Engines, powerplant: covers the integration of engines/powerplants into the aircraft. In case of helicopters this encompasses also power transmission rotors.
- Propellers: the installation of propellers within the aircraft.
- Systems, instruments and equipment: functioning, interaction and prevention of hazards of all installed equipment in relation to each other and to the aircraft itself.
- Operating limitations and information: documentation of all relevant information to operate the aircraft, including continuing airworthiness and maintenance.
- Crashworthiness and cabin safety: aspects to increase survivability of persons onboard in case the aircraft crashes[23].
- Operating environment and human factors: interaction between the ecosystem within the aircraft and persons onboard.
- Security[24]: protection of crew and passengers against criminal threats.

In accordance to the nature of ICAO and the annexes, the requirements laid down in Annex 8 are of high-level nature and form the minimum level to ensure an airworthy aircraft design. These fundamental requirements are further detailed within the several airworthiness standards, such as FARs and CS (cf. chapter 3.4). As can be seen in the bullet list above and as well as in the definitions of failure conditions, manned aviation is focused on the protection of passengers and crew, while airworthiness of unmanned aviation is focused on third parties outside the aircraft. The consequences of this shift will be discussed in chapter 4.4. Before going into this, the approach to establish airworthiness by the operation will be presented.

4.3 Airworthy by Operation

In the afore chapter, it was outlined that the airworthiness of an aircraft is founded on the technical design and the fulfillment of the rigor and encompassing standards. Although airworthiness of the aircraft builds the fundament for a reliable and safe operation, it is not the only aspect to be considered in order to ensure flight safety. From a high-level point of view, it is moreover the interaction of machine, pilot, design-/manufacturing organization and environment which ensures the safe operation of aircraft. Figure 4-1 presents a top-level point of view of this interaction. The processes of the aircraft design and the aircraft production affect the quality of the aircraft including the required documentation directly and therefore the pilot, crew and passengers indirectly. Safe aircraft operation is only possible if the crew is well trained and has the suitable manuals available. By their actions, pilot and crew have a direct influence on the environment where the aircraft is operated. Obviously, the most influence on the environment is present in case the aircraft crashes. Although the aircraft design or production organization cannot influence the environment in a direct way, but in an indirect way, as an inferior aircraft design might cause such crashes with a higher probability [2, 28].

[23] For UAS this would be only relevant in case passengers shall be transported.
[24] Only aeroplanes with MTOW greater than 5,700 kg. For UAS this could be the security of the UCS or also cyber security.

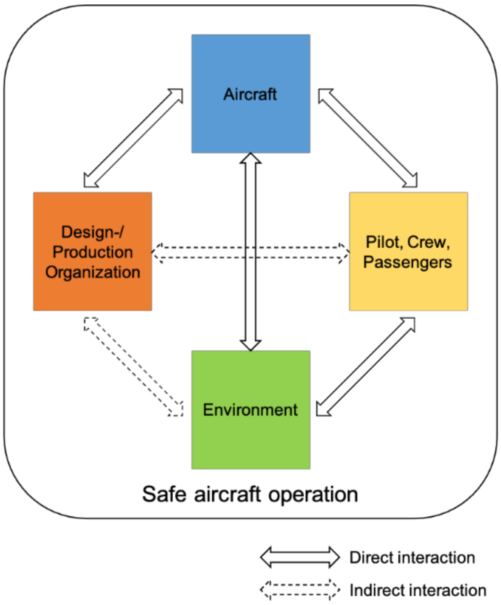


Figure 4-1. Interacting elements affecting safe aircraft operation, derived from [28].

In contrast to the beginning of aviation regulations when airworthiness of the aircraft was the focal point, today flight safety or aviation safety must therefore be seen as a holistic concept. This evolution is reflected within todays regulatory regime of aviation authorities such as EASA and FAA. Table 4-8 shows an excerpt of the regulations which lay down the requirements for the four elements aircraft, design-/production organization, crew and environment. Note that this table does not claim to be exhaustive.

As the four elements are interacting, it can be deduced that in case one element is not developed to the full extent, it might be mitigated by another. A good example is the flight test phase during a type certification process. It can be said that at this stage, the aircraft is primary known by theoretical analysis and ground tests. Consequently, compliance to all airworthiness requirements cannot be shown at this stage and there is a risk that the aircraft might not fly as expected or that, although extremely unlikely, the aircraft enters an uncontrollable state. Obviously, a flight test would not be conducted above densely populated areas as the risk for the overflown area cannot be determined to be acceptable. Therefore, the certificate of airworthiness or the permit to fly for a test aircraft would contain appropriate limitations mitigating the risk. For example, the limitation to fly only above specific test areas. By doing so, the not completed airworthiness requirements are “healed” by strict operational limitations and the aircraft can be deemed as *airworthy by operation* [2, 28, 51].

Such an approach is not very common in regular, commercial aircraft operations. However, it can be found in military aircraft more often. For example, a fighter aircraft would hardly fulfill the requirements of a large airplane, considering that the fighter conducts extreme maneuvers at high g-loads or flights at supersonic speed. To cope with this, one possibility to protect the life of the crew in case of a catastrophic failure is the installation of ejection seats. Furthermore, in order to maintain an acceptable level of safety, it is thinkable to prohibit specific flight modes in peace time. Such modes could be ultra-low high-speed flights or carrying armed weapons in non-hostile airspaces [123].

	EASA	FAA
Aircraft	EU 748/2012 (Part 21) [96] EU 1321/2014 [124] CS 23, 25, 27, 29 [29, 119, 125, 126]	Title 14, Chapter I, Subchapter C [110] FAR 23, 25, 27, 29 [120, 121, 127, 128]
Design-/Production Organziation	EU 748/2012 (Part 21) [96]	Title 14, Chapter I, Subchapter C - Part 21 [110]
Pilots, Crew	EU 1178/2011 [129]	Title 14, Chapter I, Subchapter D
Environment	EU 923/2012 EU 965/2012 EU 139/2014 EU 2017/373 [130-133]	Title 14, Chapter I, Subchapter E, F, I, J [134-137]

Table 4-8 Excerpt of regulations within the regime of EASA and FAA.

As will be shown in the following chapters, the *airworthy by operation* approach will become of more importance for UAS. However, it can already be said, that this approach will always limit the aircraft to specific operations and thus, might lead to big disadvantages compared to an aircraft shown to be airworthy by design. An aircraft shown to be airworthy by design and fulfilling the appropriate type certification basis usually will not have such strict limitations as the residual risk which the aircraft poses to crew, passengers and the environment including the inhabitants where it is operated is acceptable low.

4.4 The 1309 Paradigm Shift

The prior two chapters gave an outline on two important approaches for airworthiness. As it was shown in chapter 4.2 the classification of failure conditions foremost laid down in the 1309 paragraphs is of fundamental importance as this determines the acceptable likelihood of fatalities.

Within manned aviation, it must be assumed that in case an aircraft crashes, people onboard will suffer lethal injuries. Subsequently, the definitions of failure conditions for manned aircraft are focused on the people inside the aircraft. One could say, any airworthiness standard for manned aircraft serves primarily to protect people in the aircraft by reducing any intrinsic technical risk to the acceptable probability.

Without regard of possible future developments, the current main difference between manned and unmanned aircraft, is as the name says, the fact that no man is onboard the aerial vehicle. This obvious difference has an impact on the definition of failure conditions which shall not be underestimated. While manned aircraft safety in terms of airworthiness is focused on the onboard inhabitants and therefore the space to be protected is limited, unmanned aircraft safety in the realm of airworthiness must go further.

In case a UA impacts the ground in an uncontrolled manner, fatalities might occur but in contrast to manned aviation, this must not be always the case. As no man is onboard the UA, the only potential fatalities besides the personnel in the vicinity of the UA are the inhabitants in the impact area, the so-called third parties. These third parties are not in the focus of manned aviation airworthiness requirements. By shifting the focus from onboard persons in manned aviation to third parties in unmanned aviation, UAS airworthiness requirements, in particular for safety and the underlying principles, represent a paradigm shift.

There is no doubt that modern large manned aircraft are of complex nature and that a safety assessment is not trivial. However, as the focal point to protect people is set to people inside the aircraft, the influencing variables which pose a hazard are limited. Whereas UAS can be seen as a more complex machine than a manned aircraft (cf. chapter 4.1), in addition the variables which may cause casualties or fatalities are mainly driven by the environment where the UAS is operated and therefore almost infinite and non-deterministic. Consequently, a complete deterministic prediction on potential human losses or injuries as it is done within a manned aircraft system safety assessment process is not possible for the case of an uncontrolled UA impact. Chapter 5 and the related subchapters will further elaborate this discussion and assess how operational risks posed by UAS operations might be modelled and predicted. Before diving into this, it is necessary to have a look into current efforts on UAS airworthiness regulations of the different aviation organizations introduced in chapter 3.1 [6, 19, 27, 138-141].

4.5 UAS Regulations

As it was outlined in chapter 1.4, during the beginning of the research for the present thesis, only few civil UAS airworthiness regulations did exist. Within the unmanned aviation community, this was seen as one of the biggest obstacles to enable regular UAS operations [34, 35]. The following subchapters will present an excerpt of current UAS regulations and their development during the past decade from ICAO, FAA, EASA and NATO as representative for military unmanned aviation with a focus on airworthiness aspects.

4.5.1 ICAO

Chapter 1.1 presented that unmanned aircraft were already included within the Chicago Convention and described in paragraph 8 of the Convention. As UAS became more and more permanent in aviation during, ICAO decided that those new kind of flying needs more attention. Therefore, in 2007, ICAO established a study group on UAS, the UASSG. The target of the UASSG was to outline a first streamlined perspective of ICAO on UAS. This resulted in the publication of *Circular 328* in 2011 which outlined ICAOs basic position on UAS and which provided an outlook on the further development. Therefore, Circular 328 was written in a very generic level in order to capture the boundaries of the thematic complex UAS [8].

In 2014 the UASSG was superseded by the RPAS Panel (RPASP) which became a permanent panel within the Air Navigation Commission in order to develop all necessary standards and recommended practices. One outcome of this work programme was the *Manual on Remotely Piloted Aircraft (RPAS)*, published in 2015 [27]. This manual further elaborated the fundamental definition given in CIR 328 which differentiated between RPAS and UAS [8, 27].

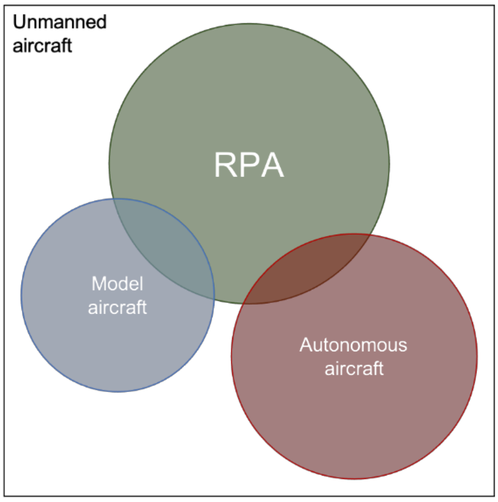


Figure 4-2. ICAO UA scheme, taken from [27].

Figure 4-2 presents the scheme from ICAO for Unmanned Aircraft. Unmanned aircraft are divided into RPA, model aircraft and autonomous aircraft. The definitions are shown in Table 4-9.

Remotely piloted aircraft (RPA)	An unmanned aircraft which is piloted from a remote pilot station.
Autonomous aircraft	An unmanned aircraft that does not allow any pilot intervention in the management of the flight.
Model aircraft	Model aircraft designed and built for recreational purposes.

Table 4-9 ICAO definitions for the UA scheme.

Notably, ICAO also takes into account the intersections between the three UA classes in order to get the complete picture. The intersection between model aircraft and RPA is described as those RPA used for recreational purposes or model aircraft used for other than recreational purposes. In a similar manner the intersection between RPA and autonomous aircraft is described. These are RPA which execute partly autonomous flight segments or vice versa, autonomous aircraft executing remotely piloted flight segments. Although defined, autonomous aircraft are explicitly excluded from the manual, as the dogmatic expectation is that there is always a human which controls the unmanned aircraft. This also reflects the general assumption that autonomy of UAS is hardly or not certifiable at all, as certification always expects deterministic behavior [27, 142].

In the course of including UAS into the regulatory framework of ICAO, it became obvious that this will affect almost all annexes to the Chicago Convention. Today, 18 of 19 annexes are subject to changes related to UAS. Notably, *Annex 2 – Rules of the Air* and *Annex 7 – Aircraft Nationality and Registration Marks* were already amended in 2012 with respect to RPAS and the definitions. In 2018 Annex 2 was amended again, this time for the inclusion of remote pilot licences.

In 2019 the necessary amendments of *Annex 8 – Airworthiness of Aircraft* were announced by ICAO. This amendment is of particular interest, as by the distributed nature of UAS the type certificate and the related certificates of airworthiness needs to be treated differently than for manned aviation. Certificates of Airworthiness are mandatory for the participation of aircraft in international aviation. There were two possibilities under discussion. Either to link all components of the UAS within the type certification, including C2Link and UCS or to issue type certificates and certificates of airworthiness for the UA and the UCS. While the first option requires an overall system inclusion in the type certificate, but provides also an exact configuration setting, the second option offers more flexibility regarding the combination of the different items of a UAS. However, this would require that the operator ensures a compatible setting of UA, C2Link and UCS. The upcoming amendment of Annex 8 does not exclude the possibility of a type certificate for UCS, however, the preferred one is apparently the overall system approach, including the entire UAS within the type certificate [8, 27, 30, 67, 142-146].

Although ICAO is focused on international civil aviation, the organization was also forced to have a look at those UAS, which are not in the scope of ICAO. Light UAS and small UAS, those UAS which now can be purchased by any person (cf. chapter 2.6). Based on the nation's recognition of them, ICAO also recognized that these kind of UAS need to be treated other than large UAS. Therefore, an attempt to categorize the UAS in accordance to their risk they pose to the overflown people is planned to be established. Furthermore, ICAO introduced the UAS Toolkit, a comprehensive web page that encompasses how to fly UAS safely.

In addition, ICAO published advisory circulars which might be applied by countries as basis for their own national UAS regulations on sUAS. Highlights of these advisory circulars are how operations in the so-called "open" and "specific" category of UAS can be conducted, what the necessary licenses are and the authorization of organization conducting such operations. These advisory circulars were adapted from existing national regulations and then transferred into a more generic high-level document from ICAO. The next chapters will provide an introduction to the terms open and specific UAS category [145, 147-150].

4.5.2 FAA

The FAA undertook several steps to streamline the integration of UAS into the airspace of the United Sates in a safe manner. Therefore, the administration issued several policies, guidelines and regulations in the last years. One first step was done in 2005, when the administration released a memorandum which served as interim guidance for operational approvals of UAS. In these times, only public applicants were eligible for the issuance of a Certificate of Waiver or Authorization, which was the common way to achieve an authorization for UAS operations. Any other applicant had to undergo regular airworthiness certification processes in order to operate a UAS by an experimental airworthiness certificate in accordance to C.F.R. § 21.191.

Nowadays, a FAA UAS type certification and certificates of airworthiness can be obtained in different ways, including the possibility for special airworthiness certificates for non-public applicants:

- special airworthiness certificate in the experimental category for research and development, crew training, and market survey (C.F.R. § 21.191)
- in case of new produced aircraft and related flight tests via special flight permit (C.F.R. § 21.197)
- special class aircraft type certificate including the standard airworthiness certificate for such aircraft (C.F.R. § 21.17(b) and § 21.183)
- type certificate for special purposes in accordance to C.F.R. § 21.25 and § 21.185

This is mandatory for any UAS above 55 lbs MTOW intended to operate commercially in U.S. airspace. However, exemptions are possible. In order to support applicants, FAA published an advisory circular on the certification of UAS and optionally piloted aircraft intended to obtain a special airworthiness certificate. Operations conducted in accordance to this policy must meet an acceptable level of safety based on the foreseeable risk the operation will pose to people and environment. Subsequently, the approach for certification is a risk-based approach. In order to determine this risk, the applicant has to provide detailed information on the UAS and the planned operation. This information encompasses, but is not limited to the points outlined in Table 4-10.

UAS risk index	Risk of the UAS operations, determined by Appendix E of the policy.
Program letter	A letter that describes the intended UAS operation.
Safety checklist	A detailed technical description of the UAS design including all sub systems and a description of all flight phases, operational areas and organizational measures.
Flight test plan	A flight test plan intended to show that the UAS is safely controllable throughout the design spectrum.
Flight areas	Desired flight areas of the applicant.
Contingency planning	Description of emergency modes e.g., in case of C2Link loss.
Safety evaluation	FAA review of the provided program letter, safety check list etc. in order to proof if the requested operation can be authorized.
Spectrum authorization	Authorization of the required radio frequencies.
Operating limitations	All limitations of the UAS plus possible additional operation limitations the FAA finds necessary in order to ensure a safe operation.

Table 4-10 Excerpt of needed information for a special airworthiness certificate by FAA [151].

Within the policy, FAA attempts the overall system approach for the certification of the UAS, called “certificated as a system.” The system includes the UA and all other associated elements which are required to safely operate the aircraft. By this approach it would be possible to certify a UAS that contains several different UA and one UCS or a UAS that contains one UA and several different UCS. However, one UCS has to control one UA and the simultaneous control of different UA by one UCS is not allowed [151].

Of core importance within the application are the program letter, the safety checklist and the determined risk index as those three aspects mainly identify the UAS operation, the associated risk and potential mitigation measures. Of particular interest is obviously the risk index. FAA defines three risk categories. These categories are based on the UAS design as well as on specific operational aspects. After determination of all values, they must be summarized in order to obtain the resulting risk group. The risk categories and group definitions are shown in Table 4-11 and Table 4-12.

Risk category	*Element*	*Value*
MTOW [lbs]	≤ 4.5	0
	$4.5 < \text{MTOW} \leq 55$	5
	$55 < \text{MTOW} \leq 300$	10
	$300 < \text{MTOW} \leq 1{,}000$	15
	$> 1{,}000$	25
v_{Max} [kts]	< 87	0
	$87 \leq v_{Max} \leq 250$	10
	> 250	20
h_{Alt} [ft]	< 200 AGL	0
	$200 \leq h_{Alt} < 500$ AGL	5
	$500 \leq h_{Alt} < 5{,}000$ AGL	10
	$5{,}000$ AGL $\leq h_{Alt} < 17{,}999$ MSL	15
	Class A and above	25
Flight history	Known – previous flight time > 50 [h]	0
	Known – previous flight time < 50 [h]	2
	Unknown – first flight	6

Table 4-11 Risk categories and values, taken from [151].

Risk group	*Cumulative points*
Group I	≤ 16
Group II	$17 \leq Points \leq 39$
Group III	≥ 40

Table 4-12 Risk groups, taken from [151].

It must be noted that in case the intended operation incorporates one of the following points, group III will automatically be applied without regard of the cumulative points-

- Night Operations
- Instrument meteorological conditions
- BVLOS and/or EVLOS
- Chase Aircraft
- Operations less than 2 miles from towered airport

The higher the risk group, the more information must be provided by the applicant to FAA. Subsequently, the level of rigor of the evaluation by the administration increases and the resulting operational limitations increase also. Within the policy, samples are provided. These limitations are for example the prohibition to conduct flights above densely populated areas or that visual observers are mandatory for BVLOS operations except the operation is conducted in areas reserved for UAS or general restricted flight areas [151].

With the inevitable emerge of UAS and in particular commercial sUAS, FAA, like many other aviation authorities, realized the urgent need to provide adequate regulations. In order to resolve this need, 2008, FAA established the sUAS Aviation Rulemaking Committee (sUAS ARC) which proposed several sets of recommendations for the regulation of sUAS. FAA was additionally pushed by the *FAA Modernization and Reform Act* enacted in February 2012 and obliged the administration to foster the integration of UAS by providing an integration plan not later than by the end of September 2015. The roadmap for this ambitious venture was published in 2013 and provides the overarching picture on UAS integration within the U.S. Since the first publication, the integration plan was updated continuously [3, 152].

Ultimately, this led to Part 107, the law within Title 14 of the Code of Federal Regulations, which covers sUAS operations and the requirements on them in the United States. Part 107 was issued in 2016 and amended vastly in 2021. Part 107 is applicable to UAS with a MTOW below or equal 55 lbs. Unlike for example Part 25, Part 107 is not focused on technical requirements of the product. It also encompasses registration of sUAS, remote pilot certification and allowed operations itself. As the latter represents the key aspect, consequently, Part 107 became part of subchapter F *Air Traffic and General Operating Rules* and not part of subchapter C *Aircraft* like Part 23 or Part 25.

Being aware that sUAS will hardly fulfil traditional airworthiness requirements and that probably manufacturing companies cannot be treated in the same manner as those regulated under FAR Part 21, the technical requirements on the sUAS are performance based high level requirements and those on the manufacturers are not considered. Notwithstanding, safe UAS operations are ensured by very strict operational requirements and licence requirements. For example, FAA mandated that no sUAS shall be flown out of VLOS and above any not in the UAS operation participating person or unsheltered persons. Furthermore, it is mandatory that the UAS shall only be piloted by a licenced remote pilot or the acting pilot must be under the supervision of a licenced one [25, 153, 154].

While the first version of Part 107 of 2016 did not differentiate between sUAS type and operation, the 2021 version provides a differentiation regarding these two aspects. By overcoming the origin one size fits all approach, the current version of Part 107 allows more operational freedom but safety to overflown people and property is still ensured by appropriate limitations. Specific aspects like the mandatory remote pilot licence or to operate only in VLOS remain, hence, by introducing four categories which combine technical and operational aspects, a suitable regulation was introduced. Table 4-13 and Table 4-14 summarize highlights of Part 107 and the related Advisory Circular.

As can be seen by Table 4-13 to Table 4-16, the operational requirements and limitations are very strict, yet there are only few technical requirements and those requirements are of non-prescriptive nature regarding the sUAS design. A remarkable aspect is that although FAA differentiates between restricted and unrestricted access areas on the ground above which the sUAS operation takes place, there is no obvious difference other than that Category 3 sUAS are only allowed to perform transit flights in case non-participants are present in the overflown non-restricted access area. In general, a primary driver are the participants of the UAS operation. Either they are classified as *direct* or *indirect* participants. Only those persons are classified as direct participants which are needed for the safe operation of the sUAS [155].

	Category 1	*Category 2*	*Category 3*	*Category 4*
MTOW	≤ 0.55 [lbs] ≤ 0.250 [kg]	≤ 55 [lbs] ≤ 25 [kg]		
v_{Max}	≤ 87 [kts] ≤ 44.76 [m/s]			
E_{Imp}	N/A	≤ 11 [ft − lbs] ≤ 14.9 [J]	≤ 25 [ft − lbs] ≤ 33.9 [J]	i.a.w. FAA airworthiness certificate
Design	The UA shall not contain any exposed rotating parts that would lacerate human skin on impact with a human being.			i.a.w. FAA airworthiness certificate
Safety	N/A	sUAS shall be designed, produced, or modified such that it does not contain any safety defects.		i.a.w. FAA airworthiness certificate
Equipment	For night operations only: Anti-collision lights that can be seen for 3 statute miles with a flash rate sufficient to avoid collisions.			i.a.w. FAA airworthiness certificate
Operational manual	N/A	yes		Approved flight manual
Maintenance instructions or instructions for continued airworthiness	N/A	yes		
Product support and notification process	N/A	yes		i.a.w. FAR 21
Declaration of compliance based on FAA accepted Means of Compliance	N/A	Yes	Yes	No, but Airworthiness Certificate
Marking	N/A	Cat 2 label	Cat 3 label	i.a.w. FAR 21

Table 4-13 FAA sUAS technical requirements [25, 153, 155-157].

Category	***General requirements***
all	Only VLOS (either by remote pilot or visual observer)
	In case of a loss of control of the sUAS it shall not pose no undue hazard to other people, other aircraft, or other property for any reason.
	The sUAS must be in a safe condition prior to the operation. This must be verified by a preflight check.
	In case a failure occurs during flight, the operation shall be aborted.
	Maximum allowed flight altitude above ground level: $400\ [\mathrm{ft}]$.
	sUAS visibility of three miles must be given.
	Distance to clouds: $500\ [\mathrm{ft}]$ below and $2000\ [\mathrm{ft}]$ horizontal.
	No operation in the vicinity of airports without permission of the aircraft.
	No reckless operation. Dropping of objects is not allowed.
	No more than one UA shall be piloted by one remote pilot.
	Requirements for night operations
	Operational anti-collision lights. Advance remote pilot competence test.

Table 4-14 FAA sUAS general operational requirements [25, 153, 155-157].

	Operations above or within in restricted access areas	
Category	*Direct participants*	*Indirect participants*
1, 2	Allowed	Allowed, except for sustained flights above over open-air assemblies of persons, unless the operation meets the requirements of standard remote identification or alternative remote identification of UAS.
3	Allowed	Must be notified about the operation.
	Category 3 sUAS shall not fly above open air assemblies of people in general.	
4	Allowed	I.a.w. operating limitations of the approved flight manual or otherwise prescribed by FAA. No sustained flights above over open-air assemblies of persons, unless the operation meets the requirements of standard remote identification or alternative remote identification of UAS.
	Operation above or within unrestricted access areas	
Category	*Direct participants*	*Indirect participants*
1, 2	Allowed	Allowed, except for sustained flights above over open-air assemblies of persons, unless the operation meets the requirements of standard remote identification or alternative remote identification of UAS.
3	Allowed	Transit flights only, no sustained flights.
	Category 3 sUAS shall not fly above open air assemblies of people in general.	
4	Allowed	I.a.w. operating limitations of the approved flight manual or otherwise prescribed by FAA. No sustained flights above over open-air assemblies of persons, unless the operation meets the requirements of standard remote identification or alternative remote identification of UAS.

Table 4-15 FAA sUAS operational requirements for sUAS operations above people [25, 153, 155-157].

	Operation over moving vehicles over or within restricted access areas	
Category	*Direct participants*	*Indirect participants*
1, 2, 3	Allowed	Must be notified about the operation.
4	Allowed	I.a.w. operating limitations of the approved flight manual or otherwise prescribed by FAA.
	Operation over moving vehicles over or within unrestricted access areas	
Category	*Direct participants*	*Indirect participants*
1, 2, 3	Allowed	Transit flights only, no sustained flights.
4	Allowed	I.a.w. operating limitations of the approved flight manual or otherwise prescribed by FAA. No sustained flights above over open-air assemblies of persons, unless the operation meets the requirements of standard remote identification or alternative remote identification of UAS.

Table 4-16 FAA sUAS operational requirements for sUAS operations above moving vehicles [25, 153, 155-157].

It should be noted that the maximum allowed kinetic impact energies for category 2 and 3 are much less than the mutual 66 J criterion. The 66 J criterion is deemed as the lethality for blunt impacts on human bodies and which is applied for example in AEP-83 [107]. To calculate the kinetic impact energy, in accordance to [155], FAA requires to apply the following equation:

$$E_{KinImpact} = 0.0155 \cdot m \cdot v_{MaxImpact}^2 \; [\mathrm{ft-lbs}] \tag{4-1}$$

To transfer the result from equation (4-1) into SI units, it is necessary to multiply the result with the gravitational constant, the conversion value of foot to metre and with the conversion value of pound to kilogram.

$$E_{KinImpact}[\mathrm{J}] = C \left[\mathrm{kg}\frac{\mathrm{m}^2}{\mathrm{s}^2}\right] \cdot E_{KinImpact} = 1.356 \cdot E_{KinImpact} \; [\mathrm{J}] \tag{4-2}$$

The allowance of only very low impact energy values indicate that FAA does not give high confidence on the reliability of these UAS and rather relies on conservative limitations in order to provide a balance between the technical uncertainties and the necessary safety for the overflown area and inhabitants. FAAs primary tool to determine safety of aircraft is type certification, as it is for every other aviation authority. Consequently, in case a sUAS obtained an airworthiness certificate from FAA, less limitations are possible.

Another noteworthy point is the aspect that FAA does not provide a definition regarding *open-air assemblies of people*. Within the updated AC for Part 107, it is noted that this aspect is mainly dependent on a case-by-case analysis and in particular on the density of people not directly participating within the UAS operation. Some examples are mentioned, e.g. concerts, football games etc., however no clear definition is given, which leads to a residual vagueness.

In conclusion, by the 2021 update of Part 107, although limited, FAA enables regular operations with sUAS above people which is a significant step forward on the integration of UAS into the national airspace of the U.S. [2, 13, 25, 110, 152, 155-161].

4.5.3 EASA

Before outlining the UAS regulation attempts of EASA, it is necessary to point out, that the Agency was not responsible for the type certification of all UAS from the beginning. In the foundation years of EASA, UAS and in particular light or small UAS were not that prominent as they are nowadays. When EASA was established in 2002, the agency was only responsible for type certification of UAS with a MTOW of greater than 150 kg. For all other UAS, the national aviation authorities in Europe were responsible for type certification. Yet arbitrary, this weight limit had a significant influence on the development of UAS regulations, as can be seen for example in [68, 106, 107]. In any case, the fact that the European national aviation authorities were responsible for a substantial portion of UAS led to a fragmented regulation regime across the EASA member states. For example, if a UAS operator was authorized to conduct a mission with a specific sUAS in France, the same operator with the same sUAS might be declined to conduct an operation in Austria [87]. This unsatisfactory situation should remain until 2018. In 2018, with the second amendment of the Basic Regulation, EASA became responsible for the regulation of all civil UAS without regard of MTOW in order to establish harmonized rules for UAS across the member states [33, 88].

Prior to this remarkable change, in 2009, EASA published a policy regarding the airworthiness certification of UAS with a MTOW above 150 kg [162]. It based on a work from JAA and EUROCONTROL from 2004 [6]. Primary aim of the policy is to provide guidance for applicants how to establish a type certification basis for a UAS. Such a guidance was necessary as there were no civil airworthiness standards available similar to CS-23 or CS-25. Notably, while the present thesis was written, besides several special conditions for UAS (for example [163-165]), there are still no official airworthiness standards for UAS from EASA which are comparable to CS of manned aircraft available. In the words of EASA the policy from 2009 was intended to become the first step on the way to establish an encompassing regulatory scheme for UAS in Europe. Subsequently, the policy contains several determinations, which laid down the fundament of today's UAS regulations in Europe.

Primary goal of the policy is to maintain the high level of aviation safety in Europe. Therefore, it defines that no UAS shall be less safe than a comparable manned aircraft in order to ensure the safety of overflown people. However, it is also stated that UAS airworthiness requirements shall not be more rigid than requirements for manned aircraft. Furthermore, it is defined that Part 21 is applicable to UAS. To determine which airworthiness standard is applicable to a UAS, an approach based on the kinetic impact energy is pursued within the policy. The basic calculation for the kinetic energy of the UAS is shown in equation (4-3).

$$E_{KinImpact} = \frac{(m[\mathrm{kg}] \cdot v[\mathrm{kts}]^2)}{10^9} \tag{4-3}$$

The kinetic impact energy must be calculated in relation to the type of the UA and for two scenarios. One scenario is an unpremeditated descent, for example in case of loss of thrust. The other scenario is a loss of control scenario, assumed to result in a high-speed impact.

Table 4-17 summarizes the velocity determination for the different UA types and the different scenarios.

UA type		*Unpremeditated Descent*	*Loss of control*
Aeroplanes	v	$1.3 \cdot v_{Stall}$ With MTOW and landing configuration.	$1.4 \cdot v_{MO}$
Rotorcraft	v	Scalar value of the autorotation velocity vector	Terminal velocity with rotors stationary
Airships/balloons	v	Combination of the terminal velocity resulting from the static heaviness, and the probable wind velocity	Terminal velocity with the envelope ruptured/deflated to the extent that no lifting medium remains

Table 4-17 Velocity definitions quoted from EASAs' UAS airworthiness certification policy [162].

Equation (4-3) returns a value which needs to be inserted into two given figures within the policy document. These figures are shown below.

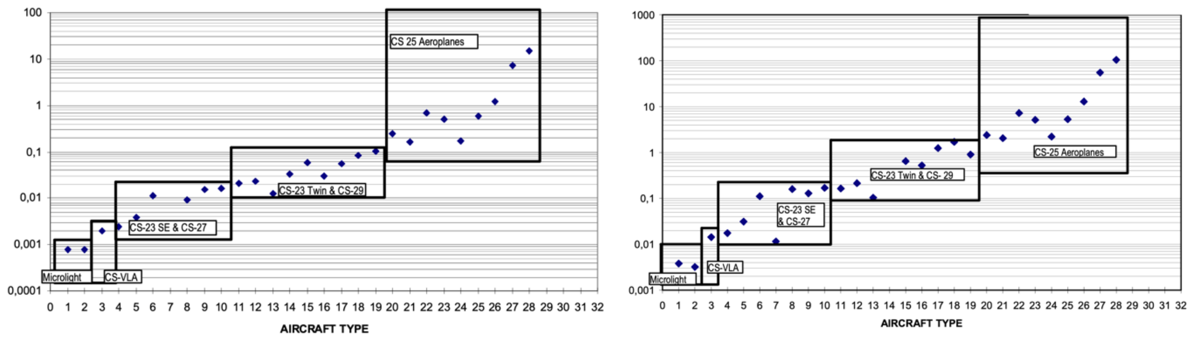


Figure 4-3. Kinetic energy and related airworthiness codes taken from [162].

Once the appropriate Certification Specification has been identified, the applicant shall tailor the requirements in an adequate manner. If the deduction leads to more than one airworthiness code, the applicant shall combine these codes suitably. It should be noted that EASAs' UAS airworthiness certification policy states that also AEP-4671 might be an acceptable airworthiness standard as long as the deduced civil airworthiness code would not require stricter safety numbers within the 1309 paragraph than AEP-4671. Within [34] an intense review and analysis on the application possibilities of AEP-4703 for LUAS in accordance to EASAs' UAS airworthiness certification policy was performed. Core result of this review was that AEP-4703 would be an appropriate airworthiness code for the type certification of a broad range of LUAS [68, 107].

Six years after the publication of the airworthiness certification policy, during a conference on Riga, the European Commission officially recognized the importance of UAS for the future aviation and declared their willingness to foster the integration of UAS into European airspace in a harmonized way. In the aftermath of the Riga declaration, EASA published an opinion on the future handling of UAS, including those below 150 kg MTOW. By this publication, EASA outlined the idea of a risk-based categorization system in order to regulate UAS in an adequate manner and not to slow down the development by inappropriate regulations. However, to adopt these proposed regulations, at first it was necessary to amend the EASA Basic Regulation in order to grant the Agency the responsibility to regulate all UAS. This step was done in 2018 as described above. The amendment of the Basic Regulation included the adoption of an annex which contains the essential requirements for UAS. This annex covers all aspects that have to be considered in case of UAS operations shall be conducted. They include high level requirements on technical, design/manufacturing, organizational and personnel aspects, which together form the core foundation of safe UAS flight operations. This holistic approach was introduced in chapter 4.3 and shown in Figure 4-1. Figure 4-4 expands this concept to UAS and is presented below.

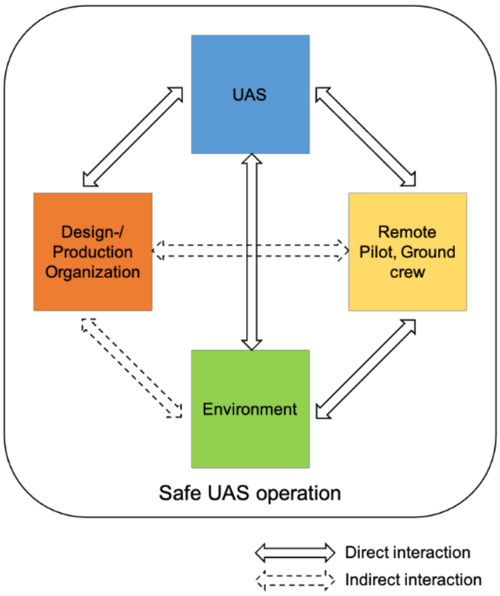


Figure 4-4. Interacting elements affecting safe UAS operation, derived from [28].

Until the publication of the amendment of the EASA basic regulation, EASA conducted several iteration steps in accordance to their rulemaking process in order to further develop the opinion of 2015 and to transfer it into the European Aviation laws. Finally, these efforts led to the EU Delegated Regulation 2019/945 which defines requirements for the design and manufacturing of UAS and the EU Implementing Regulation 2019/947, which defines the rules and procedures for the operation of unmanned aircraft [15, 19, 23, 24, 88, 166-170].

The two regulations plus the already published amendments and AMC must be seen as complementary and as such, the following summary will treat them as one set of regulations. EU and EASA differentiates between three categories of UAS operations: *open*, *specific* and *certified* operations. UAS that fall under the open operations category are those, which are deemed to pose such a low risk that they do not need any official authorization. UAS related to the specific operations category are such UAS operations that pose a higher risk to the overflown area and people and therefore require a specific authorization by a competent authority. The last category, certified operations, are expected to pose the highest risk to ground and air and are similar regarding complexity as manned aviation.

While this thesis was written, the European regulations for UAS were focused on the *open* and *specific* category. In particular for the open category, the regulations can be divided into four aspects: UAS design requirements, UAS functional requirements, required documents and personnel requirements. Operations in the open category are divided into three subcategories: A1, A2 and A3 which conclude the four aspects within the operational limitations for each operation [28]. Table 4-18 to Table 4-21 present extracts of the primary design and functional requirements on UAS of class C0 to C6, the required documentation and marking for UAS as well as the resulting operational limitations and further requirements for conducting UAS operations in the open category. Note that C5 and C6 class UAS are for operations under the specific category only, which will be discussed later in this chapter [23, 24, 166-170].

Requirement	*Unit*	*C0*	*C1*	*C2*	*C3*	*C4*	*C5*	*C6*
MTOW	[kg]	< 0.25	< 0.9	< 4	< 25	< 25	< 25	< 25
E_{Imp}	[J]	-/-	< 80	-/-	-/-	-/-	-/-	-/-
v_{Max}	[m/s]	≤ 19	≤ 19	-/-	-/-	-/-	-/-	< 50 GS
Selectable low-speed mode	[/]	-/-	-/-	X*	-/-	-/-	X**	-/-
d_{max}	[m]	-/-	-/-	-/-	< 3	-/-	< 3	< 3
Sound pressure (4 years after publication)	[dB(A)]	-/-	MTOW < 0.9 [kg]: < 81 0.9 [kg] < MTOW < 4 [kg]: $81 + 18.5 \cdot \lg(m/900)$ *		Indication label *	-/-	Indication label *	Indication label *
Lighting	[/]	-/-	X	X	X	-/-	X	X
Electrically powered only	[/]	X	X	X	X	-/-	X	-/-

* If not a fixed-wing sUAS.

** If not tethered.

Table 4-18 EASA sUAS extract of design requirements [23, 24, 166-170].

As can be seen by Table 4-18 to Table 4-21, the European regulation compendium for sUAS within the open category is more prescriptive than the one of FAA. Furthermore, it appears more complex because of the several interactions between the EU drone regulations [23, 24, 166-168]. Nevertheless, the regulations are similar. The core of the regulations can be summarized to a MTOW of less than 25 kg, operations within VLOS only, no operations above assemblies of people and in safe distance to people. It is noteworthy that assemblies of people are not defined by an exact number, but as the inability of the gathered people to escape or go away because of surrounding mass of people[25]. Furthermore, it should be noted that the primary means to ensure safety of people on the ground is the limitation to VLOS and the assumption that an operator keeps sufficient distance to uninvolved people. However, in case a UAS of the open category encounters a critical, technical malfunction, for example loss of the flight control system or a software error, the operator cannot do anything else than warn potential bystanders. It is questionable if limitations like VLOS are really sufficient to cover such malfunctions.

[25] Article 3 (37) Regulation (EU) 2020/1058 [168].

Function	*C0*	*C1*	*C2*	*C3*	*C4*	*C5*	*C6*
Safely controllable	X	X	X	X	X***	X	X
Structural integrity	-/-	X	X	-/-	-/-	-/-	-/-
Hazard minimizing design	X	X	X	-/-	-/-	-/-	-/-
Attainable height ≤ 120 [m]	X	X	X	X	-/-	-/-	-/-
C2Link loss procedure	-/-	X	X**	X**	-/-	X**	X**
Electronic identification system	-/-	X	X	X	-/-	X	X
Geo-awareness system	-/-	X	X	X	-/-	-/-	-/-
Flight termination	-/-	-/-	-/-	-/-	-/-	X**	X

** If not thetered.

*** No automatic control modes allowed except stabilization.

Table 4-19 Functional requirements for C0 to C6 UAS [23, 24, 166-170]

Document/marking	*C0*	*C1*	*C2*	*C3*	*C4*	*C5*	*C6*
Manual	X	X	X	X	X	X	X
Class identification label	X	X	X	X	X	X	X
Serial number on UA	-/-	X	X	X	-/-	X	X

Table 4-20 Document and marking requirements for C0 to C6 UAS [23, 24, 166-170]

	Operation			
Requirement	A1		A2	A3
General	VLOS only			
Altitude	$< 120\ [\mathrm{m}]$			
Allowed UAS	C0 Privately built UAS < 0.25 kg	C1	C2	C2, C3, C4, Privately built UAS < 25 kg
Flight over people	May overfly uninvolved people.	Mission shall be conducted in a way it can reasonably be expected that no uninvolved person will be overflown.	No overfly of uninvolved people. At least 30 m horizontal distance to uninvolved people (may be reduced to 5 m in case of active low-speed mode).	Mission shall be conducted in an area where it can reasonably be expected that no uninvolved person will be overflown during the entire mission time. At least 150 m horizontal distance from residential, commercial, industrial or recreational areas.
	No overflight of assemblies of people.			
	Safe distance to people must be maintained.			
Active and updated remote identification and geo-awareness system	N/A	Mandatory	Mandatory	Mandatory for C2, C3
Remote pilot	Familiarized with UAS instructions	Familiarized with UAS instructions Completed online training course	Familiarized with UAS instructions Completed online training course	Familiarized with UAS instructions Completed online training course

Table 4-21 Open category: Allowed operations and operational requirements [23, 24, 166-170].

For the present thesis, this recap on the European UAS open category is deemed to be sufficient. A detailed analysis with respect to this category, including the development background of the regulations, the principle how the aspect organization and the related product quality shall be ensured as well as the limited application of the open category for the military can be found in [28].

In case a UAS does not meet the requirements for the open category, either because of design or because of intended operation, the specific category needs to be applied. While operations in the open category do not need any authorization by a competent authority, it is basically mandatory to have an operation authorization before conducting an operation within the specific category. Competent authorities for such authorizations are the national civil aviation authorities in the state of registry.

Exemptions are applicable in case the operator holds a Light UAS operator Certificate (LUC) with the adequate privileges or in case the operator has submitted a declaration of compliance with a standard scenario. An entire discussion on the specific category with all possibilities would be out of scope of the present thesis. Therefore, focus will be given on the operational authorization by a competent authority and the declaration of compliance to a standard scenario. Regarding the latter, Table 4-22 provides a summary with respect to the primary operational requirements for the two standard scenarios STS-01 and STS-02.

One of the biggest differences between the standard scenarios and the open category is obviously the possibility to conduct an operation above populated area in accordance to STS-1 or to conduct an operation beyond visual line of sight within the STS-2 scenario. Furthermore, the design requirements for C5 and C6 class UAS allow much more performance and design possibilities than the C1-C4 class (cf. Table 4-18). However, by looking closer at the details, it must be noted that such additional freedom is granted only under very rigorous operational limitations. This can be seen for example by the definition of the “controlled ground area”:

“controlled ground area” means the ground area where the UAS is operated and within which the UAS operator can ensure that only involved persons are present;”

Article 2 (21) Regulation (EU) 2020/639 [167]

Such a definition requires sound measures to control the ground area and to prevent uninvolved people entering the area. Nevertheless, it is possible to perform such operations and to maintain the requirements. For example, in case of an overflown populated area, which is seen as areas that extensively used for residential, commercial or recreational purposes[26], it is thinkable that the UAS operator informs the inhabitants personally and gives clear advice regarding the safety precautions, so that those people become involved persons. Another possibility would be to separate the operational area by blockades from the remaining area in order to avoid the entrance of uninvolved persons, similar to movie shoots. However, such actions will always require a lot of preparational work. Consequently, instantaneous flights as they can be performed in manned aviation (“file and fly”) or as it is possible in the open category, are not possible. It is questionable if such standard scenarios of the specific category will be applied that often so that it is justified to keep them within the regulations or not.

[26] Article 2.3.1 (f) ED Decision 2020/022/R [170].

	Operation	
Requirement	STS-01	STS-02
General	VLOS	BVLOS If no VO is present, maximum 1 km distance between remote pilot and UA. If VO(s) present, maximum 2 km distance between remote pilot and UA. Maximum 1 km distance between UA and closest VO. At least 5 km visibility.
	No more than one UA shall be piloted by one remote pilot.	
	No operation from moving vehicles.	
	No hand-over of UA between different UCS.	
Altitude	$< 120\ [\mathrm{m}]$	
Airspace	Controlled or uncontrolled, with low risk of encounter with manned aircraft.	
Allowed UAS	C5	C6
Active and updated remote identification and geo-awareness system	Mandatory	Mandatory Active system that prevents the UA from leaving the designated airspace.
Ground area	Controlled ground area in a populated environment.	Controlled ground area entirely located in a sparsely populated environment.
Flight over people	Only above involved people within the controlled ground area.	
Remote pilot	Certificate of appropriate competency i.a.w. operational authorization and the standard scenario defined Accreditation of completed practical skill training. Familiarized with UAS instructions of the manufacturer.	

Table 4-22 Specific category: STS-1 and 2, operational requirements and limitations excerpt [23, 24, 166-170].

While the standard scenarios are prescriptive in the operation, the general specific category gives the applicant the possibility to apply for operational authorizations that enables the operator to conduct the operation in a way as exactly needed. To obtain an operational authorization for an operation in the specific category, besides administrative information on the UAS operator or that adequate insurance is given, the applicant shall provide to the competent authority the operational risk assessment, a list of mitigation measures and an operation manual.

The operational risk assessment is of fundamental importance for obtaining an authorization. Such an operational risk assessment must include at least the elements shown in Table 4-23.

<table>
<tr><td>Element</td><td colspan="2">Description</td></tr>
<tr><td>Operation</td><td colspan="2">Characteristics and purpose of the operation

Operational safety objectives proposal

Complexity of operation

Proposed target level of safety, equivalent to manned aviation.</td></tr>
<tr><td>UAS</td><td colspan="2">Type of UAS

Technical features and performance</td></tr>
<tr><td>Environment</td><td colspan="2">Overflown ground area and population.

Intended types of airspace where the UA.</td></tr>
<tr><td>Personnel</td><td colspan="2">Competence, experience, licenses etc. of the personnel conducting the operation.</td></tr>
<tr><td rowspan="3">Risk identification</td><td colspan="2">Resulting unmitigated ground risk and unmitigated air risk based on the elements operation, UAS, environment and personnel.</td></tr>
<tr><td>Unmitigated ground risk</td><td>Unmitigated air risk</td></tr>
<tr><td>-VLOS or BVLOS
-Population densities
-Will assemblies of people be overflown?
-UA characteristic dimension</td><td>- Precise airspace volume to be used
- Airspace volume needed for contingency measures
- Airspace class
- ATM measures</td></tr>
<tr><td>Risk mitigation</td><td colspan="2">TLS shall be met. Considerations should be given to

- containment measures for people on the ground
- strategic operational limitations e.g. time and place of operation, airspace regulations,
- ability to resolve inadvertent operational conditions incl. avoidance of mid-air collisions
- organisational aspects, e.g. maintenance, personnel competence, human error
- design aspects of the UAS for mitigating risks (e.g. fail-safe design, frangibility, etc.)</td></tr>
</table>

Table 4-23 Key elements of an operational risk assessment i.a.w. [24, 169, 170].

Because of the criticality of the operational risk assessments for the specific category and in order to ease the creation on the side of the applicants as well as to ease the validation of them on the side of the authorities, EASA defined the *SORA* methodology developed by JARUS as AMC for the conduction of an operational risk assessment [24, 166-171]. An in-depth presentation of SORA would be far beyond the scope of the present thesis. Instead, a brief summary on the underlying concept will be provided and specific aspects that are now part of the EASA regulations will be outlined. It should be noted that JARUS has published much more than only the SORA concept. JARUS also developed several recommendations for the nations to cover all aspects of unmanned aviation [172]. Selected aspects will be introduced in the further text, but focus will be given on official regulations, published by EASA.

The underlying concept of SORA is of holistic and qualitative nature. It focuses on the two primary risks that the UA operation might harm other airspace users or people on the ground. Therefore, a basic model is defined, which depicts the ground and air as areas and associates the two risk models for ground and air. Figure 4-5 presents this model.

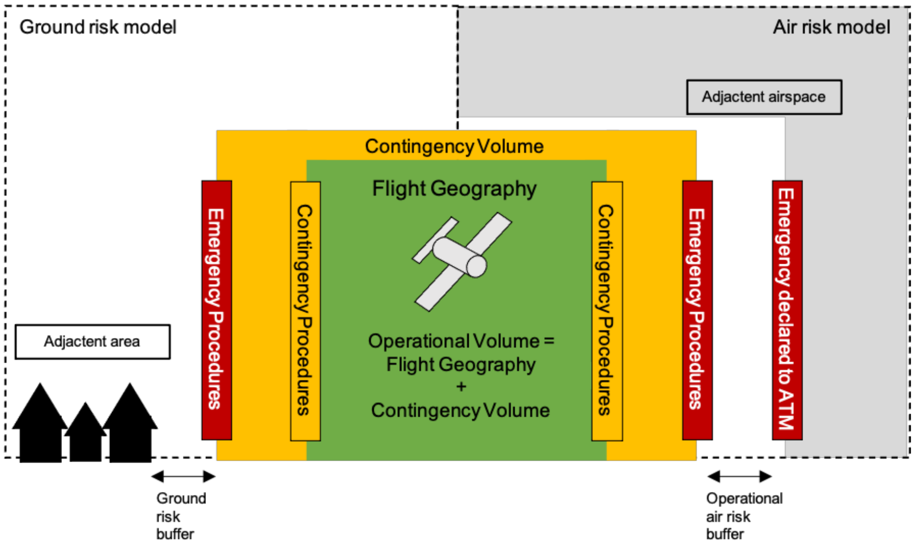


Figure 4-5. Illustration of SORA basic model, provided in [169-171].

The intention of the basic model within SORA is to cover a potential *loss of control of the operation* scenario during a specific operation and to show that the residual risk is acceptable low. Once the total risk of the operation is identified, the adequate *Operational Safety Objectives* need to be deduced. They are based on a given table within the AMC for operational risk assessments. Afterwards the UAS operator must summarize the OSOs within the safety portfolio and provide this as part of the operational risk assessment to the competent authority. These OSOs are not to be confused with operational safety considerations outlined in the introduction chapter 1. In order to determine the key element ground and air risk which define the extent of the OSOs to be applied, first the parameters of the UA designated for the specific operation needs to be entered into Table 4-24.

Parameter	*Values*			
d_{Max} [m]	≤ 1	≤ 3	≤ 8	> 8
E_{Kin} [kJ]	< 0.7	< 34	$< 1{,}084$	$> 1{,}084$
VLOS/BVLOS above controlled ground area	1	2	3	4
VLOS above sparsely populated area	2	3	4	5
BVLOS above sparsely populated area	3	4	5	6
VLOS above populated area	4	5	6	8
BVLOS above populated area	5	6	8	10
VLOS above assemblies of people	7	Not allowed		
BVLOS above assemblies of people	8			

Table 4-24 SORA intrinsic ground risk determination, provided in [169-171].

After the intrinsic ground risk has been determined, the potential mitigations present within the UAS or within the operation can be considered in order to determine the final risk numbers. The final ground risk class (GRC) number is important because this number is greater than seven, the operation cannot be approved for the specific category and must be shifted to the certified category. Table 4-25 shows the three mitigation measures, quoted from [169-171].

		Robustness		
#	*Ground risk mitigation*	*Low/None*	*Medium*	*High*
1	M1 – Strategic mitigations: E.g. number of people at risk is reduced.	0: None 1: Low	-2	-4
2	M2 – Ground impact effects are reduced: E.g. impact energy of the UA is reduced, for example by a parachute.	0	-1	-2
3	M3 – Emergency response plan is in place, the UAS operator is validated and effective.	1	0	-1

Table 4-25 Mitigations measures for the final ground risk class, taken from [169-171].

JARUS also works on an additional annex to SORA for the justification of the GRC [173]. As this annex is neither finalized nor included within the EASA regulations, it will not further be discussed here. However, the annex was reviewed as part of the assessment of selected risk approaches, that will be presented in chapters 5 and 11.

Once the final GRC number is defined and lower or equal than seven, the air risk class (ARC) number can be determined. For determination of the ARC, the path diagram shown in Figure 4-6 must be executed. The ARC defines the risk to other airspace users based on the type of airspace where the operation shall take place. This risk or mid-air collisions increases from ARC-a to ARC-d, whereas ARC-a would be for example a segregated airspace reserved for the UAS operation only and ARC-d could be a zone of high manned aircraft traffic, the proximity to a hospital with a lot of emergency helicopter operations. Dependent on the result of the execution, the applicant might need to apply tactical mitigation performance requirements or might be forced to by the competent authority.

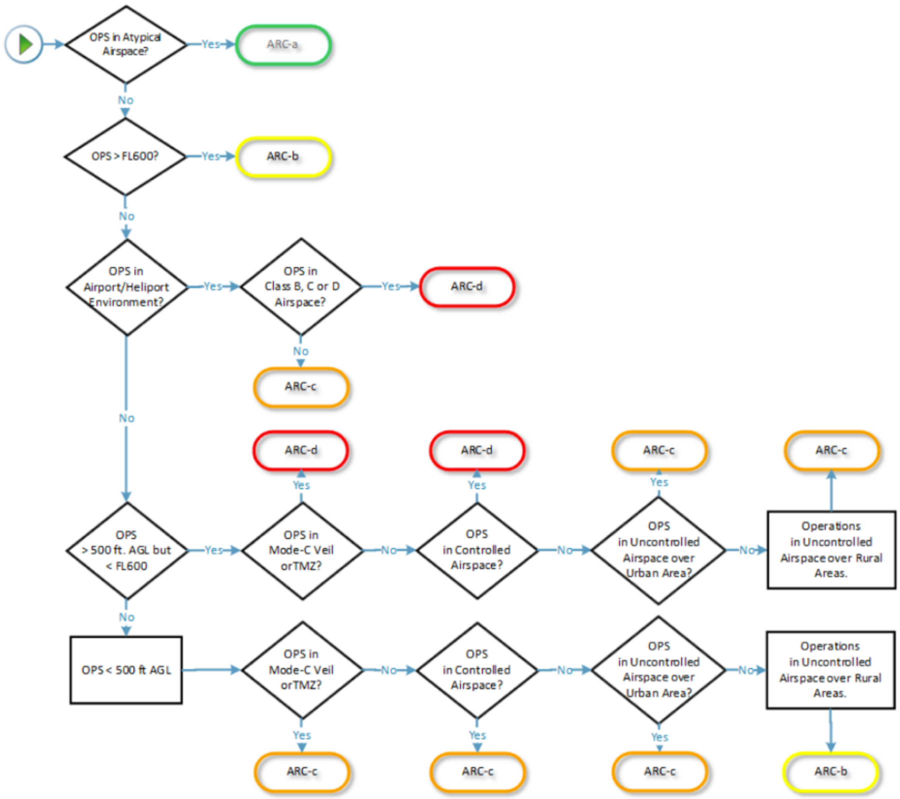


Figure 4-6. ARC determination i.a.w. SORA basic model, taken from [169-171].

After the determination of the final GRC and ARC are completed, the *specific assurance and integrity level (SAIL)* can be deduced. The SAIL will ultimately lead to the OSOs which need to be fulfilled by the operator in order to have a chance for operational authorization. Based on the resulting SAIL, the required OSOs provided in Table 4-27 can be identified. Note that the OSO table shown here is only a quotation from the summary within [169-171]. Within appendix E of AMC1 [169, 170] to article 11 of [24] a detailed description of every OSO can be found.

GRC	*ARC-a*	*ARC-b*	*ARC-c*	*ARC-d*
≤ 2	I	II	IV	VI
3	II	II	IV	VI
4	III	III	IV	VI
5	IV	IV	IV	VI
6	V	V	V	VI
7	VI	VI	VI	VI
> 7	Certified category operation			

Table 4-26 SAIL determination, quoted from [169-171].

		SAIL					
OSO #		I	II	III	IV	V	VI
Technical issue with the UAS							
OSO#01	Ensure the UAS operator is competent and/or proven	O	L	M	H	H	H
OSO#02	UAS manufactured by competent and/or proven entity	O	O	L	M	H	H
OSO#03	UAS maintained by competent and/or proven entity	L	L	M	M	H	H
OSO#04	UAS developed to authority recognized design standards[1]	O	O	L	L	M	H
OSO#05	UAS is designed considering system safety and reliability	O	O	L	M	H	H
OSO#06	C3 link performance is appropriate for the operation	O	L	L	M	H	H
OSO#07	Inspection of the UAS (product inspection) to ensure consistency with the ConOps	L	L	M	M	H	H
OSO#08	Operational procedures are defined, validated and adhered to	L	M	H	H	H	H
OSO#09	Remote crew trained and current and able to control the abnormal situation	L	L	M	M	H	H
OSO#10	Safe recovery from a technical issue	L	L	M	M	H	H

Deterioration of external systems supporting UAS operations							
OSO#11	Procedures are in-place to handle the deterioration of external systems supporting UAS operations	L	M	H	H	H	H
OSO#12	The UAS is designed to manage the deterioration of external systems supporting UAS operations	L	L	M	M	H	H
OSO#13	External services supporting UAS operations are adequate for the operation	L	L	M	H	H	H
Human error							
OSO#14	Operational procedures are defined, validated and adhered to	L	M	H	H	H	H
OSO#15	Remote crew trained and current and able to control the abnormal situation	L	L	M	M	H	H
OSO#16	Multi-crew coordination	L	L	M	M	H	H
OSO#17	Remote crew is fit to operate	L	L	M	M	H	H
OSO#18	Automatic protection of the flight envelope from human error	O	O	L	M	H	H
OSO#19	Safe recovery from human error	O	O	L	M	M	H
OSO#20	A human factors evaluation has been performed and the human machine interface (HMI) found appropriate for the mission	O	L	L	M	M	H
Adverse operating conditions							
OSO#21	Operational procedures are defined, validated and adhered to	L	M	H	H	H	H
OSO#22	The remote crew is trained to identify critical environmental conditions and to avoid them	L	L	M	M	M	H
OSO#23	Environmental conditions for safe operations are defined, measurable and adhered to	L	L	M	M	H	H
OSO#24	UAS is designed and qualified for adverse environmental conditions	O	O	M	H	H	H
[1] For experimental UAS, the non-compliance to recognized standards may be accepted.							
O Optional L Low robustness M Medium robustness H High robustness							

Table 4-27 Operational safety objectives, quoted from [169-171].

As can be seen by Table 4-27, the higher the SAIL the higher the amount of OSOs to be fulfilled. Additionally, the level of robustness increases with higher SAIL numbers. Levels of robustness are linked to levels of assurance within SORA. They are achieved by a combination of the level of integrity of each mitigation measure (called “safety gain”), the related evidence to assure that the mitigation will work (called “method of proof”) and the associated compliance statement of the UAS operator Table 4-28 and Table 4-29 present the robustness level determination as well as the qualitative and general description of the levels of assurance.

	Low assurance	*Medium assurance*	*High assurance*
Low integrity	Low robustness	Low robustness	Low robustness
Medium integrity	Low robustness	Medium robustness	Medium robustness
High integrity	Low robustness	Medium robustness	High robustness

Table 4-28 Robustness level determination, quoted from [169-171].

Level of assurance	*Description*
Low	Simple declaration of compliance that the level of integrity is fulfilled.
Medium	Evidences are provided, for example tests of technical mitigations or documented experience in case of human-based mitigations.
High	The declared level of integrity is verified and found to be acceptable by a competent third entity.

Table 4-29 Assurance level description, taken from [169-171].

The appendices to SORA included within the AMC1 [169, 170] provide further extensive guidance regarding the substantiation of the levels of robustness by the levels of integrity and assurance. Although of qualitative nature only, Table 4-27 to Table 4-29 show that the OSOs and their achievement are not trivial, in particular as soon as the operation enters SAIL III or higher.

In particular OSOs #04, #05, #10, #12, #18, #19 and #24, if applicable to the specific operation, should not be underestimated as their substantiation require a sound design of the UAS. Furthermore, dependent on the requested specific operation authorization, the competent authority can define additional OSOs not listed in Table 4-27 which need to be fulfilled. In conclusion, the entire set of OSOs reflects and takes into the interaction of the four elements of that affect a safe UAS operation shown in Figure 4-4.

On top of the applicable OSOs, SORA requires that the UAS addresses the risk of a loss of control situation adequately by safety requirements which shall ensure the containment of the UA within the operational volume (cf. Figure 4-5) in order to protect the adjacent area and airspace. This remarks also the target level of safety, which was noted in Table 4-23. The containment is divided into a *basic containment* and an *enhanced containment*.

Basic containment should be safeguarded by the requirement, that no probable failure within the UAS or by any the operation supporting element should cause the UA to leave the operational volume. To show compliance on this requirement, an assessment of the complete UAS design and the intended operation must be provided and verified.

Enhanced containment should be given by the UAS for example in case the proximity area to the operational volume is inhibited by assemblies of people, or if the residual air risk class is ARC-d or if the controlled ground area is populated. Enhanced containment shall be substantiated by the three safety requirements shown in Table 4-30.

	Requirement
Design	In accordance to appropriate standards, recognized by the competent authority.
Safety	Probability that UA leaves the operational volume: $P_{Leave} < 10^{-4}[1/Fh]$
	No single point of failure within the UAS or by any the operation supporting element should lead to the UA leaving the ground risk buffer.
SW/AEH	Software (SW) and airborne electronic hardware (AEH) that might cause the UA to leave the ground risk buffer should be developed to a standard or method recognized by the competent authority.

Table 4-30 Enhanced containment requirements [169-171].

Some remarks on the requirements for basic and enhanced containment. The term *"should"* is used because the requirements are laid down within an AMC and not within the regulation itself. So, they are basically not mandatory and an applicant might propose alternative means of compliance. However, it is very likely that the competent authority insists on the application of the requirements.

Requirements as shown in Table 4-30 are typical airworthiness requirements (cf. for example AEP-4671 USAR.1309 and AMC.1309 [68]). The substantiation of the safety requirement and the need to identify SW and AEH which might cause the most-feared event that the UA leaves the ground risk buffer zone, makes an in-depth system safety assessment indispensable. This could be done for example in accordance to ARP4761 and the identified SW and AEH could be developed in accordance to DO-178C and DO-254 [174-176]. The compliance proof is comprehensive and probably expensive for the UAS operator as it can be deduced by looking at the exemplary standards which is further increased by the proof of compliance for the other OSOs.

Furthermore, it should be noted that for SAIL V and VI a verification by EASA is mandatory, with the aim to achieve a type certificate or restricted type certificate. In these cases, EASA acts as the competent third entity as described in Table 4-29. EASA also issued guidance material regarding the design verification for SAIL III and IV classified UAS, defined as medium risk. The reason for this is laid down within AMC1 [169, 170] to article 11 of [24] where it is recommended that the national authorities should seek design verification by EASA. Also, the UAS operator might apply on voluntary basis for a type certificate or restricted type certificate by EASA. Before these verification guidelines have been published, by end of 2020 EASA issued a special condition [165], which outlined airworthiness requirements for such UAS. Notably, within the final document, no AMCs including safety numbers were presented. Based the recommendations within [24, 169, 170], one could say that EASA sees the specific category from SAIL III onwards critical and fraught with risk and therefore, needs to be handled close to certified aircraft in order to mitigate the risks.

It is undisputable that a full type certification will require more than the requirements outlined in Table 4-30. Nevertheless, taking into account the necessary efforts to generate the required evidences for SAIL III or higher classified operations under the aspect that only very limited operations are possible, the question arises, if such an effort is justified or if the conduction of a full type certification process would not be more efficient on a long-term view. However, these are project or business wise decisions which need to be taken case by case. This summarizing estimation shall conclude the recap of the specific category and as last part of the present chapter, a short look at the certified category will be done.

While this thesis was written, EASA was in the rulemaking process for establishing adequate certification specifications for those UAS that will fall under the certified category [177]. In accordance to Article 6 of Regulation (EU) 2019/947 these are all UAS whose operation includes either the flight above assemblies of people, transportation of people or the carriage of dangerous goods [24].

Nevertheless, as it was described in the beginning of the current chapter, EASA already published a policy on the certification of UAS, which is, to the author's best knowledge, still applicable to define an adequate type certification basis. In addition, EASA published several special conditions, clarifying specific aspects of airworthiness of UAS if an applicant attempts the agency for a UAS type certification in accordance to the UAS certification from 2009 [162, 178]. Of particular interest are the clarifications regarding the definitions of the failure conditions and the related acceptable occurrence probabilities, which were proposed by EASA in three special conditions: SC-RPAS.1309-01 in 2015, SC-RPAS.1309-03 in 2018 and SC Light-UAS Medium Risk 01 [163-165]. Table 4-31 and Table 4-32 present the definitions for the different failure conditions and the acceptable failure probabilities. In order to get an encompassing picture and to get an indication if the requirements from the two special conditions are more or less rigorous, a comparison is done with the military UAS airworthiness code AEP-4671 [68].

Failure condition	*AEP-4671 / AEP-83*	*SC-RPAS.1309-01 / SC-RPAS.1309-03*
No safety effect	Failure conditions that have no effect on safety.	Failure conditions that would have no effect on safety. For example, failure conditions that would not affect the operational capability of the RPAS or increase the remote crew workload.

Minor	Failure conditions that do not significantly reduce UAS safety and involve UAS crew actions that are well within their capabilities. These conditions may include a slight reduction in safety margins or functional capabilities and a slight increase in UAS crew workload.	Failure conditions that would not significantly reduce RPAS safety and that involve remote crew actions that are well within their capabilities. Minor failure conditions may include a slight reduction in safety margins or functional capabilities, a slight increase in remote crew workload, such as flight plan changes.
Major	Failure conditions that either by themselves or in conjunction with increased crew workload are expected to result in an emergency landing of the UA on predefined site where it can be reasonably expected that a serious injury will not occur. Or Failure conditions which could potentially result in injury to UAS crew, ground staff, or third parties.	Failure conditions that would reduce the capability of the RPAS or the ability of the remote crew to cope with adverse operating conditions to the extent that there would be a significant reduction in safety margins, functional capabilities or separation assurance. In addition, the failure condition has a significant increase in remote crew workload or impairs remote crew efficiency.
Hazardous	Failure conditions that either by themselves or in conjunction with increased workload are expected to result in a controlled trajectory termination or forced landing potentially leading to loss of the UA where it can be reasonably expected that a fatality will not occur. Or, Failure conditions for which it can be reasonably expected that a fatality to UAS crew, ground staff, or third parties will not occur.	Failure conditions that would reduce the capability of the RPAS or the ability of the remote crew to cope with adverse operating conditions to the extent that there would be the following: i) Loss of the RPA where it can be reasonably expected that one or more fatalities will not occur, or ii) A large reduction in safety margins or functional capabilities or separation assurance, or iii) Excessive workload such that the remote crew cannot be relied upon to perform their tasks accurately or completely.
Catastrophic	Failure conditions that are expected to result in at least uncontrolled flight (including flight outside of pre-planned or contingency flight profiles/areas), and/or uncontrolled crash, Or Failure conditions which may result in a fatality to UAS crew, ground staff, or third parties.	Failure conditions that are expected to result in one or more fatalities.

Table 4-31 Comparison of failure conditions definitions, quoted from [68, 163, 164].

	AEP-4671				*SC-RPAS.1309-01*		*SC-RPAS.1309-03*	
	$MTOM \leq 5{,}670$ [kg]		$MTOM > 5{,}670$ [kg]		$MTOM \leq 750$[kg][1] $MTOM \leq 600$[kg][2]		$MTOM \leq$ 8,618 [kg][3]	
Failure condition	P [1/Fh]	FDAL	P [1/Fh]	FDAL	P [1/Fh]	FDAL	P [1/Fh]	FDAL
No safety effect	$> 10^{-3}$	E	$> 10^{-3}$	E	N/A	N/A	N/A	N/A
Minor	$\leq 10^{-3}$	D	$\leq 10^{-3}$	D	$< 10^{-3}$	D	$< 10^{-3}$	D
Major	$\leq 10^{-4}$	C	$\leq 10^{-4}$	C	$< 10^{-4}$	C	$< 10^{-4}$	C
Hazardous	$\leq 10^{-5}$	C	$\leq 10^{-6}$	B	$< 10^{-5}$	C	$< 10^{-6}$	B
Catastrophic	$\leq 10^{-6}$	B	$\leq 10^{-7}$	A	$< 10^{-6}$	B	$< 10^{-8}$	A
P_{CumCat}	$\leq 10^{-5}$	N/A	$\leq 10^{-6}$	N/A	No requirement	N/A	No requirement	N/A

[1]If the UAS type certification determined i.a.w. EASA UAS certification policy results in CS-VLA [162, 179].

[2]If the UAS type certification determined i.a.w. EASA UAS certification policy results in CS-VLR [162, 180]

[3]If the UAS type certification determined i.a.w. EASA UAS certification policy results in CS-23 level 3 [125, 162]

Table 4-32 Acceptable failure probabilities comparison of AEP-4671 and SC-RPAS.1309-01/03 [68, 163, 164].

Regarding the definitions of failure conditions Table 4-31 it can be seen that the definitions are very similar. The *Major* failure contains a notable difference, as the definition of AEP-4671 requires that no injury of third parties shall reasonably occur, while the definition given within the two SC-RPAS.1309 does not include this. Consequently, the AEP-4671 definition is more conservative in this specific case. Another notable difference can be seen within the *Catastrophic* failure condition definition. Within AEP-4671 the definition includes besides fatalities also the total loss of control with subsequent uncontrolled crash of the UA, whereas within the two SC-RPAS.1309 the definition is focused on fatalities only. Basically, both are similar regarding the worst-case consequence which is the loss of life. However, again, AEP-4671 is basically more rigorous as already the uncontrolled crash and the probable complete loss of the UA which not necessarily causes a fatality is treated as *catastrophic*. Despite these slight differences, the definitions of both approaches are almost identical.

In contrast to the similarity of the failure conditions, the acceptable failure probabilities differ in an outstanding way. On first sight the numbers are also identical, for example, within *minor* and *major* throughout the three documents there is no difference and also the numbers for *hazardous* are quite comparable. Furthermore, in every one of the documents it is required that no single point of failure shall lead to a catastrophic event. However, besides these similarities, the numbers for the *catastrophic* failure condition incorporate a range of two orders of magnitude. This becomes even more significant on second sight, if the weight limitations are considered.

As can be seen in Table 4-32, within AEP-4671, a weight-break-point is present at 5,670 kg requiring a one order of magnitude increase for heavier UA with an upper limit of 20 t. In fact, EASA proposes this also, however, the weight-break-point is set already at 750 kg. This leads to the consequence, that an exemplary UA with a MTOW of 1,000 kg which is subject to a type certification under the umbrella of the EASA UAS certification policy would have to fulfill more severe safety probability requirements than a 10,000 kg UA which is subject to a type certification under AEP-4671 [68, 162-164].

Obviously, there will be always discussions regarding weight-based limitations and the relation to airworthiness standards. For example, why does a 601 kg rotary wing need to be certified in accordance to CS-27 and why cannot it be certified to CS-VLR [119, 180]? For manned aviation this might always be answered by referring to a reasonably increased passenger capacity and increased complexity of heavier and bigger aircraft. However, for UAS this rationale is not valid. While the increase in safety numbers within AEP-4671 seems to be proportionate and additionally secured by the additional P_{CumCat} requirement, the increase within the two SC-RPAS.1309 seems not to be proportionate. Moreover, one could get the impression that requirements from manned aviation have been directly applied.

Nevertheless, as EASA is still working on certification standards for UAS, the safety requirement for UAS of the certified category might face changes until the final publication. In the eyes of EASA a CS-UAS needs to cover all type of UAS and should not be limited to specific aircraft types, such as for example CS-VLR or CS-23. Furthermore, light UAS need special attention and probably will get their own CS. The afore mentioned special condition for UAS classified as medium risk within the specific category outlines a first draft of such a CS for light UAS. It is recognized that the special condition is basically not intended for UAS of the certified category, nevertheless, as it addresses airworthiness requirements, it is seen as an appropriate example [165].

A first impression on how a future CS-UAS might look alike can be found within the JARUS recommendation *CS-UAS* [181]. The CS-UAS recommendations document is intended for fixed-wing UAS with MTOW $\leq$ 8,618 kg and UAS with VTOL functionality and a MTOW $\leq$ 3,175 kg. CS-UAS covers all aspects of a UAS and is similar to other CS with regard to the layout. Table 4-33 presents the content of both proposed airworthiness codes. As can be seen within the table, both are following basically the content structure of a certification specification but they are expanded with UAS specific aspects, such as “ancillary systems” or “remote crew information”.

Regarding CS-UAS and the SC Light-UAS, it is remarkable that both are objective based. This means the requirements are not written in a prescriptive way as they are written for example in CS-25. Subsequently, the UAS designer has much more freedom as the requirements state *what* needs to be achieved but not *how*. For example, the structural requirements do not prescribe specific loads to be substantiated with regard to symmetric or asymmetric loading conditions during flight as it is done in AEP-4671[27]. However, it is required that such factors must be determined by the applicant and that such conditions shall not lead to a structural failure[28].

[27] E.g. USAR.337 [68]

[28] CS-UAS.2215 [181]

SC Light-UAS Medium Risk	JARUS CS-UAS
Subparts	
A General B Flight C Structures D Design and Construction E Lift/Thrust/Power System Installation F Systems and Equipment G Remote Crew Interface and other Information H C2 Link	A General B UAS Operation C Structures D Design and Construction E Power Plant Installation F Systems and Equipment G Crew Interface and other Information H Ancillary Systems
AMC	*Guidance Material*
Not available yet.	A General B UAS Operation C Structures D Design and Construction E Power Plant Installation F Systems and Equipment G Crew Interface and other Information H Ancillary Systems

Table 4-33 Content of SC Light-UAS Medium Risk and JARUS CS-UAS [165, 181].

A second remarkable aspect observed within the JARUS CS-UAS recommendation are the so-called *High Level Standardized Mitigations (HSLM)*. HLSM are contained in a separate annex and have the aim to reduce the degree of necessary certification actions if the UAS is operated under them. The four HLSM are

- HLSM.1: Operations over unpopulated areas
- HLSM.2: Operations over areas with a low population density
- HLSM.3: Operations in segregated airspaces
- HLSM.4: Harm-reducing or harmless UAS design

Obviously, by applying the HLSM in the course of a UAS certification would make a step-wise certification approach from specific category to certified category possible. For example, if an applicant wants to achieve a restricted type certificate under SAIL V and applies CS-UAS from the beginning. In such a case, it is thinkable that the applicant begins with operations above unpopulated areas only. The necessary substantiation evidences for the specific operation could be used as basis for the full type certification and the type certification basis could be fulfilled stepwise while in parallel the applicant gains experience with the UAS as it can already be operated. The idea to incorporate such an approach within a CS is seen as very beneficial and it could encourage UAS operators to apply for type certificates.

This summary about the SC Light-UAS and JARUS CS-UAS recommendation completes the chapter about EASAs regulation efforts for UAS. Please note that an assessment of specific national UAS regulations in the EASA regulatory area is not deemed to be necessary, as the EASA member states are obliged to transfer the European drone regulations into their national aviation law system (cf. chapter 3.1.3 and chapter 3.1.4). Although there might be slightly differences between the different civil NAAs regarding, for example within the application of the specific category, the core requirements defined in the EU regulations 2019/945 and 2019/947 will be identical [23, 24, 166-168]. The next subchapter will provide a short but detailed review on the NATO UAS airworthiness standards, which have been mentioned already often within the present thesis.

4.5.4 NATO

Equipment and machinery that follows harmonized standards enables NATO to interact and exchange material and data between each member state without the need put an interpreter in the middle. In conclusion, harmonization is of key importance for NATO [108]. Chapter 3.1.6 provided an introduction to this concept and underlined the reasons why NATO is keen on establishing standards with respect to airworthiness of UAS that are accepted amongst the allied nations.

Chapter 2 outlined the historical evolution of UAS and their military origin. From a side product of manned aviation primary used as target drones, UAS became an indispensable and highly valued core capacity for intelligence, surveillance, reconnaissance and also strike capabilities across military forces and consequently also for NATO. The rapid increase of military UAS and subsequent operations by the end of the 20th century led to the foundation of the *Joint Capability Group on UAV (JCGUAV)*. The name was changed to *JCGUAS* to take into account the “system” nature of UAS. JCGUAS acts as focal point for UAS within NATO for operational and technical aspects. In order to forward the harmonization with respect to UAS and to get eased access to the airspaces across the alliance, JCGUAS established the *Flight In Non Segregated Airspace (FINAS)* group, which set up expert working groups covering the fields airworthiness, human factors and sense and avoid with the aim to create standards that enable the integration of UAS into non-segregated airspaces and to foster the acceptance of them within the foremost civil controlled aviation environment [34, 182].

Before taking a look into the results of the work of the FINAS airworthiness expert groups, the general NATO UAS classification will be presented in order to get a general idea how NATO categorizes UAS.

Class	*Category*	*Normal employment*	*Normal altitude* h_{Alt} [ft]	*Normal mission radius*	*Example UAS*
Class III $MTOM > 600[\mathrm{kg}]$	Strike/Combat	Strategic/ National	$\leq 65{,}000$ MSL	Unlimited, BRLOS	GHTP
	HALE	Strategic/ National	$\leq 65{,}000$ MSL	Unlimited, BRLOS	Global Hawk
	MALE	Operational/ Theatre	$\leq 45{,}000$ MSL	Unlimited, BRLOS	Gray Eagle
Class II $150 < MTOM < 600[\mathrm{kg}]$	Tactical	Tactical formation	$\leq 18{,}000$ AGL	200 [km] RLOS	Watchkeeper
Class I $MTOM < 150[\mathrm{kg}]$	Small $MTOM > 15[\mathrm{kg}]$	Tactical unit	$\leq 5{,}000$ AGL	50 [km] RLOS	LUNA
	Mini $MTOM < 15[\mathrm{kg}]$	Tactical sub-unit (manual or hand launch)	$\leq 3{,}000$ AGL	25 [km] RLOS	Skylark
	Micro $E_{Imp} < 66[\mathrm{J}]$	Tactical sub-unit (manual or hand launch)	≤ 200 AGL	5 [km] RLOS	Black Widow

Table 4-34 NATO UAS classification, taken from [183].

The NATO UAS classification scheme presented in Table 4-34 differs significantly from the civil classification scheme which is nowadays present at FAA or EASA. NATO does not differentiate between certified, specific or open class. Instead, the classification is focused on the operational characteristics shown in the category column and employment. This can be traced back to the necessary focus of military aviation which is mission accomplishment (cf. chapter 3.1.6). However, in order to achieve high mission reliability, sound aircraft design is inevitable, which motivates the need to have airworthy military UAS and consequently requires adequate UAS airworthiness standards.

One of the first notable publications from FINAS and airworthiness working groups was STANAG 4671, nowadays known as AEP-4671, which was released in 2009. It covers fixed wing UAS, which have a MTOW of more than 150 kg but less than 20 t (class II and class III UAS). The work on the first edition of AEP-4671 began in 2007 and based on a French draft called USAR 3.0 which relied on the initial version of CS-23 [184] as main input. This heritage is still visible in AEP-4671 as the airworthiness code contains a cross reference table with regard to the requirements of CS-23 that have been transferred into USARs [31, 68, 162]. Subsequently, AEP-4671 is quite similar to the layout of the various CS from EASA of these days. It consists of two books, where book 1 contains the airworthiness requirements and book 2 contains the AMC. Table 4-35 outlines the content of AEP-4671.

Meanwhile, AEP-4671 was updated twice and while the first update was primary an editorial amendment, the second update which led to edition 3, introduced significant changes, in particular with regard to system safety as it introduced the weight-break point that already has been briefly introduced, for example in chapter 4.2 and 4.5.4.

While the AEP-4671 underwent the ratification process across the NATO member states, FINAS decided that it is also necessary to cover other than those UAS which are fall under the scope of AEP-4671. Therefore, FINAS set up two further working groups which had the aim to develop an airworthiness code for fixed-wing UAS with a MTOW below 150 kg (LUAS) and an airworthiness code for rotary wing UAS with a MTOW above 150 kg. The two expert groups completed their work by 2011 and after a lengthy ratification process, the two new airworthiness standards were published by the NATO Standardization Organization in 2014 as AEP-80 for rotary wing UAS and AEP-83 for fixed-wing LUAS. AEP-80 as well as AEP-83 have faced already updates in 2016 [32, 106, 107, 109].

The core input for AEP-80 was CS-27, consequently and identical to AEP-4671, the content follows the same layout as it is known from manned aviation airworthiness certification specifications. Table 4-35 presents the content of AEP-80 in the right column.

AEP-4671		*AEP-80*	
Book 1 – Airworthiness Code		*Book 1 – Airworthiness Code*	
Subparts			
A	General	A	General
B	UA Flight	B	UAV Flight
C	UA Structure	C	Structure
D	UA Design and Construction	D	Design and Construction
E	UA Powerplant	E	Powerplant
F	Equipment	F	Equipment
G	Operating Limitations and Information	G	Operating Limitations and Information
H	Command and Control Data Link	H	Command and Control Data Link – Communication System
I	UA Control Station	I	UAV Control Station
Appendices			
C	Basic landing conditions	A	Instructions for continued airworthiness
D	Wheel Spin-up Loads	C	Icing Certification
F	Test procedure for Self-Extinguishing Materials	D	HIRF
G	Instructions for continued airworthiness	F	Test procedures for Self-Extinguishing Materials
K	Other Aspects of Transportation and Factors to consider		
L	HIRF Environments and Equipment HIRF Test Levels		

Book 2 – Acceptable Means of Compliance			
A	General	A	General
B	UA Flight	B	UAV Flight
C	UA Structure	C	Structure
D	UA Design and Construction	D	Design and Construction
E	UA Powerplant	E	Powerplant
F	Equipment	F	Equipment
G	Operating Limitations and Information	G	Operating Limitations and Information
H	Command and Control Data Link	H	Command and Control Data Link – Communication System
I	UA Control Station	I	UAV Control Station

Table 4-35 Content of AEP-4671 and AEP-82 [68, 106].

While AEP-4671 and AEP-82 follow a traditional approach as they contain prescriptive airworthiness requirements to be fulfilled by the UAS design, AEP-83 pursues a more flexible approach. This is a result of the working groups recognition that LUAS cannot be treated in the same way as large UAS. Fixed wing LUAS are very broad regarding the design possibilities. Additionally, it must be considered that a non-neglectable part of the design companies of those UAS are not traditional aircraft companies.

Therefore, AEP-83 pursues a hybrid approach which shall ensure an adequate level of enough safety by defining *essential airworthiness requirements (ER)* that need to be fulfilled by so-called *detailed arguments*. Essential airworthiness requirements within AEP-83 are the military version of the civil essential airworthiness requirements that can be found for example in [33, 88]. The detailed arguments can be seen as a mixture of requirements and AMCs, which are appropriate to show compliance to the specific mandatory essential airworthiness requirements. If no valid argument by an applicant is provided why a detailed argument does not to be fulfilled, compliance must be shown. In addition, AEP-83 features also for almost all detailed arguments *means of evidence* in order to support the UAS designer within the creation of substantiation evidences for the type certification of the LUAS. The requirements within AEP-83 are grouped as follows:

- ER.1 System integrity
- ER.1.1 Structures and materials
- ER.1.2 Propulsion
- ER.1.3 Systems and equipment
- ER.1.4 Continued airworthiness of the UAS
- ER.2 Airworthiness aspects of operation
- ER.3 Organisations

The overall layout of AEP-83 is basically a table with three columns, that set aside essential airworthiness requirement, detailed argument and means of compliance. Therefore, it differs vastly from AEP-4671 and AEP-80 and a direct comparison of requirement paragraphs is very difficult [32, 34, 107].

Discussing every single aspect of the three published AEPs would be far out of scope of the present thesis. Therefore, focus will be given on the safety requirements. As it was already seen within the civil UAS regulations, a cornerstone within airworthiness requirements are the acceptable safety numbers in relation to the failure condition. Table 4-36 provides a conclusive table on the acceptable failure probabilities of AEP-4671, AEP-80 and AEP-83.

	AEP-4671		*AEP-80*	*AEP-83*	
$MTOM$ [kg]	$\leq 5{,}670$	$> 5{,}670$	$\leq 3{,}175$	≤ 150	≤ 15
Failure condition	P [1/Fh]				
No safety effect	$> 10^{-3}$	$> 10^{-3}$	$> 10^{-3}$	$> P_{Cat} \cdot 1000$	
Minor	$\leq 10^{-3}$	$\leq 10^{-3}$	$\leq 10^{-3}$	$\leq P_{Cat} \cdot 1000$	
Major	$\leq 10^{-4}$	$\leq 10^{-4}$	$\leq 10^{-4}$	$\leq P_{Cat} \cdot 100$	
Hazardous	$\leq 10^{-5}$	$\leq 10^{-6}$	$\leq 10^{-5}$	$\leq P_{Cat} \cdot 10$	
Catastrophic	$\leq 10^{-6}$	$\leq 10^{-7}$	$\leq 10^{-6}$	$\leq \frac{P_{CumCat}}{N_{CatFC}}$	
P_{CumCat}	$\leq 10^{-5}$	$\leq 10^{-6}$	$\leq 10^{-5}$	$\frac{0.0015}{MTOM}$	$\leq 10^{-4}$

Table 4-36 Acceptable failure condition probabilities AEP-4671, AEP-80 and AEP-83

With respect to Table 4-36 , the following should be mentioned. Unlike AEP-4671 and AEP-80, which require within the AMCs that no single point of failure shall lead to a catastrophic event, AEP-83 does allow single point of failures which might lead to catastrophic failure conditions if they are shown to be extremely improbable. The concept of calculating the acceptable cumulative catastrophic failure probability as a function of the MTOW and the acceptable probabilities for the individual failure conditions based on the expected number of catastrophic failures in AEP-83 was already outlined in chapter 4.2. In addition to the remarks there, it is noteworthy to outline that this approach ensures a smoot transition of P_{CumCat} between AEP-83, AEP-80 and AEP-4671, making them consistent in the safety requirements and resulting in appropriate safety requirements for the individual UAS. Figure 4-7 presents a graphical illustration of the function and the described smooth transition.

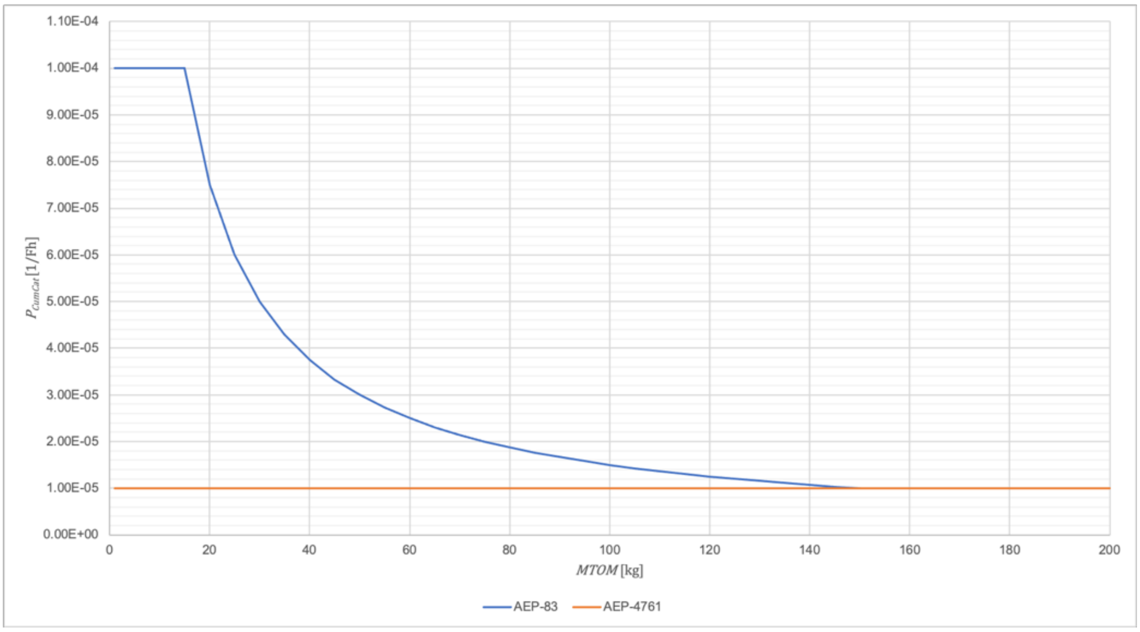


Figure 4-7. P_{CumCat} transition between AEP-83 and AEP-4671 [68, 107].

Furthermore, AEP-83 outlines that UAS with an impact energy of less than 66 J are not lethal. Consequently, no hard requirements are put on them. However, an appendix is included that provides guidance for the certification of them in case such a UAS shall be operated within non-segregated airspace.

NATO covers with AEP-83, AEP-80 and AEP-4671 almost all types of UAS present in the alliance. However, LUAS that have VTOL capabilities or pure VTOL LUAS are not covered yet. Therefore, it was decided by FINAS to set up an additional working group who shall develop an appropriate standard for these kinds of LUAS. In order to be efficient and effective and also to harmonize the LUAS codes to the utmost, the VTOL team works in close cooperation with the AEP-83 team [28, 34, 182, 185].

By its efforts to harmonize all aspects of unmanned aviation amongst the allied nations in order to grant an optimized interoperability, NATO JCGUAS achieved a status as a forerunner. In contrast to the civil world, the military has already gained decades of experience in the fields of UAS design, UAS airworthiness, UAS operations, crew licensing and cross border operations. While in the beginning of JCGUAS, a lot of fundamental work had to be done in order to build a solid basis, the group can be seen now as fully operational ready to further develop what already has been achieved. One example for this transition, is the issue that the NATO nations also have to resolve how legacy UAS which were not developed in accordance to the AEPs can be flown in foreign allied airspaces. Another aspect for the transition from fundamental to routine work is the beginning of the regular operation of the NATO Alliance Ground Surveillance system, a fleet of Global Hawks RQ-4D, which were procured by NATO in order to ensure strategic surveillance capacities [182, 185].

By this conclusion, the present subchapter is completed. The next subchapter will outline operational safety considerations based on the findings in chapters 4.1 to 4.5 and which shall serve as start for the review of UAS operational risk assessments in chapter 5.

4.6 Operational Safety Considerations in the Context of UAS Operations

The afore chapters presented the concept of UAS as overall system that needs to be considered with all its elements, including the ground-based ones, in the context of airworthiness. In this course, two fundamental paths to achieve airworthiness were presented: airworthy by design and airworthy by operation. While the first path is state-of-the-art in civil manned aviation, it was shown by the review of current available UAS regulations, that the second path became a key to determine airworthiness of unmanned aviation or, in other words, to determine that an operation with a UAS is safe. A good example for this can be found within the open and specific category of the EU drone regulations and the related EASA AMC and GM.

Though open and specific category, in particular SORA, apply a lot of restrictions in order to achieve a safe operation, either by limitations given in the applicable regulation upfront or as a result of the OSOs to be applied, the operational safety considerations under research within this thesis aimed torwards another direction. Operational safety considerations in the sense of the present text were researched in order to proof if by taking such considerations into account, airworthiness of a LUAS can be determined in general and therefore, a type certificate could be achieved. SORA instead, if not applied in the realm of standard scenarios, will always result in a specific and singular type of mission without the possibility to deviate. Whereas the idea of operational safety considerations was that they can be applied in general, with no limitation on a singular mission.

By this conclusion and by the review of current UAS regulations and the inherent paradigm shift regarding safety, it can already be said that certain aspects needs to be considered, which also answers partly the first research question: What are relevant operational safety considerations in the context of UAS operations? Relevant operational safety considerations are but not limited to: failures in the UAS and their effects, the operational environment, in particular population density, fatality probabilities and impact areas. A deeper outline of the identified general operational safety aspects to be considered will be provided in the next chapter.

5 UAS Operations Risk Assessment

In chapter 3 and chapter 4, the concept of aviation safety and airworthiness was presented. Furthermore, the two concepts of *airworthy by design* and *airworthy by operation* was presented. Based on these discussions, in the next step a review will be provided, on the aspects that need to be considered to assess the risk of a UAS operation. After this generic assessment, several concrete UAS operation risk assessments were analysed in order to obtain practical examples. By this, the present chapter is the logical follow-up within contribution C1, as it expands the big picture on UAS by operations risk assessments.

5.1 General Aspects

As it was discussed in the chapters before, one key driver in the airworthiness certification of aircraft is the assessment of inherent hazards within the aircraft and the adequate control of those hazards, in order to obtain an acceptable risk level for the occupants and subsequently for the operational environment. In contrast to manned aviation, where the risk assessment is focused on the technical system, unmanned aviation needs to be expanded as the primary concern is the risk to people on the ground.

The most obvious expansion is the inclusion of the operational area. However, while the expansion on the operational area itself contains several challenges, there are additional aspects that need to be considered if a comprehensive risk UAS operations risk assessment shall be performed. The summarizing term for this expansion is the casualty probability. While in UAS that are certified for example in accordance to [68], the overall casualty probability can be set equal to P_{CumCat} it can also be seen as SAIL, where it is of qualitative nature. However, it can also be described as summation of the probabilities that casualties might occur in the air and on the ground due to the UAS operation, which is shown in equation (5-1).

$$P_C = P_{C_{Ground}} + P_{C_{Air}} \qquad \textbf{(5-1)}$$

P_C	Probability of casualties due to a UA per flight hour.
$P_{C_{Ground}}$	Probability of casualties on the ground due to a UA per flight hour.
$P_{C_{Air}}$	Probability of casualties in the air due to a UA per flight hour.

The components of equation (5-1) are containing several variables for which the determination is crucial for any UAS operations risk assessment. In the next chapters, the variables and the related core challenges will be discussed briefly [2, 68, 174].

5.2 Failure and Failure Effects

In chapter 4, the iconic 1309 safety paragraph was presented. While compliance to this specific airworthiness requirement is shown by a systematic safety assessment of the technical manned or unmanned aircraft system, a UAS operation risk assessment must take into account the possible effect of failures of such a system in a similar way, but from another point of view. Instead of assessing the failure entry probability and the confirmation that this probability is sufficiently low, like it is done for P_{CumCat}, a UAS operations risk assessment must consider that a failure occurred within the UAS and the possible effects on the UAS and on the environment where the UAS is operated. For the purpose of the present text, this variable shall be called P_{FUA}. This probability includes also the probability that the airborne UA is not controllable anymore and therefore might endanger other airspace users.

This consideration might be very generic, for example: In case of an onboard failure in the airborne UA it is assumed that the UA will always crash. Or a more detailed consideration might be given, for example: There is an onboard failure in the UA, affecting the Flight Control System. Is the failure detected or not? If it is detected, are there possible countermeasures?

Several levels of consideration are thinkable. These levels are always dependent on the available knowledge about the UAS. UAS operations risk models which take into account only broad and generic considerations, might be easily applied, but on the other hand they might result in too conservative or too optimistic assessment results. Conversely, a UAS operations risk model that requires a lot of technical information about the UAS might be not applied because not always every information needed is available. Therefore, an adequate balance regarding the implementation of UAS failures and their effects is necessary [28, 34, 45, 186].

5.3 Operational Environment

The operational area or operational environment is of significant importance in a UAS operations risk assessment because the inhabitants of this area are endangered in case of failed UAS. Dependent upon the operation, the area is divided into the airspace and the ground space.

Within a non-segregated airspace, a failed UA will endanger other aircraft operating in the same airspace. Such a risk can be easily minimized by limiting the specific airspace to the UA itself or to UAS in general. An example can be already seen in the current altitude limitations for small UAS in the regulation regime of EASA or FAA. The risk for other manned aircraft will become much more immanent as soon as MALE UAS operations in international air transport ascend.

In any case, a failed UA which enters an uncontrolled state resulting in a crash will put people and infrastructure on the ground in danger. Consequently, a UAS operations risk model must incorporate a possibility to shape the ground space sufficiently. As it was discussed in the remarks on failures and failure effects of the UAS, this can include several levels of consideration.

While more simple models might contain only the overflown map, more sophisticated models contain further categorization within the map, for example water or built-up areas. The more sophisticated the model, the more details will be contained within the representation of the ground area. On the highest level, such a ground model could include a complete set of ground and building elevations as well as a detailed information about the shelter capacity S of the buildings within the area. Shelter capacity is of importance as it indicates the capacity of a building to protect the inhabitants by not collapsing in case of an impacting UA.

Subsequently, a more complex ground model will lead to a more complex UAS risk assessment, requiring much more data input. Especially, the shelter capacity S is one of the most challenging aspects, as it requires lot of information regarding the buildings and construction materiel of them [186].

5.4 Population Densities

Besides a sufficient modelling of the infrastructure in the operational area, one of the most important aspect is the inclusion of the people which populate the air and ground space of the operational area. The population density in the air $\rho_{Pop_{Air}}$ can be represented as people who are sharing the same airspace together with the airborne UA. Based on the fact that while this thesis was written UAS operations in non-segregated airspaces were not allowed per definition, the variable $\rho_{Pop_{Air}}$ could be easily neglected by assuming a segregated airspace.

However, the inclusion of the ground population density $\rho_{Pop_{Ground}}$ is inevitable and must be included in a UAS operations risk model. The mutual unit for population densities is people per defined area, e.g. people per square kilometre.

Ground population densities can be included in a UAS operations risk model in various ways. For example, as a beginning point, only an assumed number of people in an overflown area could be applied. While such broad assumptions are useful for first estimates, a more realistic model needs to consider that population densities vary locally. Census data from statistic authorities are useful data for this aspect.

Furthermore, besides the pure local number of people in an operational area, another point to consider within the modelling of a population density is the distribution of the people. Taking into account only local variations will result in static and assumed uniform distributions. Although such a population model gives a closer comparison of reality, an additional component needs to be considered: the temporal component. Each day, people are in move, for example if they go to work or if they go from work to their home. Population densities do not vary only locally they also vary in time. Therefore, in order to generate a realistic representation, a UAS operations risk model should also incorporate the temporal distribution component of population densities. Conversely, this is the most challenging part, as temporal movement data of people is crucial to determine.

In summary, the modelling of ground population densities needs to performed with care. The modelling of population density is of key importance within a UAS operations risk model, as it is the fundamental variable that defines how many people might get hit in case of a UA crash [2, 186].

5.5 Impact Area

To determine the amount of people who are affected by a UA that hits the ground, the potential impact area of the UA A_{Impact} must be defined. People within the impact area are assumed to be hit and to suffer injuries which also could be lethal. The combination of population density and impact area form the final prediction regarding the hazard potential of an airborne UAS in a UAS operations risk assessment.

The review of several UAS operation risk assessment has revealed that there is no mutual resolution how to calculate the impact area of a crashing UA. Basically, two methods were identified in general: Geographical method and empirical method, which is usually found on the UAs weight.

Both methods should be seen as hypothetical. This might be contradictory, especially for the empirical method. However, the observations which led to the specific impact area equations are foremost based on manned aircraft, which cannot be compared directly to UAS, in particular to light UAS. On the other hand, the geographical method is based on pure physical aspects of the UA and does not take into account historical data.

An impact area of a crashing UA will always be highly dependent upon the design of the UA and the failure condition that led to the crash. Consequently, the calculation and prediction of impact areas are probably the biggest uncertainty in a UAS operations risk assessment. UAS operations risk models should consider this aspect and not be fixed on one specific method. However, it must also be admitted that there must be one starting assumption [186].

5.6 Fatality probability

After UAS failures and failure effects, the operational area including population densities and distributions as well as the impact areas have been discussed, it is necessary to have a look at P_{Fat}, the fatality probability of people who are in the vicinity of a crashing UA. This probability should not be confused with casualty probability P_C.

The fatality probability explicitly determines how reasonable it is that a person will suffer lethal injuries after being hit by a crashing UA or parts of it. Therefore, the range of P_{Fat} lies between zero and one. Whereas casualty probability represents the conclusive probability of a person being hit by a crashing UA per flight hour as it was shown in equation (5-1).

In order to quantify the probability of a fatality, the transfer of kinetic energy from the crashing UA into impact energy and further transfer to the human body has become the common metric. Blunt trauma studies in the early 20th century have shown that a fatal injury can already occur by an impacting object of 66 J. Although such studies were focused on point damage and did not cover aspects like distributed energy or possible UAS specific design features, for example frangibility, newer studies did not lead to results that could justify an increase of acceptable higher impact energies. This has been already reflected in regulations, for example the European Regulations for Drone Operations in the EU, which does not strictly focus on the 66 J UA impact energy E_{Imp} as boundary for flying above uninvolved people.

Because of its nature, the fatality probability must be seen as medical variable. If a person suffers lethal injuries after being hit by UA, strongly depends on how the person was hit and if life-critical organs were injured. For example, if a rotor cuts a finger, it probably does not lead to a fatality, however, if the same rotor severs an artery, the fatality probability tends to one.

To conclude, P_{Fat} represents a function of high uncertainty because it depends on the individual hit case which is subject of at least the UA design, the impact velocity, the impact angle and the body area of the person struck. Consequently, the inclusion of any P_{Fat} equation into a UAS operations risk assessment which tries to predict the injury level of an individual person or assemblies of people imposes also a level of ambiguity and an additional uncertainty. Therefore, predictions of P_{Fat} in UAS operations risk assessment should be handled with caution [24, 28, 186].

5.7 Review of Selected UAS Operations Risk Assessments

While in the beginning of the research for the present thesis, such works were quite rare, nowadays there are many more available. In 2017, Washington [186] analysed 33 different approaches focused on UA ground impact. Since then, much more were published. Therefore, besides the already presented regulation approaches of Aviation Authorities, it was decided to limit the review on selected UAS risk approaches with respect to the considerations outlined in chapters 5.1 to 5.6.

The following chapters will summarize the review for all studied UAS Operations Risk Assessments at once. More details regarding the specific models can be found in chapter 11.1.

5.7.1 Failure and Failure Effect Models

The vast majority of the models under review did not consider root causes in the UAS that might lead to a crash or mitigation measures that might avoid the crash or limit the outcomes [36-40, 42, 44, 46, 47, 187-189]. Most of the models assume a constant failure rate for P_{FUA}. Although the works of Breunig et al. [48], La Cour-Harbo [50] and Kaya [190] took into account that there are failures inside the UAS with different probabilities and linked them to hazard reference systems, they did not further assess the origin of the failures in the UAS. Only Barr et al. [191] performed an extensive root-cause analysis comparable to the methods of a preliminary system safety assessment for sUAS (cf. [174]). However, applying this blueprint on a specific UAS under review would make in-depth knowledge of the UAS design indispensable. Furthermore, SORA requires for certain SAILs that the cumulative probability of a loss of control scenario is below a certain threshold (cf. chapter 4.5.3), which can be seen as another term for P_{CumCat}. Additionally, the considerations regarding the justification of the GRC do require to include the probability of a loss of control state due to the systems of the UAS. Both requires to perform a system safety assessment in accordance to accepted standards in order to achieve justified rationale for the probability number [24, 166, 167, 169, 170, 173].

By applying a Barrier Bow Tie Model, Clothier et. al. [49] assessed the aspects of UAS internal mitigation measures as well as failure detection capacities in a qualitative manner. Hence, no further mathematical deduction was made which could provide a quantitative probability statement.

Several models applied Target Level of Safety approaches. TLS approaches are founded on combining the aspects discussed in chapters 5.1 to 5.6 into one equation. One common combination is provided in [192] and shown in equation (5-2).

$$CE = P_{FUA} \cdot \rho_{Pop_{Ground}} \cdot A_{Impact} \cdot P_{Fat} \cdot S \tag{5-2}$$

CE Casualty Expectation in case of a UA crash

The TLS is defined by an acceptable CE. By rearranging equation (5-2) an acceptable P_{FUA} can be determined. This is shown in equation (5-3).

$$P_{FUA} = \frac{CE}{\left(\rho_{Pop_{Ground}} \cdot A_{Impact} \cdot P_{Fat} \cdot S\right)} \tag{5-3}$$

If P_{FUA} is known, equation (5-2) can also be used to determine allowable populations densities to be overflown by the UA, while the defined acceptable CE is maintained.

$$\rho_{Pop_{Ground}} = \frac{CE}{(P_{FUA} \cdot A_{Impact} \cdot P_{Fat} \cdot S)} \tag{5-4}$$

Application of the TLS approach in different ways can be found in for example in [36-40, 46, 47, 169-171, 173]. The TLS approach is a mutual way to assess an acceptable level of risk posed by a UAS operation. However, most of the reviewed models which used TLS did not include a root-cause analysis. As written above, a constant failure rate was assumed in most cases.

5.7.2 Operational Area Models

A notably number of the reviewed approaches applied a very broad and generic representation of the operational area only, e.g. populated or not-populated areas or built-up or non-built-up areas [36-38, 50, 169, 170, 187, 189].

In [42] and [44], Waggoner and Lum included the density of structures as well as the average height and size of buildings in the operational area model which can be seen as improvement compared to the generic representations. Melnyk provided a detailed consideration of the overflown infrastructure in order to get a realistic representation of the infrastructures shelter capacity S to withstand the kinetic energy of an impacting UA [47]. However, the application was limited to the United States.

It is noteworthy to point out that the modelling of the shelter capacity S marked the greatest variance within the reviewed approaches. While Melnyk's advanced approach linked kinetic energy and building materiel data in order to determine shelter effectiveness, the assessment of Weibel only assumed different levels to withstand penetration without further deduction of origin. Dalamagkidis included such a penetration probability, combined with the probability that it is possible for exposed people to take shelter as well as a fatality probability if the shelter is hit. Within the work of JARUS several approaches are suggested for the modelling of the operational environment, including the inclusion of obstacles influencing shelter capacity and furthermore shelter is defined as function of people exposed to the UAS operation [36, 46, 47, 173].

One notable approach was found in the work of Kaya [190]. The operational model is founded on a GIS database and augmented by real-time sensor data of the airborne UA, allowing an online updating of the risk posed by the UA to the overflown environment. Although this represents a very sophisticated approach, it can only be applied entirely during an active UA operation.

A further interesting aspect for the operational area model was observed in the paper of La Cour-Harbo [50]. In this approach an environmental component, wind, is included. While environmental aspects were identified as considerable aspect in general by [49] or [191], Cour-Harbo included wind as a probabilistic risk function.

As can be seen by this summary, the literature review of the different UAS operation risk assessments led to the expected findings regarding modelling levels of the operational area.

Modelling of operational areas varies greatly in detail and appliance. Especially the inclusion of shelter capacity S poses a great level of uncertainty within the different assessments.

5.7.3 Population Density Models

As discussed in chapter 5.4, population density models might encompass a broad range regarding the simulation of reality. The driving factor for population models especially for light UAS operations is the ground population, nonetheless, based on the fact that UAS will share the same airspace with manned aircraft, this airspace will also be populated and should be taken into account.

However, while this thesis was written, operations of civil UAS were usually limited to the very low airspace, e.g. below 400 ft AGL. In this airspace, regular manned aviation does not take place in general. Therefore, it can be reasonably assumed that $\rho_{Pop_{Air}}$ is a neglectable factor [23, 24, 189]. Nevertheless, for the sake of completeness, before the summary of the driving variable $\rho_{Pop_{Ground}}$ is going to be discussed, a short recap of $\rho_{Pop_{Air}}$ models found in the reviewed UAS risk assessments will be presented.

Upfront it is noteworthy that only a minority of the evaluated UAS operations risk assessments incorporated a model to simulate $\rho_{Pop_{Air}}$. In the past the population in the air was driven by manned aviation only, usually represented as aircraft per defined airspace volume. In the near future, $\rho_{Pop_{Air}}$ will be increased significantly by the number of UA per defined airspace volume. Because this is not the case yet, $\rho_{Pop_{Air}}$ models found are based on statistics of aviation authorities and historical data. Usually they were included by databases or by applying a general probability of mid-air collision P_{MAC} [36, 39, 42, 44, 46]. other assessments under review either provided only a recommendation that $\rho_{Pop_{Air}}$ should be considered if the risk of a UAS operation is assessed, or, did not consider $\rho_{Pop_{Air}}$ at all. An exemption is given by SORA, which requires that an applicant determines the risk to other airspace users by defined scheme, which leads to the expected risk level. Although the air risk has direct influence on the resulting overall risk assessment, it is only of qualitative nature (cf. Figure 4-6) [169-171].

In contrast to $\rho_{Pop_{Air}}$, $\rho_{Pop_{Ground}}$ was considered in all reviewed UA operation risk assessments. The depth of the considerations throughout the different assessments varied greatly. On the lowest level, $\rho_{Pop_{Ground}}$ was only taken into account in a qualitative manner by stating that this must be considered [49]. One step further found inside the models, was to define population classes like populated or not populated. Based on assumed $\rho_{Pop_{Ground}}$ values, this differentiation was divided into further sub classes like sparsely and densely populated areas, or more even more granular sub classes [39, 40, 46, 169-171, 187, 189].

While with such assumed population densities predictions might be given for UAS operations above areas with comparable populations densities, a more sophisticated way is to apply population densities from official sources, e.g. census data. By linking such data to the place where the UAS operation takes place, more realistic predictions in case of a crash of the UA can be made. This approach was found in many of the reviewed UAS operations risk assessments [36, 37, 42, 44, 50, 173, 190].

Although applying place-dependent population densities will provide a better simulation of the real world, this approach misses to incorporate the factor of time. The pure application of census data usually results in a constant and uniform distribution of people without taking the aspect into account that people move their position during a day.

Only few models provided a solution on the challenging aspect to simulate daily people movement. And even those range from pure basic assumption up to real time data inclusion. Le Cour-Harbo [50] for example assumed that 70 % of the inhabitants in the overflown area are in buildings during the UA operations, which therefore cannot be seen as time-dependent. Melnyk [47] suggested a promising approach which linked the local population density, area usage, mission duration and impact area, resulting in a well thought through distribution simulation. However, also this approach does not include the current daytime of the UAS operation. Within the work of JARUS suggestions are made to support population data within risk assessments by data obtained from satellite observations or data from mobile phone networks in order to get up-to-date information. However, there are only recommendations made which an applicant should consider for the determination of ground populations and no definite model is proposed [173]. Census-based data was also used as primary input for modelling $\rho_{Pop_{Ground}}$ in the work of Kaya [190]. In order to overcome the fact that this data is static, it is suggested to augment the data by real-time sensor input from the UA and to amend the flight path accordingly, in order to minimize the risk of the overflown people. Breunig [48] developed a very sophisticated model, which differentiates between pedestrian density for people moving around during the UAS operation and census-based population density for the general number of inhabitants in the area. For the pedestrian density, a database was taken as source, which provides 24 h average values of people movement data.

5.7.4 Impact Area Models

In all except one [187] of the reviewed UAS operations risk assessment models the affected area of an impacting UA, A_{Impact}, was discussed [36-40, 42, 44, 46-50, 171, 173, 188-191]. The vast majority of the considered UAS Operations Risk Assessments applied geographic methods to calculate A_{Impact} with characteristic parameters of the UA, e.g. w_{UA} and l_{UA}, as well as average dimensions of human bodies, e.g. r_P and h_P, as main input. A significant number of the different approaches took into account a direct vertical descent (the “falling object”) and the glide impact, which assumes that the UA glides uncontrolled with a given glide angle γ to the ground [38, 39, 42, 44, 46, 48, 188]. Notably, the approach in [173] applies a hybrid concept which combines glide, restitution and slide effects by incorporating the time the UA needs after impact to slow down to a velocity which results in non-lethal energy. In contrast to the these geographic approaches, probability density functions were applied in [50] and [190].

Two papers [47, 189] suggested equations based on m_{UA} which were derived from UAS data. Therefore, both claimed to be empirical and already validated. However, such approaches must be treated carefully as the statistical basis usually cannot be reproduced. With respect to the two reviewed papers here, it was found that both showed a lack regarding determination coefficients.

It is noteworthy, that Barr et al. [191] proposed to consider primary the part of a hit person which most probably will lead to lethal injuries instead of focusing on the UA as definition for the affected area. This approach is very interesting because it overcomes the aspect that there is no consensus how to calculate A_{Impact}.

As discussed in chapter 5.5, all equations for A_{Impact} are of theoretical nature. Based on the presented rationales none of them should be seen as a fundamental law.

5.7.5 Fatality Probability Incorporation

The review of the UAS operations risk assessments with respect to the probability of a fatality in case of an impacting UA P_{Fat} resulted in mixed findings. As already noted, the primary driver for determining P_{Fat} is the kinetic energy E_{Kin} and if the endangered persons are protected by a shelter factor S or not. Within the reviewed papers, inclusion of E_{Kin} and S took either place explicitly by determining clear equations, implicitly by strict assumptions or in a hybrid form that incorporates aspects of both types.

Explicit formulation of P_{Fat} can be found for example in [39, 46, 48, 50, 173, 187, 189]. In those works, P_{Fat} is formulated as function based on E_{Kin} or E_{Imp} and S and can be directly calculated or might set equal one by default.

Examples for the implicit formulation of P_{Fat} by applying strict assumptions can be retrieved from [36-38, 40, 42, 44, 47, 190]. In order to determine P_{Fat} by this way, it was observed that at first, the fundamental assumption was defined, for example the probability of fatality is always equal one within the impact area. Second, possible boundary conditions might be defined, e.g. the probability of fatality is always equal one within the impact area for any impact energy greater than 66 J.

Hybrid formulation examples were found [36, 49, 188, 191]. Those formulations can be characterized by the point that they link the fatality probability to qualitative aspects, e.g. mitigation measures that are described in non-mathematical terms or the relation to a UA.

As can be seen here, a small majority of the reviewed UAS Operation Risk Assessments applied the implicit form for P_{Fat}. The further estimation and consequences for the present thesis will be shown in chapter 6.6.

5.7.6 Casualty Probability

While the variables P_{FUA}, $\rho_{Pop_{Air}}$, $\rho_{Pop_{Ground}}$, A_{Impact}, S and P_{Fat} were provided foremost in a relative clear way, a combined casualty probability P_C in case of an impacting UA as depicted in equation (5-1) was found seldom only. The main reason for this finding is that the risk a UAS poses to other aircraft, the probability of mid-air collision P_{MAC}, was deemed to be neglectable based on the expected airspace, in which UAS are allowed to be flown (cf. chapters 5.4 and 5.7.3).

It is noteworthy that the modelling of P_{MAC} is crucial, as there are only few valid sources regarding near mid-air collision of UAS and aircraft yet. On the one hand, it is not a surprise that available models of P_{MAC} are foremost hypothetical. On the other hand, it is surprisingly that also UAS Operation Risk Assessment which included such models, did not always combine $P_{C_{Ground}}$ and $P_{C_{Air}}$, for example [36, 39, 46].

Notably exemptions can be found in [42, 44, 171] and [191]. Those papers provided the most comparable methods to the expected determination of the casualty probability in case of an impacting UA, either in qualitative or quantitative form. For the majority of the other reviewed papers, it can be said, that equation (5-1) can be reduced to equation (5-5).

$$P_C = P_{C_{Ground}} \tag{5-5}$$

6 Shortcomings and Potential Mitigations for a new Approach

The previous chapter showed that the reviewed UAS Operation Risk Assessment approaches have a very broad range with respect to the primary aspects that need to be taken into account. Each one has several advantages and disadvantages and there is none that should be deemed as the de-facto standard.

Assessing and summarizing the different UAS Operation Risk Assessments revealed several explicit and implicit shortcomings. Both kinds are described in the next chapters. It should be noted that these descriptions do not claim to be complete nor that they should be seen as ultimate.

The present chapter will summarize the observed shortcomings and will focus on the items that need to be addressed in a new approach. The chapter will be concluded by provision of possible mitigations how the identified items might be resolved. It is also seen as the conclusion of contribution C1.

6.1 Operational Environment

The models to simulate the operational environment are seen either as too generic or too comprehensive (for example [187] and [47]). While in the first case, quick but broad results can be obtained, the second case might provide precise results. However, this will require a lot of information upfront about the overflown environment to perform the risk assessment and therefore, cost more time as for every operational environment the required information need to be checked if they can be applied. For example, the shelter factor is hard to obtain as it may vary greatly throughout different local regions and countries.

The model of the operational environment should be incorporated into a UAS Operations Risk Assessment in a way, that a reasonable balance of details regarding the overflown area is maintained within the assessment. This is valid for manual as well as automated assessments.

To achieve this, it should be avoided that too much details upfront are necessary by the user, because it may force the user to take too much assumptions, leading to uncertainties in the assessment results. In particular the inclusion of shelter factors imposes a high degree of uncertainty and therefore it should not be applied in detail. A full integration and in-depth inclusion of shelter factor S will always require specific data of the overflown buildings upfront, making huge databases indispensable. While this might be applicable for small operation areas, it will probably be very hard to obtain this for bigger areas like cities. Therefore, especially for fast but reliable UAS Operations Risk Assessments, shelter factor S should be included with valid rationales based on the UAS type under review, e.g. that the m_{UA} is too low to damage any building that it collapses, or the opposite, that any building hit by the UA collapses.

Another item to be addressed within the operational area model is the variation of the overflown ground with respect to the different types of areas and buildings. It is a big difference if an operation takes place above a water area or above a residential area. Other examples are industrial areas, open areas, natural areas like forests or also non-public areas like military facilities. Although some attempts to do so were identified, this aspect should be given some more attention. Instead to focus the assessment on aspects like shelter factors in the overflown area, it is seen more beneficial to include a possibility to analyse and to cluster the overflown area by different area types in the assessment. Such a sorting would obviously help to plan UAS operations without the need to expose certain areas more than needed to the risk of a crashing UA, for example housing areas.

By taking into account those two aspects, a well-balanced model of the operational environment may be achieved. In addition to this, another driving item that needs to be addressed is the inclusion of population densities into the assessment. Furthermore, the application of static and uniform population density models, in particular with respect to the ground represent one of the biggest weaknesses in existing approaches.

Basically, this could be seen as part of the operational environment, however, because of the importance and possible impact, the simulation of population densities will be discussed as an own item in the next chapter.

6.2 Simulation of Ground Population Densities

It was shown that the inclusion of the overflown people is a key factor in any UAS Operations Risk Assessment. The population in the air is seen as neglectable for this time being as the vast majority of civil UAS does not operate in airspaces where manned aircraft operate. Nevertheless, once UAS share the airspace with manned aviation on a regular basis, this must be re-addressed. However, it is also seen as reasonable, that if this happens, UAS will be under the regime of Airspace Traffic Control and treated as any other aircraft. Assuming that UAS are subject to Airspace Traffic Control, the risk of collisions with manned aircraft will be reduced to an acceptable low level.

With respect to ground population densities, it was revealed that the inclusion and modelling of this aspect is one of the most challenging aspects amongst UAS Operations Risk Assessments. From the author’s point of view, it is not sufficient to implement population densities only by taking into account census based geographical population data or take broad assumptions as for example that a certain percentage of persons is at home or not. Although geographical census-based population data will provide a good projection of the real inhabitation, it does usually not take into account the daily movement of the inhabitants during a day inside the overflown area. Moreover, this leads usually to uniform and not randomized distributions of the people on the map.

In order to mitigate this, the modelling of ground population densities should be arranged in a way that the model will provide a close reproduction of the geographical population distribution which is related to the time dependent movement of the overflown inhabitants. Additionally, it should be avoided that the distribution is uniform or completely predictable. It is obvious that for such a model the need to define several fundamental assumptions is inevitable. The assumptions which need to be defined should be based on reliable sources and be transparent and traceable.

6.3 Closed Approaches

A notably number of the reviewed UAS Operation Risk Assessments were very specific in their application, in particular if the intention is for one explicit mission only (e.g. [48], [189] or [171]).

For example, some approaches either very limited in the applicable spectrum of UAS or only applicable to a specific country.

On the one hand, this is understandable, because limiting the assessment will reduce uncertainties as it can be assumed that within the self-defined limits, most of the variables to be considered are known. On the other hand, closed approaches, cannot be adapted to other use cases, making broad comparisons within such a UAS Operations Risk Assessment hard to achieve.

Therefore, a new UAS Operations Risk Assessment approach should be designed in an open way in order to be capable to include use cases that are not part of a default setup.

6.4 Root-Cause Incorporation

In contrast to the final outcomes of a UA impacting the ground is assessed foremost, the root-cause which led to the impact was taken into account in the reviewed UAS Operations Risk Assessments only very seldomly (e.g. [171, 191]). This might be based on the fact, that for the assessment of the risk posed by the UAS operation the impact of a failed UA and the potential outcomes are obviously of more interest than the reason of the outcome.

However, the history of aviation has shown that the root-cause determination is one key factor in the inspection of aircraft accidents and incidents. As tragic as every aircraft incident is, the understanding of the reasons why the incident happened will increase safety of future aviation. Once a technical cause is known, it will be avoided in later aircraft designs. Additionally, different root-causes might result in different outcomes.

Considering those aspects, the non-incorporation of the root-cause might impose a gap in a UAS Operations Risk Assessment. Future approaches should consider this and provide a way to include root causes if needed in order to simulate different scenarios.

6.5 Application Complexity

The chapters before can be expanded as shortcoming with respect to the complexity of a UAS Operations Risk Assessment application. It was observed that the application of several UAS Operation Risk Assessment approaches tend to be either very complex or very simple. Very complex in a sense that the application is very long and a lot of data is needed. This data is not limited to the operational area, it also might incorporate in-depth knowledge of the UAS. Otherwise round, there are approaches which are simple in their application are the complete opposite to this. While in the first case quick assessments of a planned mission are not possible, the second case allows quick assessments.

The results of both assessment approaches should be questioned. UAS Operations Risk Assessment approaches that require many detailed information, especially about the UAS, are usually very limited in their application (cf. chapter 6.3). UAS Operations Risk Assessments that do not need a lot of input data are applying usually generic assumptions for the most parts of an assessment, which ultimately can only lead to generic results.

A new approach should be scalable or balanced regarding the necessary information to be provided as input for the UAS Operations Risk Assessment. This poses a crucial demand, especially if a UAS is completely unknown to the assessor. In case of a completely unknown

UAS in a known environment, this would require to simulate an infinite number of possible failure conditions and results. As this is not feasible, an average way should be established.

6.6 Impact Implications

Although the vast majority of the reviewed approaches present an assessment of the risk of a UAS operation, conclusive information on the possible implications of a UA hitting the ground or another aircraft in an airworthiness metric is not clearly visible. Additionally, it was found that a differentiation between ground and air impacts might be helpful with respect to the individual risk in the specific domain but is not really beneficial with respect to the overall risk the UAS Operation poses to the environment where it is operated and the inhabitants (for example [42, 44]).

In relation to this and in particular for the realm of ground impacts, it is seen critical that definite fatality probabilities in the form of energy barriers or similar are applied, e.g. [47] or [187]. This might result in wrong expectations regarding the real lethality in case of a person getting hit by a failing UA. For example, in case a fixed wing UA with mass of 2 kg crashes and hits a person's shoulder with the wingtip, this person might suffer light injuries. However, if the UA hits the person with its heaviest point, e.g. the engine, the person probably will die. This also works in the opposite way. A UA which is not lethal in theory, might hit a person in such an unfortunate manner, for example frontal onto the head with an overspeed because of a deep dive, this person might also suffer lethal injuries.

In addition to these aspects and as it was described in chapter 5.4 and 5.7.3, casualty expectations might be divided into the two dimensions air and ground. Although such a differentiation could provide an advantage regarding a detailed assessment on how the UAS operation affects each dimension, it is not seen beneficial if a conclusive expectation is not provided. Therefore, it is recommended to merge both casualty expectations into one, if for air and ground a differentiation of the casualty expectation is applied.

Additionally, it is suggested to avoid that within a UAS Operations Risk Assessment concrete human fatality probabilities for UA crashes are applied. Basically, this is a conservative approach, however as described above, the application of fixed fatality variables in a risk assessment tends to give misleading expectations to the assessor.

A UAS Operations Risk Assessment should focus on the aspect if a person or several persons were hit or not, instead of attempting to determine the degree of injury of the persons hit. Several of the reviewed papers already followed this attempt, but this should be emphasized by introducing a hit per flight hour variable for determining the casualty expectation.

6.7 Transparency, Traceability and Validation

The primary aim of UAS Operations Risks Assessments is to prove to a competent authority that a specific UAS operation only poses an acceptable level of risk to the environment and inhabitants where it is operated. Consequently, the means of determining this risk as well as the results of such an assessment should be transparent and traceable. Furthermore, a validation method should be provided in order to support the acceptance of the tool itself.

With respect to the reviewed approaches, it was observed that almost none of them offered means to cover the aspects transparency, traceability and validation. Although in some approaches, a basic attempt was given to support the three aspects, it was foremost not maintained throughout the whole assessment. In particular, the aspect of validation seems to be very challenging to be supported [36, 42, 44, 47, 189].

In order to improve this weakness, a new approach should provide a clear trace on how the results of the assessments were determined. Furthermore, means of validation should be provided.

6.8 Risk Awareness

To conclude the shortcomings discussed within chapters 6.1 to 6.7, one last aspect should be mentioned: Risk awareness. As an example, for this shortcoming, recall the differentiation between air and ground casualties and the related merger suggestion regarding casualty expectations. Instead of providing a clear total number of expected casualties, the users might be required to interpret the results further.

While a total number or a list of potential implication obviously would increase the risk awareness of the UAS operator before the mission, the possibility to interpret results might end up in too optimistic expectations. Especially if an operator wants to conduct a mission at all cost, willing to accept a high risk, such interpretations are dangerous. From the authors point of view, the results of UAS Operations Risk Assessments should be as much as possible clear to the user with only very limited or clearly defined room for interpretation.

UAS Operations Risk Assessment serve to assess the risk posed by the airborne UA to the overflown ground and the air the UA flies in. The risk awareness about the potential risk is essential for operators as well as the authorization authority. Therefore, new approaches should include a capability to increase the risk awareness.

6.9 Summary

As a conclusion, it can be said, that the more variables an UAS operation risk assessment requires, the more detailed and probably more precise the result will be. However, more variables always imply more uncertainties as more assumptions need to made, making the assessment on the one hand more exhaustive in the conduction and on the other hand more limited in its application. Furthermore, the results might be less reliable than those of an assessment with a lower grade of necessary details to be provided as the sum of all uncertainties might have a too high influence on the result.

Chapters 6.1 to 6.8 showed several observed shortcomings in existing approaches for UAS Operations Risk Assessments. To overcome these shortcomings, suggestions for mitigating measures were made. These suggestions as well as the as the aspects discussed in chapter 5.1 to 5.6 represent also the relevant operational safety considerations that need to be taken into account in the context of light UAS operations in Germany and therefore, providing the answer to research question number 1. In the next chapter, the practical implementation of dedicated recommendations will be described by the introduction of the O.R.C.U.S. tool.

7 Prototype Implementation by O.R.C.U.S.

The idea of developing an own UAS Operations Risk Assessment tool originated in the early beginning of the research and was driven by the hypothesis as well as the derived research question 2. Furthermore, when it was found that there were no tools to assess UAS operations above Germany this idea was pursued with more intensity. This was supported by the aspect. of the very limited availability and accessibility of existing approaches. Eventually, the advent of the European UAS Risk Based Regulation implementation emphasized the development of O.R.C.U.S. additionally [51].

In the present chapter, at first the fundamental concept and aim of O.R.C.U.S. will be described, followed by a presentation of the architecture. Afterwards, a default application of O.R.C.U.S. is outlined. The last subchapter will conclude the capabilities of O.R.C.U.S. and summarize the improvements and advantages compared to existing approaches. By this, chapter 7 represents contributions C2, C5, C6, C7 and C8.

7.1 Aim and Concept

Chapter 4.6 introduced the basic operational safety aspects that should be considered, further described in detail in chapter 5 and chapter 6 provided several shortcomings in existing approaches to conduct UAS Operations Risk Assessments with respect to the identified aspects.

Based on the described points and by reminding research question 2 “How can these operational safety considerations be modelled?”, a software-based tool was found best to cope with the challenging idea to develop an own UAS Operations Risk Assessment tool. The overarching development target was to generate a tool chain that is capable to provide reliable predictions on the risk of a UAS operation even if only few technical information about the UAS are available and to relate the results to airworthiness terminology, in order to increase risk awareness of the user. To conclude, the following derived design goals were defined:

- Risk-predictions of a UAS operation shall be possible with only few information about the UAS.
- Those predictions shall be made available in an airworthiness related terminology.
- The results shall be provided in a way, that the risk awareness of the user might be increased.
- Results shall be clear and a means of validation shall be provided.
- The application complexity shall be low.
- The tool shall not encompass the impact of a UA only, it shall also encompass the technical source that led to the impact.
- The operational environment shall focus on Germany, including a non-static distribution of population densities with a place and time-related behaviour.
- Applied assumptions, equations as well as underlying data sources shall be well-defined in a transparent and traceable way.
- A module-based architecture shall be used in order to include future models and to expand the tool to other appliances.

In the next chapter, the architecture of the resulting O.R.C.U.S. tool will be presented. This includes the fundamental design decisions and principles of the software based on the design goals. Furthermore, it will be shown how the design goals were fulfilled.

7.2 O.R.C.U.S. Architecture

This chapter will present the architecture of O.R.C.U.S. Because O.R.C.U.S. contains a high number of different modules, which are called functions the software will be presented here at a glance in order to provide a better orientation and to improve the understanding of the next sub-chapters content. Every module is described in detail within the glossary provided in the appendix chapter 11.2.9.

O.R.C.U.S. consists of different types of functions, which are defined as main function, sub function or ini function. Furthermore, functions that interact or which are related to each other are organized into groups and sub groups. If one function initiates another function, the initiating function is called a parent function and the initiated function is called a child function.

Figure 7-1 shows the core function groups of O.R.C.U.S. from a top-level point of view. On this level, O.R.C.U.S. can be divided into four core fields:

- Operational Environment Generation
- Initialisation
- Mission Simulation
- Evaluation

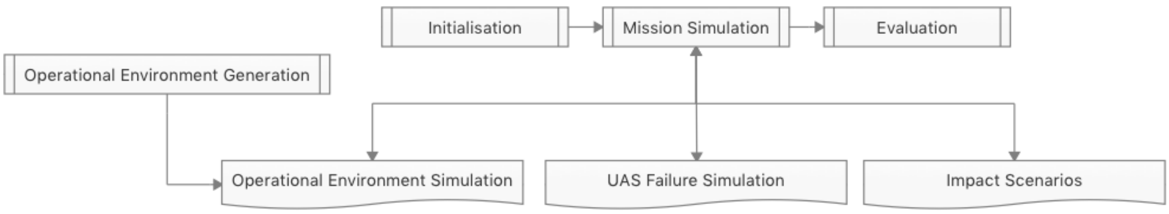


Figure 7-1. O.R.C.U.S. core function groups.

The Operational Environmental Generation group contains all main and sub functions that are necessary to model the area for which the UAS operation shall be simulated. It will be presented in detail in chapter 7.2.2.

Within the Initialisation group all relevant data about the mission and the UAS is stored. Although the *INI* function is only one single main function, it is seen as a function group because it requires access to the UAS data. Further details regarding the UAS incorporation are shown in chapters 7.2.3.

After the initialisation is done, the parameters are handed over to the Mission Simulation group. This function group is the biggest and most complex part of O.R.C.U.S. It performs automatically the simulation of the UAS operation, based on the initialisation parameters. Within this simulation, the operational environment is dynamic with respect to the movement of people during the UAS operation. Random failures in the UAS are initiated which can lead to different impact scenarios. The cause of the simulated failures is linked to the UAS data. Based on this approach, a complete picture from technical failure until the final outcome on the ground is given. During the simulation, all necessary data is stored in single files in order to have the possibility to analyse any aspect of the simulated UAS operation later if needed. In chapters 7.2.4 to 7.2.7, highlights of the mission simulation group will be presented.

The resulting evaluation files are used by the Evaluation function group. This function group performs a complete analysis of all evaluation files and generates a simulation summary spreadsheet. This spreadsheet links the simulation results to airworthiness terminology and therefore, the user can directly estimate the potential risk of the UAS operation. Further information on this part of O.R.C.U.S. will be discussed in chapter 7.2.8.

Figure 7-2 and Figure 7-3 are showing all main and sub-functions of O.R.C.U.S. These two figures shall serve as orientation map for the next chapters in which the underlying principles of O.R.C.U.S. are going to be described.

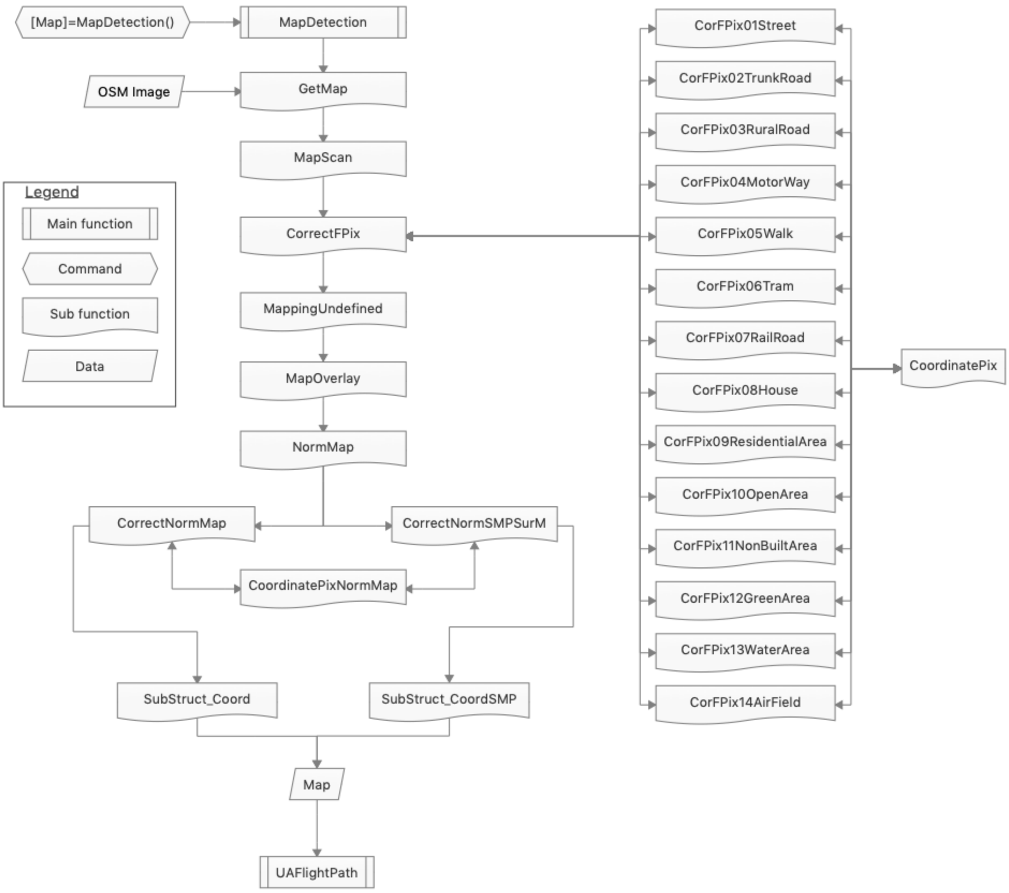


Figure 7-2. O.R.C.U.S. Operational Environmental Generation

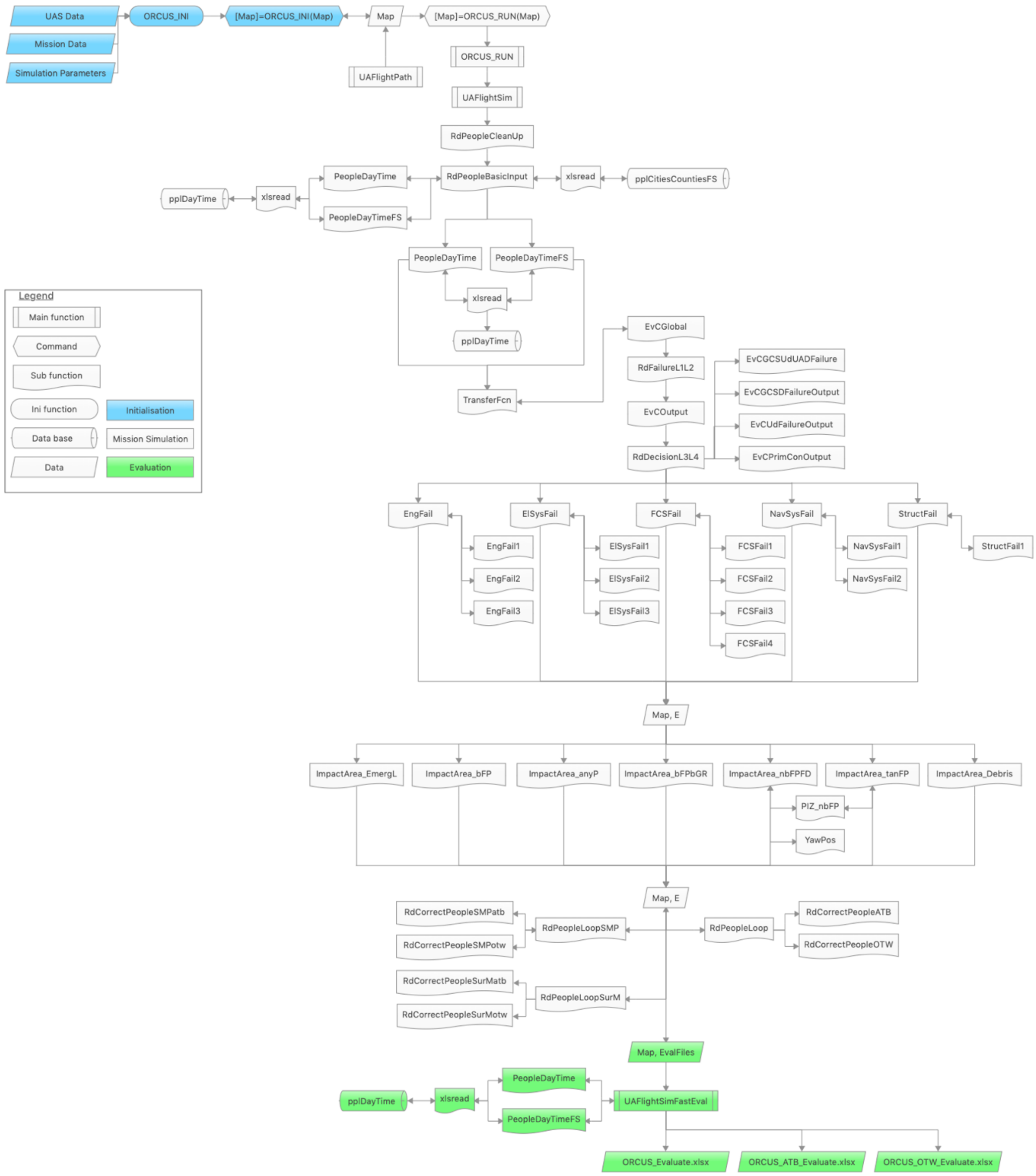


Figure 7-3. O.R.C.U.S. Initialisation, Mission Simulation and Evaluation

7.2.1 General Aspects and Design Decisions

MATLAB™ was chosen as programming language for O.R.C.U.S. Primary reason for this decision was that MATLAB™ is widely used in the scientific community, very versatile regarding possible applications and is quite intuitive regarding the programming of code. Because of these aspects, MATLAB™ was seen as a promising way to support the idea of a module-based architecture that can be expanded with additional modules and functions. In addition to this, all major operating systems are supported and the developer of MATLAB™ provides regular updates [193].

With respect to the specific UAS under assessment, from the beginning of the research it was decided to focus on light fixed wing UAS with a m_{UA} of less than 150 kg. Predictions of UAS of sizes comparable to manned aviation with several tons of MTOW would make it necessary to include much more secondary effects on the ground, for example explosions, fire etc. and therefore, causing an indefinite number of uncertainties which makes the assessment and prediction not feasible. Focus on fixed wing UAS was given because in contrast to the nowadays most present light VTOL UAS, fixed wing UAS still have more capacities regarding endurance and payload carriage and therefore, were seen as the more valuable UAS to assess. More details about the default UAS model for O.R.C.U.S. can be found in chapter 7.2.3.

In addition to this aspect, in the days the research for and the development of O.R.C.U.S. started, LUAS were not regulated besides in the regime of the military. EASA was explicitly not responsible for these kinds of UAS, so it was seen as beneficial to focus on them, as for the heavier UAS the airworthiness regulations of comparable manned aircraft were applicable [33, 34, 162].

Aspects like human factors and crew training are not included, as they are seen as given. With respect to current civil UAS, it was seen as more likely that the UAS encounters a technical failure rather than that the operator can introduce such a severe failure by the controls that the UA might crash. Furthermore, it can be reasonably assumed that the remote pilot has adequate knowledge about the UAS and sufficient training (cf. chapter 4.5).

Based on the literature research and the identified shortcomings, it was decided upfront not to include a variable for the structural capability of buildings to withstand an impacting UA. It was found that such a variable would impose a too big variance and uncertainty, which could not be justified. Instead, it was assumed that the probability to penetrate a building in case of a crash is sufficiently low for LUAS in the scope of O.R.C.U.S. and does not need to be further incorporated within the prototype implementation [194].

7.2.2 Operational Environment Generation

The generation of the operational environment for the mission simulation is done by the *MapDetection* function. Based on a digital map image, the algorithm creates a structure array file, that contains all the different elements of the mission area: houses, streets, green areas etc. In total, up to 14 different elements might be part of an O.R.C.U.S. map struct. This high number of distinctive map elements allows the user to perform a very differentiated risk assessment once a O.R.C.U.S. mission simulation is complete. The differentiation is in particular important because the people distribution is not the same at all points in the operational area.

In order to identify the different map elements for the UAS operations risk assessment, the idea of using the Red, Green, Blue (RGB) colour code within the digital map image as element definition was approached. This approach has the advantage, that O.R.C.U.S. MapDetection does not need to rely on meta data provided by a map provider for classifying map elements. Furthermore, MATLAB is able to decompose an image into the three colour layers for every pixel of an image, making the element identification very effective. However, it also requires to set up a database that assigns the different colour codes to the different objects [195, 196].

Digital map images are usually provided either as satellite image, as labelled graphic map or as hybrid map image. Figure 7-4 shows a comparison between the three types. A satellite image usually represents the reality better than a graphic map image. However, in order to use RGB codes as object identifier it is indispensable to have a fixed color coding inside the map image. This cannot be fulfilled by satellite map images because of the great variety in quality and the nature of true color images which contain millions of different colors and related RGB codes. With respect to this, it was decided that only graphic map images can be used as source for the map detection algorithm.

Figure 7-4. Munich Airport: Satellite image, labelled graphic map, hybrid map [197-199].

There are several providers of digital map data throughout the Internet, for example Google Maps, Microsoft Bing Maps or Open Street Maps. After looking more closely at these three providers, Open Street Maps was chosen as source for the necessary map data. This has several reasons. While Google Maps and Microsoft Bing are commercial providers, Open Street Maps is an open source-based project who allows the user to use the map data for free. Furthermore, the Open Street Map website provides a direct export function for maps, which is not provided by Google Maps nor Bing Maps. Another advantage of Open Street Maps is that within graphical map images single elements of interest as for example residential areas and houses are very detailed already on higher zoom levels, which is not the case for Google or Bing Maps. A comparison is shown in Figure 7-5. The three images were downloaded with a scale of ca. 1:10,000. Please note that the images are not up to scale here because of the conversion into the text file [197-199].

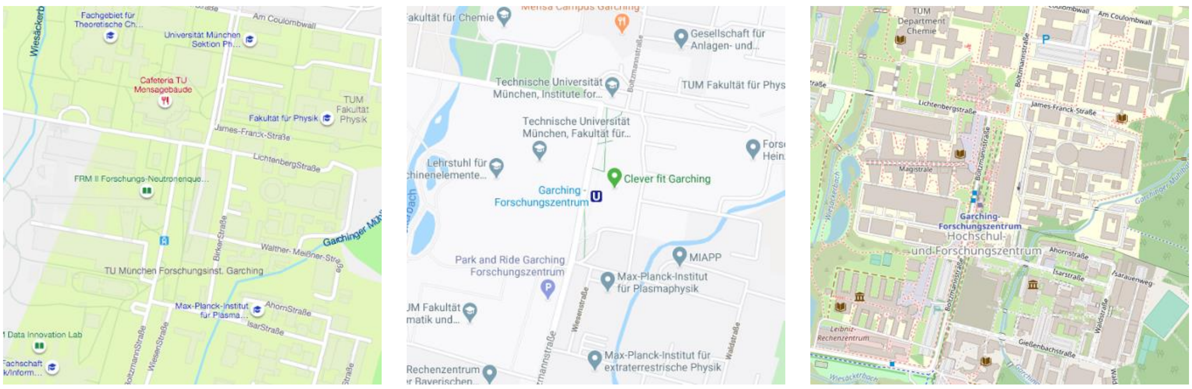


Figure 7-5. Labelled graphic map of TUM Bing maps, Open Street Map, Google Maps; [197-199].

For example, houses are included into one residential area within labelled map images of Google or appear in a transparent way at Bing Maps. In contrast to this, Open Street Maps differentiates residential areas into single houses. Furthermore, Open Street Maps offers a much clearer colour disambiguation between the different areas, which is important for using RGB code as object identifier.

It could be argued that Open Street Maps does not provide the necessary precision or certainty in general regarding position of the different objects due to the open source characteristic. Obviously, Open Street Maps cannot provide a similar precision as a high-precision geo referenced maps, but this is also valid for Google Maps and Bing Maps. It may also be true that commercial providers are able to update their map data more often and in a more regular way than Open Street Maps because of their economical background and the fact that Open Street Maps relies on data acquisition by volunteers. But studies have shown that Open Street Maps is able to provide data that is not that deviating in quality from the data provided by commercial providers [200]. In accordance with the aim and concept of O.R.C.U.S and the advantages of Open Street Maps mentioned above, it was decided that the data provided by Open Street Maps is sufficient for this thesis.

The MapDetection main function is activated by the MATLAB terminal entry *[Map] = MapDetection0200()*. Once activated, all sub-functions are called sequentially. The user only has to choose the map image and to enter the resolution in dpi and the OSM scale. Resolution and scale are necessary to calculate the dimensions of the map image. Following requirements are applicable to the map image:

Source	openstreetmaps.org
Format	Portable Network Graphics
Layer	Standard
Resolution	Any (stored in image properties, 72 dpi by default)
Scale	Any (stored in image properties)
Zoom factor	15

Table 7-1 O.R.C.U.S. Digital map Image requirements.

The result of *MapDetection* is the complete *Map* struct, which forms the basis for the mission simulation by O.R.C.U.S. To describe all sub functions of *MapDetection* in detail would be far way beyond of the scope, therefore only key aspects of the *MapDetection* function and the sub-functions are described. Further details can be found in 11.2.4 and the function glossary in chapter 11.2.9.

The import of an OSM image is done by the *GetMap* sub function. This function requires the image acquisition package of MATLAB as it uses the *imread* MATLAB function. In case of O.R.C.U.S. *Imread* imports the image as an 8-bit image (*uint8* array). Because every RGB colour is composed out the combination of the three primary colours Red, Green and Blue -- *Imread* provide the image as an m-*by*-n-*by*-z array, with $m =$ number of y-pixels, $n =$ Number of x-pixels and $n = 3$ layers. Based on this, each pixel of the image can be depicted as a triplet of the three layers and is an integer within the range from zero to 255, shown in equation (7-2).

$$\underline{Map_z} = \{m \times n\}_z \quad (7\text{-}1)$$

With $z \in (1,2,3)$ for Red, Green and Blue

$$pix_z = \{pix_R \quad pix_G \quad pix_B\} \quad (7\text{-}2)$$

$$pix_z \in (0,1,2, \ldots 255)$$

After *GetMap* is complete, the Map struct is handed over to the *MapScan* function. This sub function contains a database with RGB triplets that are assigned to the different possible elements of the basic O.R.C.U.S. -Map array. *MapScan* compares every pixel of the loaded Map array with the database by a logical equality equation and assigns it to an element by expanding the basis struct with 14 sub-structs.

It is important to note that the *MapScan* function, which represents the core map detection algorithm, was originally programmed for zoom level 15. At zoom level 15, the centimetre scale ranges amongst 1:11,500. In conjunction with a typical size of roughly 1500 x 1000 pixels, a 72-dpi map image covers an area of approximately 25 km^2, which is seen as appropriate for the operation of a light UAS. If a monitor is able to display OSM with higher sizes, the covered area will increase in accordance with equation (7-3).

$$d[\mathrm{m}] = (2.54 \ / \ R) \cdot n_{Pix} \cdot C/100 \quad (7\text{-}3)$$

d	Distance in metres
R	Resolution in dpi
C	Scale factor
n_{Pix}	Number of pixels

One note regarding the requirement to have a PNG image. Although *MapScan* would basically also work with JPEG images, JPEG does not lead to satisfying results. Main reason for this is the compression of such images, which on the one hand leads to a lower file size but on the other hand decreases the image quality. Figure 7-6 shows a high-level zoom detail of an OSM image after it was loaded with *GetMap*.

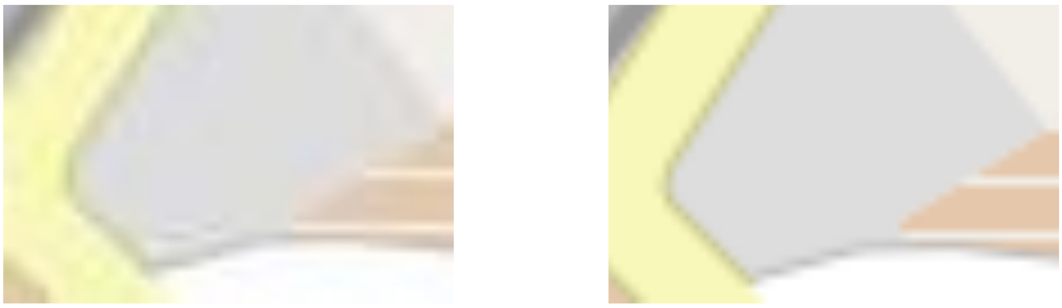


Figure 7-6. High level zoom detail of an OSM image. Left: JPEG; Right: PNG.

On the left side the JPEG version is shown and on the right side the PNG version is shown. The quality of the JPEG image is obviously worse than the quality of the PNG image. Within the JPEG image there are much more colour transitions, even in areas of the same colour than in the PNG image. In general, it is not possible to avoid such transitions completely, especially in several objects, as it will be described afterwards. But colour transitions in the same area are distorting the result in an importable way, which denies proper object allocation. Because of these reasons, the map images obtained from Open Street Maps have to be in the PNG format.

The rate of detection is highly dependent upon the map image. OSM images with large and similar areas, i.e. harbour sites, park areas etc., will result in a detection of 80 % or more. More complicated areas which contain many small fields like pedestrian zones, small paths, hiking trails, street border lines etc., will result in a detection of amongst 55 to 60 %. The detection differences are based on the delineation of the objects inside the OSM images mentioned afore. Such objects are depicted as very thin "blurry" pixel lines. The reason for this apparently blurriness is caused by the fact that the colours of the single pixels in such lines or fields are different to generate smooth transitions in the image. This results in a vast possibility of different RGB triplets for such objects.

MapScan relies on the internally stored RGB triplets, therefore the function is not able to assign all pixels to a sub-struct, especially if the loaded image is a complicated one. Furthermore, map images include labels that can distort the results. Figure 7-7 and Figure 7-8 present two explanatory samples of the results from *MapScan* for this issue. Note: A yellow pixel indicates an identified pixel; a blue indicates a non-identified pixel.

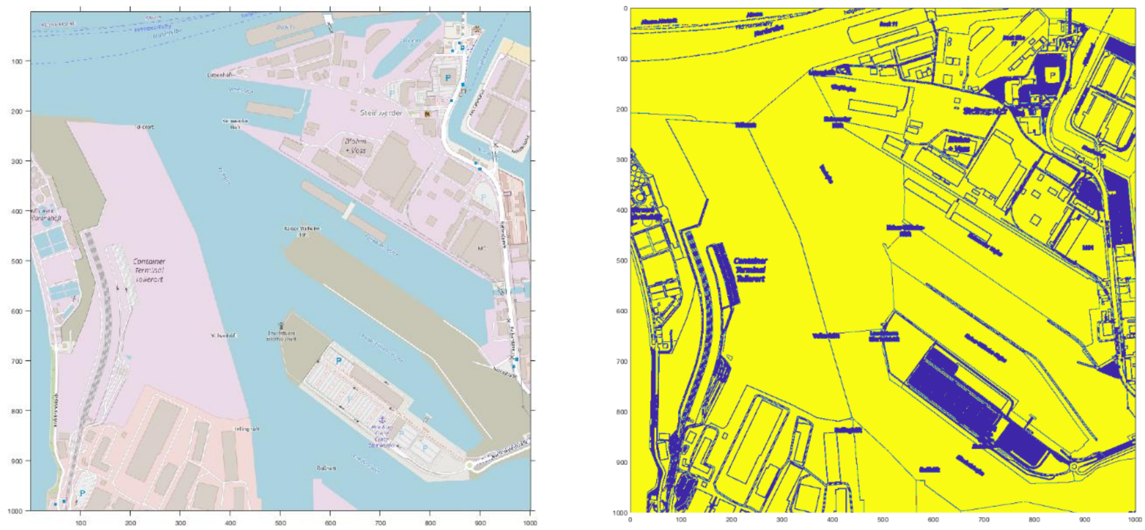


Figure 7-7. Left: OSM image part of Hamburg harbour. Right: Basic *MapScan* result, detection rate 83.99 %.

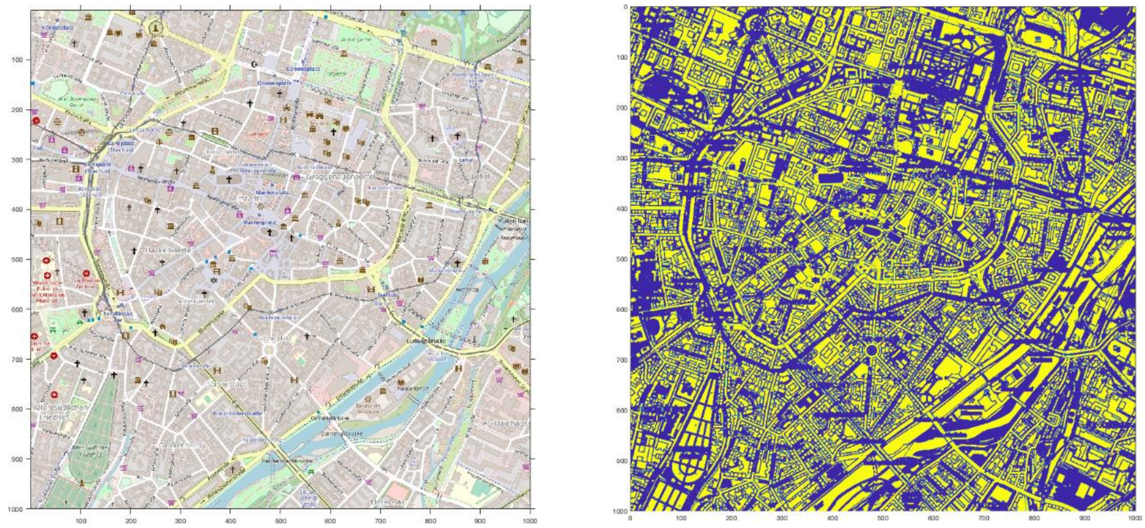


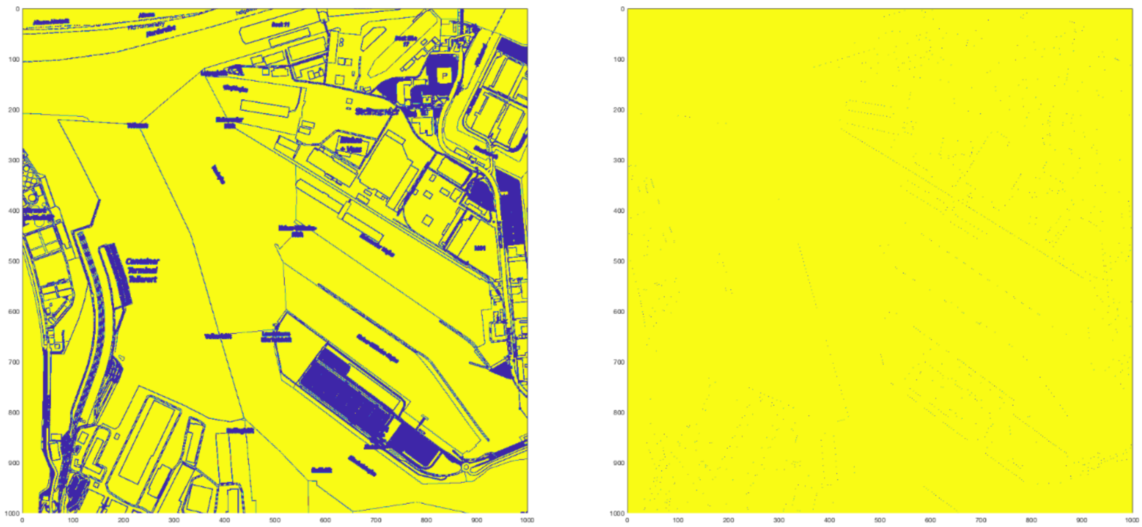
Figure 7-8. Left: OSM image part of Munich old town. Right: Basic *MapScan* result, detection rate 45.81 %.

To store and to assign all possible RGB combinations for the elements within the *MapScan* function was seen neither promising nor feasible as the 8-bit RGB colour scheme contains roughly 16.7 million colour combinations. In addition to this, it was observed that it may happen that pixels are wrong allocated. For example, a pixel which belongs to a house is allocated to a street element. The reason for this might be errors in the image or RGB triplets which are close to each other. In order to overcome these issues, a correction algorithm and an algorithm to allocate undefined pixels were developed. Once *MapScan* is completed, the map is clustered into fourteen sub-structs presented in Table 7-2.

The *CorrectFPix* sub-function and the *MappingUndefined* sub-function form a two-step sequence with the aim to provide a high detection rate of correct allocated map elements. In the first step, *CorrectFPix* identifies wrong allocated pixels and assigns them to the correct sub-struct. In the second step, *MappingUndefined* determines all undefined pixels and tries to allocate them to a sub-struct. This is performed by analysing the surrounding area of each undefined pixels and allocate the undefined pixel to the one sub-struct with the most pixels in the surrounding. With this approach, detection rates amongst 99 percent or more are achieved. Figure 7-9 and Figure 7-10 show examples for the results of this function.

#	*Name*	*Description*
1	Streets	Common streets.
2	Trunk roads	Federal roads, might cross cities.
3	Rural roads	Country roads in rural sides, might cross towns.
4	Motor-ways	The German Autobahn.
5	Walks	Pedestrian walks.
6	Tram ways	Rail lines for trams.
7	Rail roads	Rail lines for trains.
8	Houses	Common houses with inhabitants.
9	Residential areas	Bigger areas with houses.
10	Open areas	Open spaces in a city.
11	Non-built areas	Areas with no buildings.
12	Green areas	Forests, parks etc.
13	Water areas	Lakes, rivers etc.
14	Airfields	Airports, small airfields, etc.

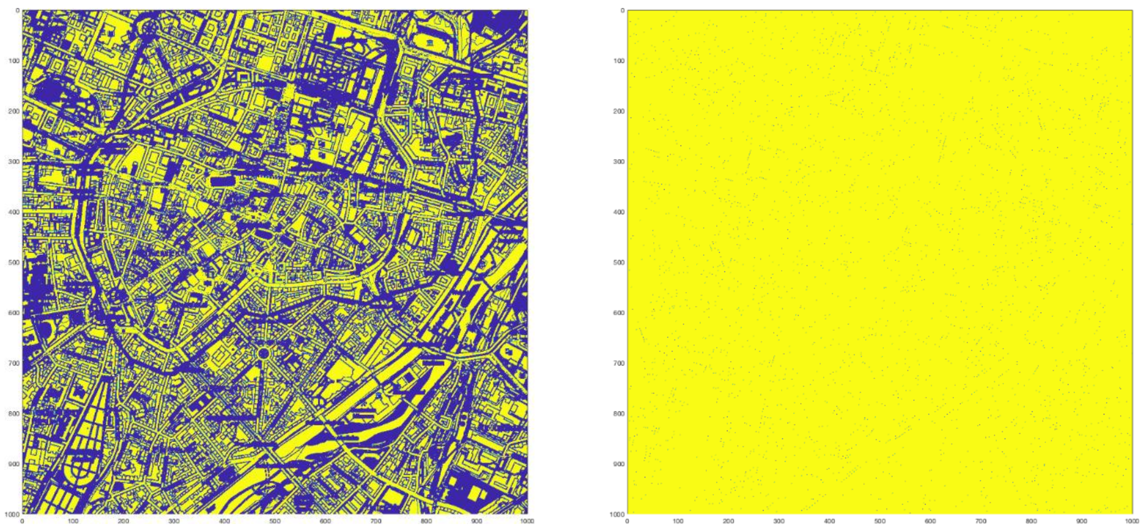
Table 7-2 O.R.C.U.S. map sub-structs.



Detection rate 83.99 %

Detection rate 99.87 %

Figure 7-9. Hamburg Harbour: Basic *MapScan* result (left), *CorrectFPix* and *MappingUndefined* result (right).



Detection rate 45.81 %

Detection rate 99.68 %

Figure 7-10. Munich Old Town: Basic *MapScan* result (left), *CorrectFPix* and *MappingUndefined* result (right).

After completion of *MappingUndefined*, the user may draw a polygon sub map within the map. This might be necessary if O.R.C.U.S. shall simulate a mission over a very small city that does not cover the majority of the OSM image. Because O.R.C.U.S. simulates people movement based on the inhabitant numbers of the city or area, it was found that in such a case the movement of the people outside of the small city would not be representative for the whole map. In order to solve this “small city/big map issue”, the *MapOverlay* function was developed. If the user applies this function, a sub map polygon (SMP) can be drawn to set the borders of the small city. After completion, the outside part of this SMP is defined as the surrounding map (SurM). Both, SMP and SurM are stored individually within the Map struct. Figure 7-11 shows as an example the small city Eberbach. The top part of the figure shows the complete OSM image and the lower part the drawn overlay in blue. While in the SMP the movement data of the city is applied during simulation, the movement data of the individual federal state in which the city is located is applied.

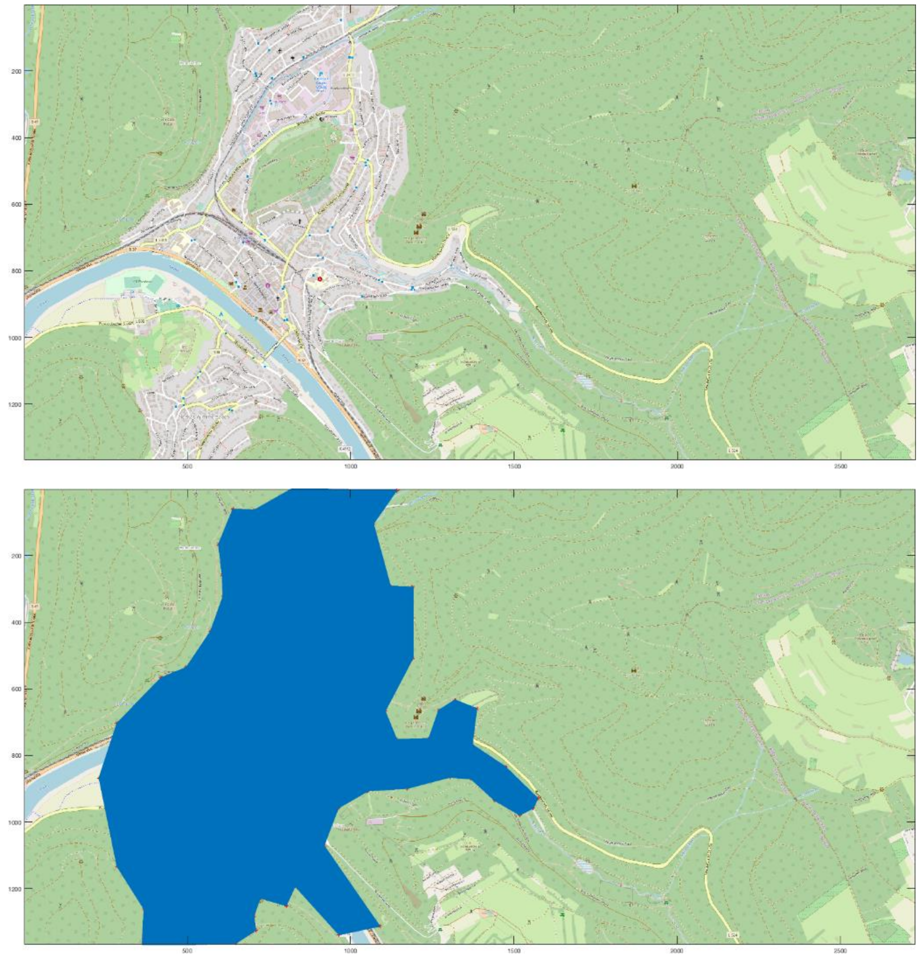


Figure 7-11. *MapOverlay* application. Blue pixels are indicating the SMP.

In the last part of the *MapDetection* function, the Map struct is scaled to a variable pixel to metre ratio target scale by using the MATLAB function *imresize*. By default, O.R.C.U.S. scales the map automatically to a ratio of one, meaning that the length of one pixel equals one metre. However, this can be deactivated within the initialisation function and any ratio can be applied. It is noteworthy, that such a scaling is not error free and it may happen that some pixels are allocated with two or three sub-structs. This error might lead to implications in the later people distribution functions. The root-cause can be traced to the fact, that due to the non-integer transformation scale factors, *imresize* theoretically should produce a matrix with a non-integer number of rows and columns, which is not possible in MATLAB. Due this, *imresize* rounds the number of rows and columns. O.R.C.U.S. contains a built-in test function called *CorrectNormMap* or *CorrectNormSMPSurM*, which checks the Map struct after the scaling for such errors. If necessary, adequate correction means are activated.

After the scaling process, *MapDetection* is complete. In the end, a set of plots will be presented to the user which shows all sub-structs by their own, a complete picture with all sub-structs at once and an efficiency graph. Currently, the whole operational environment generated by O.R.C.U.S. *MapDetection* is a two-dimensional projection of the elements contained in the OSM image. Therefore, the height of them is only implicitly included.

A future version of O.R.C.U.S. might be expanded regarding the height of the ground elements or a terrain elevation model in general. However, this is not a trivial development, as it requires an elevation model that needs to be linked to the specific OSM image. For the first prototype implementation of O.R.C.U.S. and the scope of the prototype development, this was not seen necessary because of the high level of possible elements that are generated by *MapDetection*.

With this detailed operational environment of the map struct and people density databases as well as the movement algorithms, O.R.C.U.S. is able to provide a sufficient representation of the operational environment, allowing sophisticated assessments of the risk of the operation. Before the fundamentals of the people density databases and the movement simulation are going to be described, the next chapters will present the inclusion of the technical aspects of the UAS into O.R.C.U.S.

7.2.3 UAS Incorporation

Chapter 6.4 outlined the need to incorporate the root-cause of a ground impact of a UAS. However, it is obvious that a UAS Operations Risk Assessment which always requires in-depth technical knowledge about the UAS might not be feasible. Therefore, a well-balanced incorporation of the root cause of a failure is necessary. While the incorporation of the UAS and its parameters are done within the *INI* Function, the stimulation of the different functions during an O.R.C.U.S. simulation are done within the *UAFlightSim* and for the UA in particular in the function *TransferFcn* and the underlying subfunctions.

In order to obtain a root-cause possibility, the default fixed wing LUAS for O.R.C.U.S (cf. chapter 7.2.1) was further defined. The default configuration and assumptions followed typical UAS of this class, as for example the LUNA TUAS or the Aerosonde Fixed Wing [201, 202]. Based on the fixed wing default, the UA will not instantaneously crash in case the engine has a malfunction or is switched off unintentionally. Furthermore, the engine is assumed to be a combustion engine Additionally, the default UA shall incorporate an immediate flight termination capacity, allowing to stop the flight at once. The complete default model shall incorporate five main sub systems: Flight Control System (FCS), Electrical System (ELS), Navigation System (NavSys), Engine (ENG) and Structure (STR). Table 7-3 summarizes these core definitions.

Designation	O.R.C.U.S. default LUAS
Type	Fixed Wing
Main Sub Systems	Flight Control System Electrical System Navigation System Combustion Engine Structure
Assumed capacities	Immediate Flight Termination Fault detection in UCS and UA Way point path plan Possibility to approach emergency landing sites if feasible

Table 7-3 O.R.C.U.S. default LUAS.

Each of these main sub systems might cause different failure cases inside the airborne UA leading to several impact scenarios. The nomenclature “main sub system” was chosen in order to emphasize the hierarchy in the UAS following the “system of systems” concept (cf. chapter 4.1). The highest level in such a system of systems is the aircraft itself, which imposes the aircraft system or just the system. Systems below the aircraft level are usually main assemblies as for example the fuel system. Such sub system might include further sub systems, which can be called “sub sub-systems”. Besides the hierarchy aspect, the term main sub system shall avoid the expectation that below this level, no further systems are present [203]. Figure 7-12 illustrates this concept by a generic UAS system hierarchy tree. Figure 7-13 applies this method to the described default UAS model of O.R.C.U.S. with focus on the UA. In addition to this, both figures show that each main sub system might cause several failure conditions within the UAS.

Furthermore, it was decided to incorporate the UCS and the C2Link not directly as a root cause for a failure case. From the authors point of view, within a robust UAS design, neither the UCS nor the C2Link will lead to a Hazardous or a Catastrophic failure condition. Nevertheless, both are incorporated implicitly as it will be shown later.

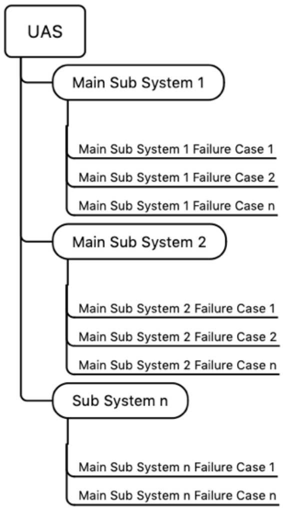


Figure 7-12. Generic UA system tree.

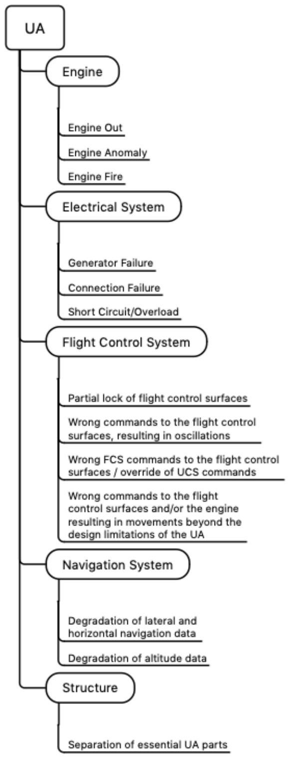


Figure 7-13. O.R.C.U.S. default UA system tree.

The underlying concept O.R.C.U.S. failure model is based on P_{CumCat}. As it was described in chapter 4, P_{CumCat} represents the fundamental airworthiness requirement for the cumulative acceptable probability of all catastrophic failure conditions in a UAS. Consequently, P_{CumCat} shall serve as basic probability that an initiating failure in the UAS itself emerges during a mission simulation by O.R.C.U.S. The total probability of an initiating failure F_0 is described in equation (7-4).

$$P_{F0} = P_{CumCat} \quad \textbf{(7-4)}$$

To define if a failure occurred during the mission in the UAS, the MATLAB™ included pseudorandom number generator *randi* is used. This function requires a maximum integer number and gives back a random number out of a uniform distribution. The maximum integer is defined by the reciprocal value of P_{CumCat} [195].

In reality, an initiating failure F_0 inside an airborne UAS might occur within a nanosecond or an even lesser time span. However, for the scope of O.R.C.U.S. it was seen as sufficient that such a failure might occur every second of the flight. Therefore, the reciprocal value for *randi* is not calculated by the $[1/\mathrm{Fh}]$ value, but by the $[1/\mathrm{s}]$ value. For example, if $P_{CumCat} = 10^{-3}\ [1/\mathrm{Fh}]$, the resulting input number for *randi* is 3,600,000. By doing so, O.R.C.U.S. can also be applied on missions which have a very low duration, e.g. below one flight hour. If seen necessary by a user, it is also possible to transfer P_{CumCat} into $[1/\mathrm{ms}]$ or other units.

If the result of *randi* equals one, a failure “occurred” in the simulated UAS. Lower P_{CumCat} will lead to higher reciprocal values, subsequently the possible random values returned by *randi* increase and the probability of an occurring failure decreases. O.R.C.U.S. calculates every second of the simulated UAS operation if an initiating failure F_0 occurred or not.

P_{CumCat} is composed out of the different catastrophic failure conditions identified within the Functional Hazard Assessment on the functional level and assigned to the physical failure conditions of the associated main sub systems and equipment identified in the System Safety Assessment [68, 174, 203]. The determination and verification of these safety numbers is one of the most challenging aspects during an aircraft type inspection process. To require such numbers for a fast UAS Operations Risk Assessment is not seen as feasible. Therefore, O.R.C.U.S. pursues another approach.

O.R.C.U.S. defines for every main sub system a failure probability in terms of percent. These values are defined in the *Ini* function. Once an initiating failure F_0 occurred, based on these underlying percentage values O.R.C.U.S. determines by random which main subsystem failed and which failure condition occurred. Each main subsystem might have several possible failure conditions as it was shown in Figure 7-13. The random function which forms the backbone of the failure conditions applies so-called "areas" or bands to determine which main sub system failed instead of just using the *rand* function of MATLAB. Those bands are defined by a high numerical limit number which is multiplied with the failure percentage number of each main sub system. After this distribution the *rand* function of MATLAB is applied, limited from 1 to the limit number. The result lies within one of the bands defined before, which determines the failed main sub system. In the same manner, the specific failure condition of the failed main sub system is defined. One the hand, this approach leads to a balanced failure simulation of the UAS and on the other hand, the underlying percentage probabilities for failures of the UAS are incorporated. However, at this point in the event chain, it is not clear if this failure condition will lead to an impact.

By design, O.R.C.U.S. incorporates the possibility that the failure is detected, either by the UCS or by the UA itself, if the UCS detection was not successful. If a failure is detected, several countermeasures can be performed in order to overcome the failure or to mitigate the consequences. This aspect reflects good design practice of UAS and also airworthiness requirements and therefore represent an essential aspect for assessing the operational risk [68]. Furthermore, with this feature, O.R.C.U.S. inherently considers the C2Link and the UCS and consequently simulating a complete UAS in an adequate level for the scope of O.R.C.U.S. To avoid predefined results regarding failure detection or countermeasure success, the simulation also applies a random function. In both cases O.R.C.U.S. reads out stored percentage values of detection and countermeasure probability. If the random function results in a value above the read-out percent value, the detection or the countermeasure has failed. As it can be seen the MATLAB *rand* function is used much often in O.R.C.U.S., but applied very differently which shall prevent convergence of the random results.

The described approach for the incorporation of the UAS is based on the principle of event trees, which represents a common technique for risk assessments for complex systems with a high level of interaction between the technical system, the environment and the operators [204]. From a high-level point of view, the event tree within a O.R.C.U.S. simulation can be depicted as in Figure 7-14.

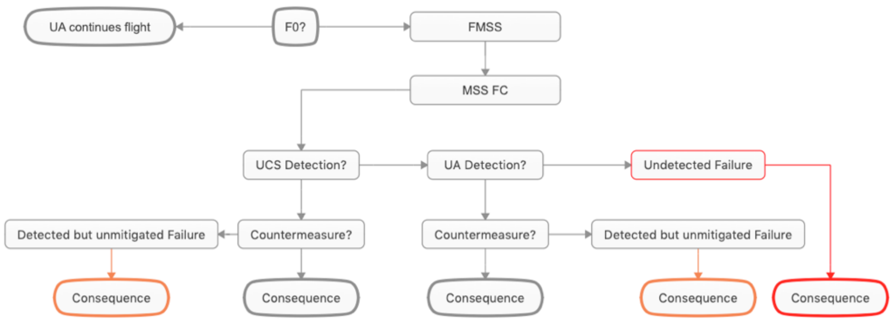


Figure 7-14. High level event tree of O.R.C.U.S.

Figure 7-14 picturizes what has been described above. The whole event sequence starts with the question if an initiating failure F_0 in a main sub system occurred or not. If no failure occurred, the UA continues flying and no consequences arise. If a failure occurred, the central question is, if the failure is detected or not, either inside the UCS or by the UA. If the failure is detected, the next question is if countermeasures are possible or not and if they are successful or not. The possibility of countermeasures is dependent upon the failure condition. For example, in case of an engine out failure condition, more countermeasures are possible than in case of an engine fire. In any case, consequences of different severity will arise.

As the number of countermeasures is limited, so is the number of consequences too. These consequences are dependent upon the UAS design and the applied countermeasure. For example, they might encompass automatic recovery modes, emergency landings or also the controlled flight into terrain. Although the last one usually leads to the loss of the UA, this is acceptable if there is a chance that fatalities on the ground can be avoided. The worst-case consequence is an undetected and unmitigated failure leading to an uncontrolled flight into terrain. Figure 7-15 shows an example event tree from O.R.C.U.S. for n countermeasures.

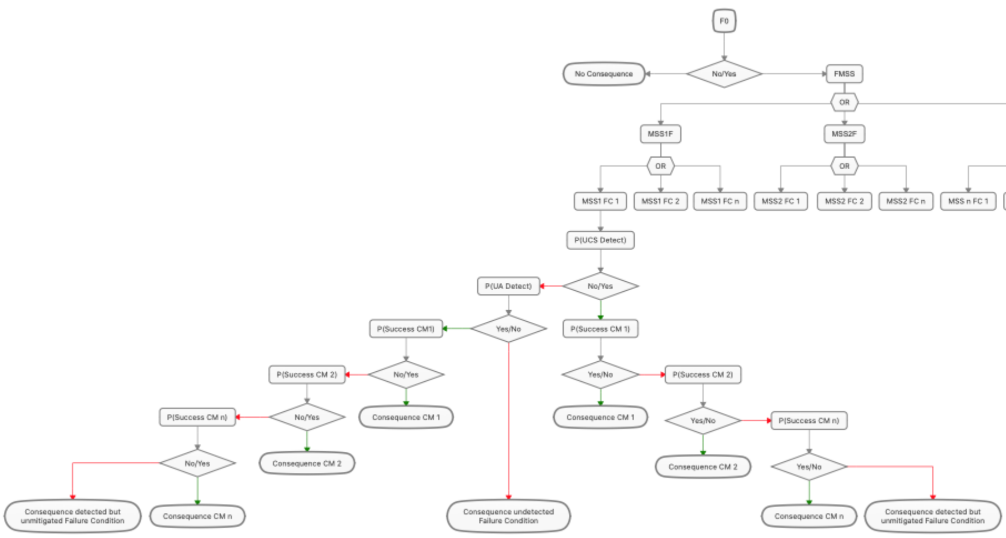


Figure 7-15. O.R.C.U.S. example event tree with n consequences.

O.R.C.U.S. embodies the following consequences: recovery, emergency landing, controlled flight into terrain, debris impact and uncontrolled flight into terrain. These consequences might arise from the 13 main sub system failure conditions shown in Figure 7-13. The underlying event tree of O.R.C.U.S. contains 83 possible combinations that can lead to these final consequences. Every path through the event tree with the different combinations of failure conditions, the detection success of them as well as the countermeasure success and the consequences are stored in an Excel spread sheet and can be amended if necessary. The event tree is read by the *INI* function and saved into the O.R.C.U.S. *Map* struct.

With respect to the example event tree shown in Figure 7-15, the worst-case outcome from the UAS point of is an undetected or unmitigated failure that leads to a crash of the UA. Such an event occurs, if an initiating failure F_0 is not detected by the UCS or the UA or if the failure cannot be mitigated after detection. This outcome can be modelled as fault tree, illustrated in Figure 7-16.

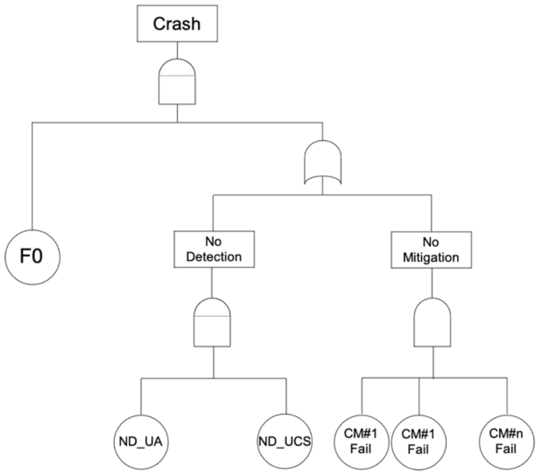


Figure 7-16. Fault tree for an undetected, unmitigated failure, leading to a UA crash.

A crash will occur if an initiating failure F_0 occurs and if this initiating failure is not detected or cannot be mitigated. The event "No Detection" is marked by an AND Gate and occurs if the failure is not detected in the UA (ND_UA) and also not detected in the UCS (ND_UCS). The event "No Mitigation" is defined as AND Gate with a $1 - \mathrm{out} - \mathrm{of} - \mathrm{n}$ redundancy, based on the point, that if one mitigating countermeasure works, the failure is mitigated, or, if the countermeasure did not work, the next countermeasure (CM) is activated [204].

To calculate the probability of such an event, it is beneficial to imagine the detection of the initiating failure as a parallel structure with two elements, while the mitigation aspect can be seen as parallel structure with n elements. Equation (7-5) presents the probability that a failure is detected and equation (7-6) presents the probability calculation of a successful mitigation.

In order to determine the probability of the worst-case consequence, the crash, only the probabilities of a failed detection and a failed mitigation are applied. Therefore, the success probabilities must be subtracted from one and both must be multiplied with the probability of the initiating failure. Equation (7-7) shows this final calculation for the probability of a crash within O.R.C.U.S.

$$P_{DetectF_0} = [P_{DetectUA} + P_{DetectUCS} - P_{DetectUA} \cdot P_{DetectUCS}] \qquad \textbf{(7-5)}$$

$$P_{CM} = 1 - \prod_{i}^{n} (1 - P_{CM_i}) \qquad \textbf{(7-6)}$$

$$P_{Crash} = P_{F0} \cdot (1 - P_{DetectF0}) \cdot (1 - P_{CM}) \quad \textbf{(7-7)}$$

For example, in case failure condition „Generator failure“ happens, the UA has no longer electric energy available. Two countermeasures are thinkable: Switch to batteries and CFIT. With the first countermeasure, the UA is able to reach an emergency landing site. If this countermeasure is not working, the remaining countermeasure is only a controlled flight into terrain. Assuming that $P_{F0} = 0.01\ [1/\mathrm{Fh}]$ and $P_{DetectUA} = P_{DetectUCS} =$ 50 % and $P_{CM_1} =$ 90 % and $P_{CM_2} =$ 80 %, the probability of an undetected and unmitigated “Generator out” failure condition results in $P_{Crash} = 5.0 \cdot 10^{-4}[1/\mathrm{Fh}]$ as shown in equations (7-8) to (7-10).

$$P_{DetectF_0} = [0.5 + 0.5 - 0.5 \cdot 0.5] = 0.75 \quad \textbf{(7-8)}$$

$$P_{CM} = 1 - \prod_{i}^{2} (1 - P_{CM_i}) = 1 - (1 - 0.9) \cdot (1 - 0.8) = 0.98 \quad \textbf{(7-9)}$$

$$P_{Crash} = 0.01 \cdot (1 - 0.75) \cdot (1 - 0.98) = 5.0^{-4}[1/\mathrm{Fh}] \quad \textbf{(7-10)}$$

For the calculation of the consequence probability, it is not necessary to incorporate the probability of the specific main sub systems failure conditions, because they are already covered within P_{F0} which equals P_{CumCat} and therefore, all possible catastrophic failure conditions are incorporated. If unknown, P_{F0} should be assumed as conservative P_{CumCat}. Within O.R.C.U.S. any main sub system is assigned to a failure probability in terms of percentage. The sum must be equal one, as shown in equation (7-11). The probabilities of a specific failure condition which may occur in a main sub system are defined in the same manner as they are defined for the failure of a main sub system. This is shown in equation (7-12). By multiplication of equation (7-11) with the initiating failure, the percentage values are transferred into the probability per flight hour which is again, equal the cumulative probability of a catastrophic failure, shown in equation (7-13).

$$\sum_{i=1}^{n} P_{FMSS_i} = 1 \quad \textbf{(7-11)}$$

$$P_{FMSS_i} = \sum_{j=1}^{m} P_{FMSSCond_j} = 1 \quad \textbf{(7-12)}$$

$$P_{F0} = P_{F0} \cdot \sum_{i=1}^{n} P_{FMSSi} = P_{CumCat} \quad \textbf{(7-13)}$$

$$P_{F0} = P_{F0} \cdot (P_{FENG} + P_{FFCS} + P_{FNAV} + P_{FELS} + P_{FSTR}) = P_{CumCat} \quad \textbf{(7-14)}$$

$$P_{FMSSCond_j} = 1/m \quad \textbf{(7-15)}$$

Equations (7-14) presents the application of equation (7-13) to the default configuration in O.R.C.U.S. For the default configuration of O.R.C.U.S. the percentage failure probability of each of the five defined main subsystems is set to 20 % and the failure detection probabilities and the success probabilities of countermeasures are set to 50 %. Additionally, equation (7-15) shows the determination of the percentage values of the specific failure conditions in a main sub system in the O.R.C.U.S. default configuration. For example, the main sub system FCS incorporates four failure conditions which lead to a percentage value of 25 % per failure mode. However, these default values can be easily modified and set to appropriate values for the specific UAS. In general, O.R.C.U.S. foresees the possibility to add other failure conditions and consequences if needed. After this description on how the UAS is incorporated into O.R.C.U.S., the next chapters will outline how the flight path of the UA is simulated and how the consequences are modelled.

7.2.4 Flight Path

The flight path simulation in O.R.C.U.S. is seen as part of the operational environment generation. However, as the *UAFlightPath* function is an independent main function which is activated manually and might be amended for every O.R.C.U.S. simulation, Figure 7-3 shows it as part of the mission simulation. In line with the design decisions for the prototype implementation taken for O.R.C.U.S. (cf. chapter 7.2.1), the UAS flight path is modelled as two-dimensional projection above the operational area.

In the current version of O.R.C.U.S. the user can choose between an elliptical or a circular shaped flight path. Both with a constant altitude obtained from the mission data stored in the *Ini* function.

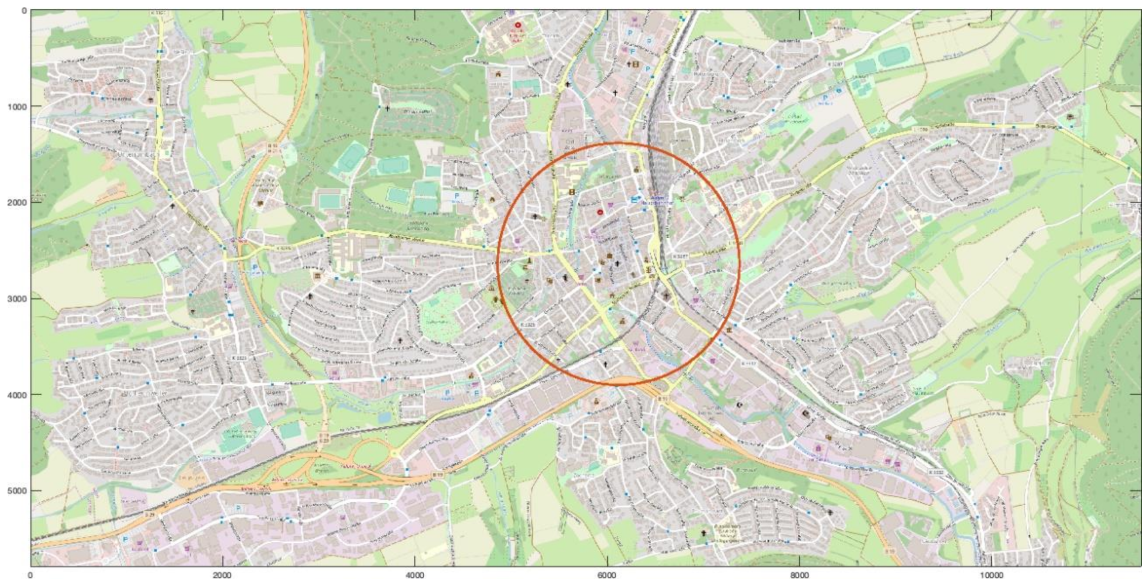


Figure 7-17. O.R.C.U.S. circle flight path example.

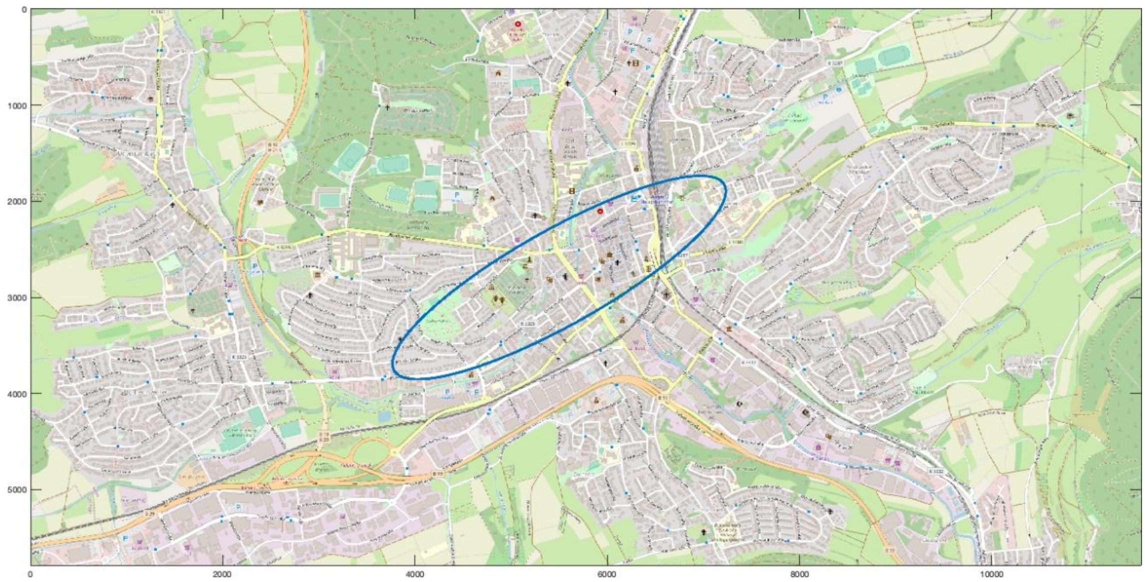


Figure 7-18. O.R.C.U.S. elliptical flight path example.

Both flight path versions are drawn automatically by O.R.C.U.S. For the ellipse the user has to set the centre point and the two vertices by graphic user interface input and to provide the ratio for semi minor to semi major axis of the ellipse. In case of the circle, besides the centre point, the user has to set up only one additionally point which marks the radius of the circle.

Once the flight path is set, the operational environment generation is complete and O.R.C.U.S. is able to perform a simulation if an *INI* function is available and executed. In chapter 7.2.8, the application of an O.R.C.U.S. simulation run will be described. However, before this will be done, it is necessary to have a look at the modelling of the different impact scenarios as well as further details in order to get the complete overview.

7.2.5 Impact Scenarios and Areas

The research on UAS operations risk assessment approaches revealed for impact areas that there is no consensus on the methods to determine these areas. To include impact areas, two general methods are present: a geographical or an empirical method. During the development phase of impact areas for O.R.C.U.S., the vast majority of UAS operational risk assessments included the geographical method. While nowadays sole approaches propagate empirical methods for determining impact areas, these approaches still impose a minority because of the non-availability of sufficient UAS impact data (cf. chapter 5.5 and 5.7.4).

Therefore, it was decided for O.R.C.U.S. to develop a basic impact area based on geographical methods. Geographical methods might be too conservative; however, they have the advantage that these methods are widely used and consequently provide a certain level of acceptance. In addition to this, geographical methods do not need to rely on external data sources for which the validity of the data must be checked.

This basic impact area A_{Impact} was defined as a circle shaped area. Centre point of this circle is the central impact point. In this area it is assumed that might get hit in case of an impacting UA. Additionally, O.R.C.U.S. defines a core impact zone, where it is assumed that people within suffer fatal injuries in case, they are present during an impact. The core impact zone forms the basis for the basic impact area. During the calculation sequence, O.R.C.U.S.

calculates the radius of the core zone at first. As can be seen by equation (7-16), this radius is the half of either the UA wingspan or the UA length, whichever is greater. The half value of the resulting maximum is rounded up to the next integer value, in order to obtain a conservative value for the radius of the core zone. By multiplying the radius of the core zone by two, the radius of the basic impact area which then becomes the entire impact area is obtained, shown in equation (7-17) and in equation (7-18).

$$r_{CoreImpact} = \lceil 0.5 \cdot \max(w_{UA}, l_{UA}) \rceil \tag{7-16}$$

$$r_{Impact} = 2 \cdot r_{CoreImpact} \tag{7-17}$$

$$A_{Impact} = \pi \cdot r_{Impact}^2 \tag{7-18}$$

It is important to note that although developed and included, the disambiguation between core impact area and entire impact area will not be further used for the risk assessment. Chapter 7.2.6 will discuss the reasons for this decision in more detail. For the further discussion, only the entire impact area will be taken into account. However, it was found necessary to provide the origin of the calculation for the basic impact zone.

In addition, it was found, that a one size fits all impact approach for all failure cases would not be sufficient for O.R.C.U.S. Thus, it was decided to develop different impact scenarios in relation to the failure condition besides the basic impact area definition which also incorporated further impact areas related to the impact scenario.

The scenarios are directly linked to the different possible failure conditions of the default setup. For example, in case of an undetected and unmitigated navigation system failure which results in the degradation of navigation data, the UA will impact the ground at any place of the overflown area. O.R.C.U.S. contains the following impact scenarios for the default UAS. The differentiation into several impact scenarios made it necessary to define additional impact areas which will be presented within the next subchapters.

7.2.5.1 Emergency Landing

The emergency landing scenario is a countermeasure and one possible consequence which can result out of sixteen event combinations from the event tree. If the scenario is applicable, the failure condition is detected either by UCS or UA and the initiation of this countermeasure is successful. Furthermore, if an emergency landing is applicable it is assumed that the UA is always able to reach an emergency landing field, at which it can reasonably can be assumed that no person gets hit. By definition, for O.R.C.U.S., these areas are green areas, water areas and non-built areas. The emergency landing field is defined as a square shaped area with the size shown in equation (7-19) and illustrated in Figure 7-19.

$$A_{ELF} = r_{Impact}^2 = \lceil \max(w_{UA}, l_{UA}) \rceil^2 \tag{7-19}$$

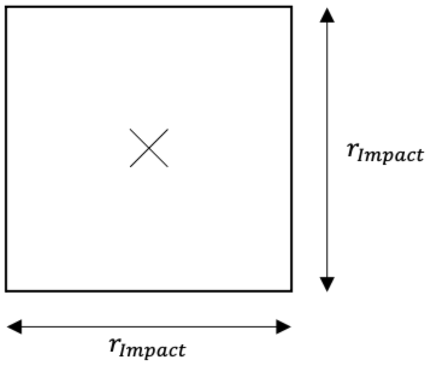


Figure 7-19. O.R.C.U.S. emergency landing scenario illustration.

Figure 7-20 shows an example of the emergency landing scenario. The blue line picturizes the flight path and the red line the beeline between detection point of the failure condition and the emergency landing field. In the right part of this figure, a zoom in of the square shaped emergency landing field is shown.

Figure 7-20. O.R.C.U.S. emergency landing scenario example.

It is recognized that the emergency landing definitions are idealized, however, they are seen as sufficient for the default configuration of O.R.C.U.S. and its initial scope. Future version of O.R.C.U.S. might incorporate additional definitions for the application of an emergency landing, for example battery or fuel capacity of the UA. The source code of this scenario is stored in the *ImpactArea_EmergL* subfunction.

7.2.5.2 Flight Termination and Immediate Impact

One possibility to mitigate a failure condition that could result in a complete loss of control of the UA is to terminate the flight of the UA immediately[29]. Nominally, this can be seen as a controlled flight into terrain. However, although such a flight termination is a system or operator-controlled action, based on the immediate aspect, there might be people within the impact zone and consequently endangered.

[29] Cf. USAR.U1412 in [68].

The resulting impact area is defined by the basic impact area definition, described in equations (7-16) to (7-18). For the flight termination and immediate impact scenario, the equation for the impact area can be reduced as shown in equation (7-20).

$$A_{FTI} = A_{Impact} \tag{7-20}$$

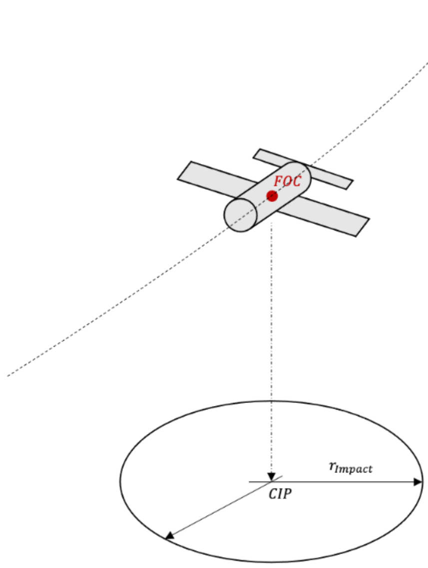


Figure 7-21. O.R.C.U.S. below flight path impact scenario illustration.

Figure 7-22. O.R.C.U.S. below flight path impact scenario example.

O.R.C.U.S. defines the immediate flight termination scenario as a controlled flight into terrain which leads to an impact of the UA directly under the flight path. This definition is similar to a UA that activates an emergency parachute or deep stall dive, leading to a UA impacting the ground shortly or directly under the point in the air where the function was activated. Figure 7-22 provides a short impression regarding the implementation in O.R.C.U.S. The blue line represents the flight path, the green dot the activation point and the red area picturizes the impact area. The subfunction which contains the necessary code is called *ImpactArea_bFP*.

7.2.5.3 *Impact at a Random Point on the Map*

The impact at a random point on the map scenario is a consequence out of the event tree which might occur in six cases and is an uncontrolled flight into terrain. It is performed by the *ImpactArea_anyP* subfunction. This impact scenario defines that the UA is in a stable but uncontrollable flight state. Its flight continues until fuel or energy is empty. Once energy is not available any more, the UA crashes immediately into the ground, similar to the flight termination scenario. As the impact zone cannot be predicted, fatalities are possible. An exemplified picture of this scenario is shown in Figure 7-23. The red arrow is not part of O.R.C.U.S. and was added to indicate the impact area.

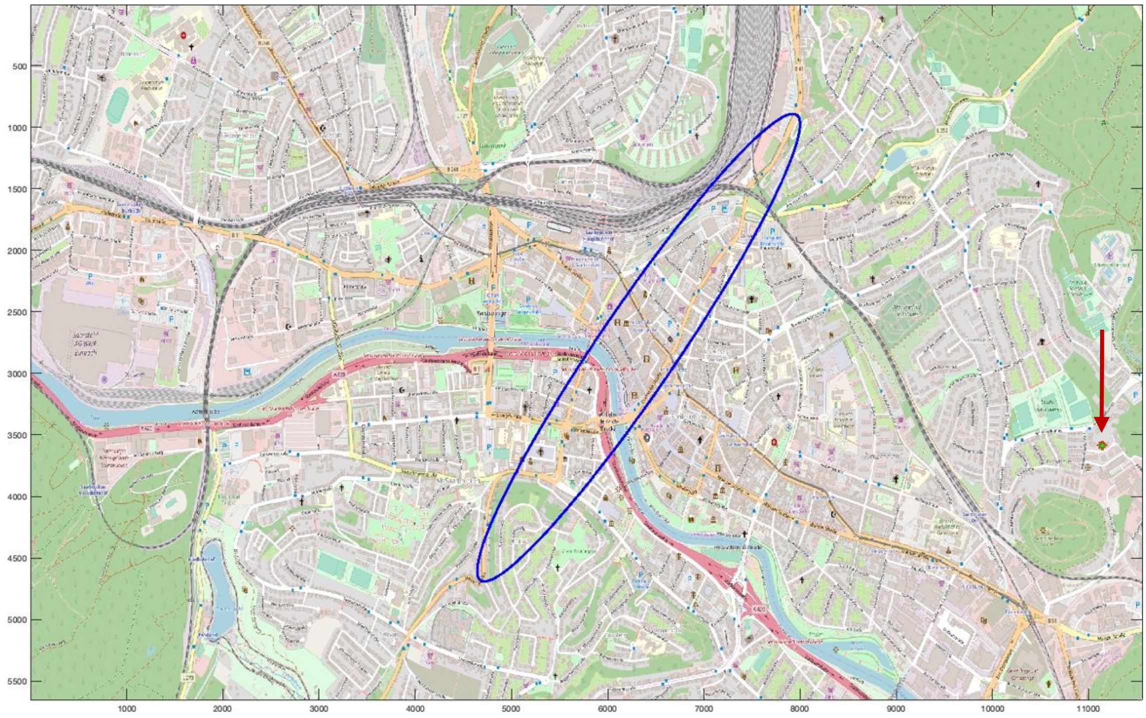


Figure 7-23. O.R.C.U.S. random impact scenario example.

For this impact scenario, the impact area is identical to the flight termination and immediate impact scenario and therefore identical to the basic impact area, please refer to Figure 7-21 for an illustration of the impact area as well as to equations (7-16) to (7-18). Similar to the flight termination and immediate impact scenario, the equation for the impact area for the random impact scenario is reduced as shown in equation (7-21).

$$A_{IRP} = A_{Impact} \tag{7-21}$$

7.2.5.4 *Impact Close to the Flight Path in Forward Flight Direction*

Based on the default fixed wing UAS, the potential failure case of locked flight control surfaces was defined. Such a lock might lead to a deviation from the flight path in the yaw and the pitch axis by maintaining forward direction. The fundamental assumptions are that the subsequent impact is close to the flight path and that in the final stage before the impact is comparable to a deep dive. Consequently, the resulting expected impact area is similar to the impact areas after a flight termination with immediate impact or the random impact on a map scenario and therefore equal the basic impact area as presented in equation (7-24). Figure 7-24 shows an illustration of this impact scenario.

$$A_{IFD} = A_{Impact} \tag{7-22}$$

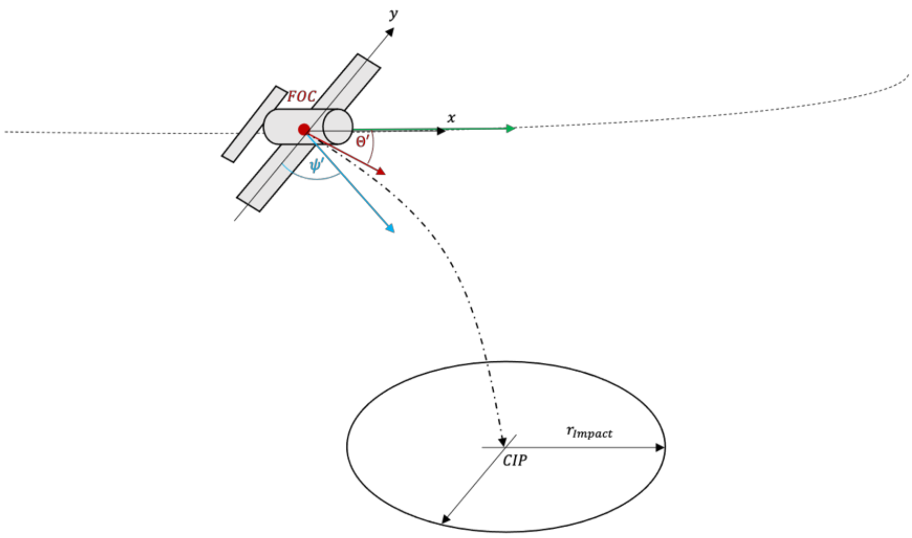


Figure 7-24. O.R.C.U.S. impact close to the flight path in forward flight direction illustration.

Figure 7-25 provides an example for this impact scenario. As before, the blue line indicates the flight path, the circle of red dots the impact area and the red dot on the flight path the failure occurrence point. In addition to this, the half circle in yellow shows the potential impact points with respect to the deviating yaw angle ψ'. Within the current configuration of O.R.C.U.S., the deviation in the yaw angle is calculated by a random normal distribution and lies within the shown yellow half circle. This half circle is defined by the theoretical perpendicular line in relation to the basic forward flight direction. The diameter of the half circle is limited by the operating altitude of the UA. For the deviating pitch angle θ', it is also assumed that the random deviation follows normal distribution. Consequently, the diameter of the half circle may vary and therefore, also the position of the central impact point. For the execution of this scenario, the responsible subfunction is *ImpactArea_nbFPFD* with the child functions *YawPos* and *PIZ_nbFP*. The first one calculates the deviating yaw angle and the latter one the potential impact zone.

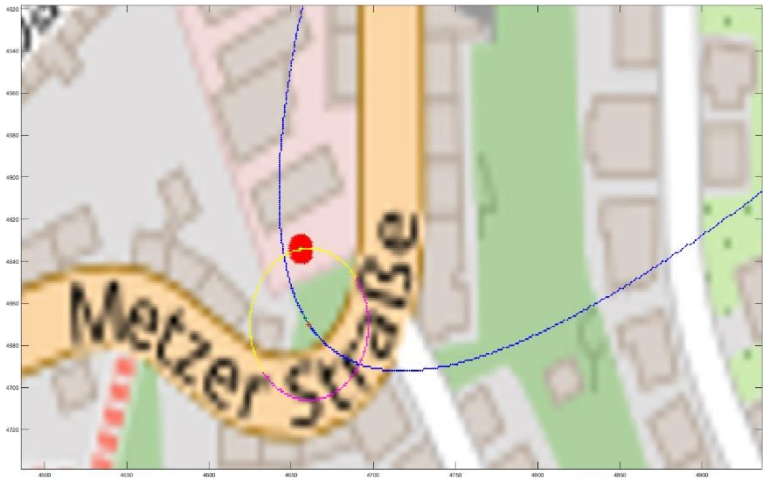


Figure 7-25. O.R.C.U.S. impact close to the flight path in forward flight direction example.

7.2.5.5 Impact After Glide with Best Glide-Ratio on the Flight Path

For the default UAS implemented in O.R.C.U.S. it is assumed that the UA will follow its pre-programmed way-point plan until it glides into the ground in case of an engine out or engine anomaly failure case, which cannot be mitigated by any of the countermeasures. It is executed by the subfunction *ImpactArea_bFPbGR*.

The fundamental assumption of this impact scenario that the UA cannot provide thrust anymore while all other systems are basically operating. Consequently, the UA will glide along the pre-programmed way point plan until it touches the ground. Based on the operating altitude of the UA and the lift to drag ratio, the remaining distance the UA can travel after the failure case occurred is calculated in accordance with equation (7-23).

$$d_{Glide} = L/D \cdot h_{Alt} \text{ [m]} \quad \textbf{(7-23)}$$

As the UA impacts the ground by gliding, the UA might also hit persons who are a standing in the glide path line and not only those within the basic impact area around the central impact point. Therefore, another impact area than the basic impact area must be applied. The glide impact area is formed by equations (7-24) to (7-26) which based on Appendix D from the supplement to the Range Safety Criteria for UAV standard [192].

$$d_{Glide|h_P} = L/D \cdot h_P \text{ [m]} \quad \textbf{(7-24)}$$

$$d_{Swath} = 2 \cdot \max{(w_{UA}, l_{UA})} + d_{Glide|h_P} \text{ [m]} \quad \textbf{(7-25)}$$

$$A_{IGR} = A_{GlideImpact} = 2 \cdot \max{(w_{UA}, l_{UA})} \cdot d_{Swath} \text{ [m]} \quad \textbf{(7-26)}$$

Equation (7-24) gives back $d_{Glide|h_P}$, which is the distance the UA would glide if the altitude is equal the average height of a person. The formulation follows the same principle as shown in equation (7-23). In order to provide a buffer zone for shallow impacts and as well as to take into account the possibility of a steep, almost vertical, glide impact, $d_{Glide|h_P}$ is increased by two times of the maximum of wingspan or UA length which results in equation (7-25) and providing d_{Swath}. Within the software code several rounding steps up to the next higher integer values are done for the dimensions of glide impact area, similar to the basic impact radius (cf.

equations (7-16) to (7-18)). This provides an additional intrinsic safety buffer in order to take into account the average radius of persons, as it is done for example in [42].

Eventually, the impact area $A_{GlideImpact}$ is obtained by multiplying d_{Swath} with two times r_{Impact} in equation (7-26). Figure 7-26 presents a drawing to support the given explanation for equations (7-24) to (7-26) and Figure 7-27 provides an illustration of this impact scenario. To conclude the present segment, Figure 7-28 shows an example of this impact scenario during an O.R.C.U.S. simulation.

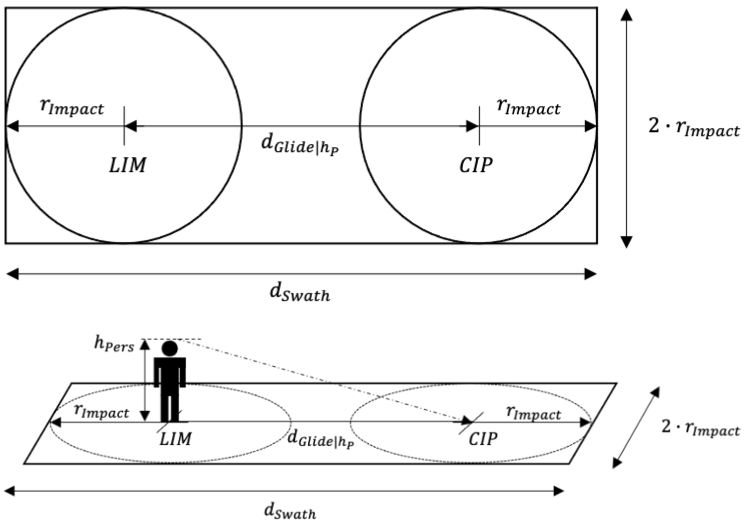


Figure 7-26. O.R.C.U.S. glide impact area.

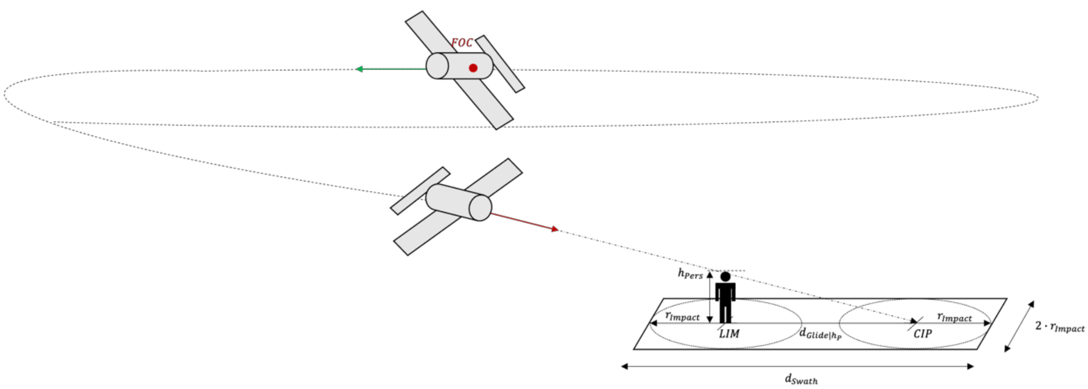


Figure 7-27. Below flight path with best glide ratio impact scenario illustration.

Figure 7-28. O.R.C.U.S. below flight path with best glide ratio impact scenario example.

7.2.5.6 Tangential to the Flight Path Impact

A similar but not equal to the impact close to the flight path in forward flight direction scenario is the so called *Tangential to flight impact scenario*. In this scenario, the UA deviates tangentially from the flight path by angle η in forward flight direction and descends at best glide ratio. Such a scenario is assumed to occur in case the UA has no capacity any more to change a symmetric position of the control surfaces or if they are in a floating status. The potential range is calculated by applying equation (7-23) again.

As the UA glides into the ground, the glide impact area needs be applied. Equations (7-24) to (7-26) which were discussed in the afore chapter form the impact area. The formulation for the impact area in case of the tangential to flight path impact scenario is summarized in equation (7-28). Figure 7-29 presents an illustration the impact scenario.

$$A_{TFP} = A_{GlideImpact} \tag{7-27}$$

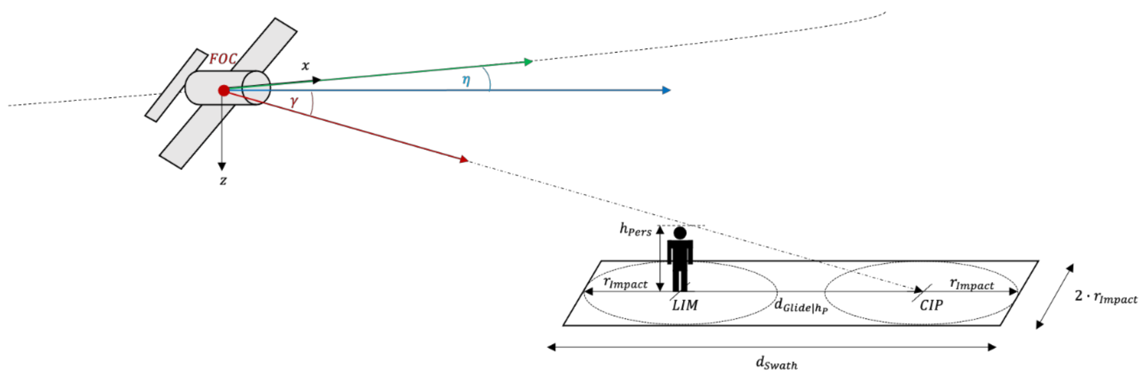


Figure 7-29. O.R.C.U.S. tangential deviation from flight path and impact illustration.

Figure 7-30 provides an example, in addition to the flight path and the impact area, the tangential deviation path is shown as red line for illustration purposes. The function for this scenario is called *ImpactArea_tanFP* and is also supported by the *PIZ_nbFP* subfunction.

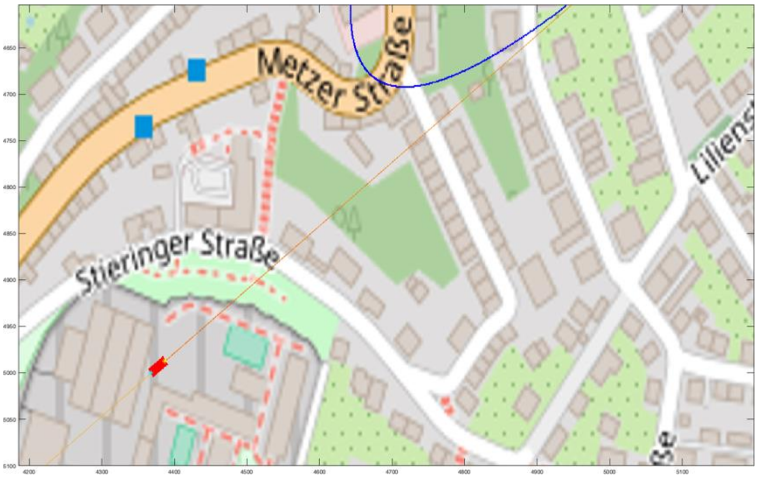


Figure 7-30. O.R.C.U.S. tangential deviation from flight path and impact example.

7.2.5.7 Debris Impact

In order to provide a comprehensive set of impact scenarios, it was deemed necessary to include also a debris scenario. Debris occurs if the airborne UA faces severe structural damage during flight, as for example if v_{NE} is exceeded or if an engine fire occurs that cannot be extinguished. The debris impact scenario is executed by the *ImpactArea_Debris* subfunction.

Debris impacts are not trivial to approximate, because the assumptions that have to be taken into account vary greatly and are highly dependent upon the design and current status of the UA. As in the beginning of O.R.C.U.S. development not many open information on LUAS accidents existed, it was tried to develop a debris model based on public data from UAS accident reports from the United States Air Force (USAF) Aircraft Accident Investigation Board (AIB) and to support this by data from manned General Aviation accidents reports of the German Federal Bureau of Aircraft Accident Investigation (BFU) [205, 206]. The research incorporated 167 reports from the BFU and 76 reports from the AIB over the time period from 1999 to 2013[30]. The reports were investigated with respect to structural disintegration of the aircraft in the air and the resulting splash pattern zone. Based on the dimensions of the splash pattern zone, it was tried to generate an equation that relates the splash pattern of a LUAS based on the UA parameters m_{UA} and v_{UA}. Unfortunately, resulting equations based on regression analysis did show only very low coefficients of determination ($R^2 < 0.01$). Therefore, this attempt was rejected and a very conservative model for the debris impact zone was defined based on the equations for a horizontal throw without drag.

It is defined, that the debris parts of the disintegrated UA spread away from the failure occurrence point on the flight path in forward flight direction which is approximated by the deviating yaw angle ψ'. The entire area is defined as a circle with a diameter based on the equations for the horizontal throw without drag and related to the velocity and altitude of the UA.

30 Note: Nowadays the investigated reports are no longer available at the website of AIB. However, they can be found here [207].

$$t_{Impact} = \sqrt{\frac{2 \cdot h_{Alt}}{g}} \text{ [sec]} \tag{7-28}$$

$$d_{Debris} = v_{UA} \cdot t_{Impact} \text{ [m]} \tag{7-29}$$

$$r_{Impact} = \max\,(w_{UA}, l_{UA}, 0.5 \cdot d_{Debris}) \tag{7-30}$$

$$A_{Impact} = A_{Debris} = \pi \cdot r_{Impact} \text{ [m}^2\text{]} \tag{7-31}$$

Equation (7-28) determines the duration t_{Impact} that it takes to for debris parts until they impact the ground without drag of the air. Based on this time, by equation (7-29) the maximum range for debris parts are calculated, representing the diameter of the affected area. For the radius of the debris impact area, the values of UA wingspan, UA length and the half of the afore calculated diameter are compared with respect to the maximum, shown in equation (7-30). This is similar to the generic impact area approach shown in equation (7-18). The resulting maximum will be inserted into equation (7-31) for the determination of the entire debris impact area. Figure 7-31 illustrates the debris impact.

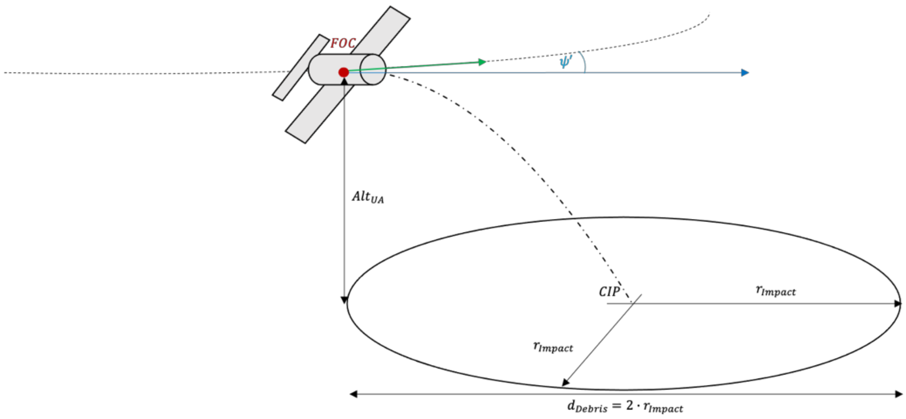


Figure 7-31. O.R.C.U.S. debris impact illustration.

Figure 7-32 provides an example for a debris impact. The impact area is obviously larger than the impact areas shown before. In the current version of O.R.C.U.S. this impact scenario arises in case of an uncontrollable engine fire, generic structural failure or wrong commands that lead to exceedance of the UA design. These failure conditions are seen as very severe and result in rapid structural disintegration and do not allow long reaction times, therefore the only mitigation could be a CFIT.

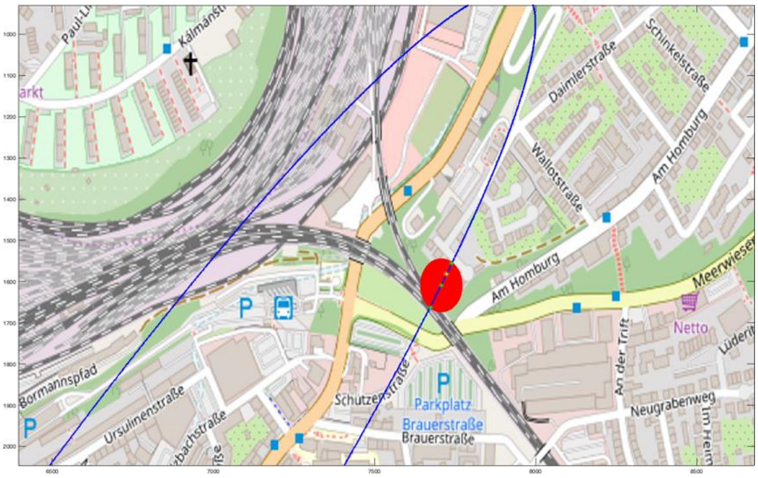


Figure 7-32. O.R.C.U.S. debris impact example.

The debris impact concludes the description of the different impact scenarios available and how impact areas are calculated in the prototype version of O.R.C.U.S. In the next chapter, implications of an impact will be discussed.

7.2.6 Impact Implications

Chapter 6.6 described identified shortcomings in the area of impact implications. In addition, the introduction of chapter 7.2.5 outlined that O.R.C.U.S. incorporates a lethal zone and the general affected zone for UA. During the first development phase of O.R.C.U.S. it was seen beneficial to differentiate between lethal and non-lethal zones. Such a differentiation has the advantage, that it might provide a smooth transition between the areas and also allows a stronger coupling between the UA and the environment. As the lethal zone is smaller than the total impact zone, predictions were deemed to be more exact and granting more operational flexibility by applying the results. In relation to the work of Feinstein [208], a quadratic distribution function was defined for the lethality with respect to the distance to the central impact point. Equation (7-32) shows the formulation and Figure 7-33 an example application for a UA with $r_{Impact} = 10$ m.

$$P_{Fat} = \begin{cases} 0 \leq d_{CIP} \leq r_{Lethal} = 1 \\ r_{Lethal} < d_{CIP} \leq r_{Impact} = \left(\dfrac{d_{CIP} - r_{Impact}}{r_{Impact} - r_{Lethal}}\right)^2 \\ d_{CIP} > r_{Impact} = 0 \end{cases} \tag{7-32}$$

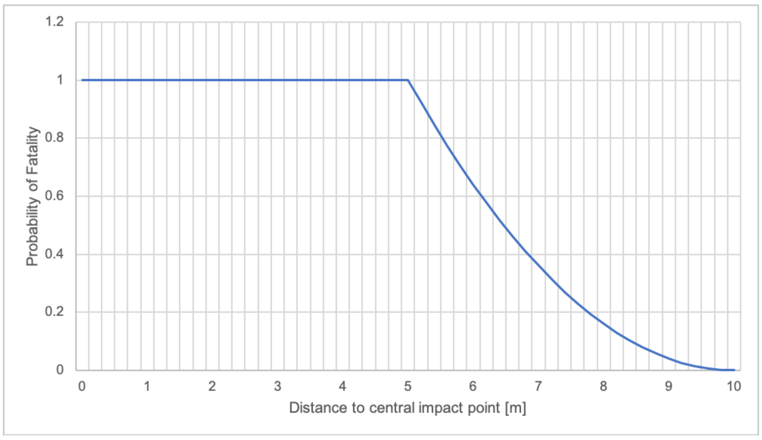


Figure 7-33. Equation (7-32) example.

However, as it was already mentioned in chapter 6.6, such fatality probability equations must include a broad range and predictions might be entirely wrong because of the immense variety of impacts and because of the great variance of potential injuries and their severity. In addition, the prediction equations might give wrong expectations to the user of a UAS risk operations assessment and the validation of a fatality probability model within a tool like O.R.C.U.S. is challenging if not even unfeasible.

Therefore, it was concluded, that for O.R.C.U.S. although the P_{Fat} model is included in the tool, *it shall not be used for evaluation*. It shall only be evaluated whether a person got hit or not in case of a crashing UA, which is from the authors point of view, the core question for fast UAS Operational Risk Assessments. Nevertheless, O.R.C.U.S. is capable to integrate future fatality probability equations if needed, but for a prototype implementation it is not seen necessary.

In order to relate the results of an O.R.C.U.S. simulation to common airworthiness metrics, a conclusive table is generated by the tool which calculates the event per flight hour and the hit per flight hour results. Chapter 7.2.8 will present further details regarding the evaluation capabilities. In any case, these results can be compared to mutual acceptable failure probabilities of UAS, defined in airworthiness standards as for example STANAG 4703 [32]. Therefore, O.R.C.U.S. is able to provide a clear and unambiguous linkage to airworthiness terms, giving users an improved risk awareness in direct quantitative terms.

7.2.7 Time and Place dependent People Distribution Model

As for every other UAS Operations Risk Assessment, the simulation of people on the ground is essential for O.R.C.U.S. too. The self-given aim was to develop a non-static distribution of population densities with a place and time-related behaviour with focus on the default operational environment Germany.

At first, it was necessary to define adequate sources for the basic population density of a place. For Germany, the Federal Statistical Office (destatis) provides precise data regarding inhabitants of villages, towns, cities, counties and federal states in Germany. Founded on federal law, with the primary task to provide data, which is neutral and of high quality, the data provided by the Federal Statistical Office is officially recognized and can be defined as valid source. Therefore, census data used for the basic population density data base in O.R.C.U.S. was stemmed from destatis. The provided data is updated on regular basis. For the prototype implementation of O.R.C.U.S. which was concluded in the second half of 2019, the annual census data from end of 2018 including updates until mid 2019 was used [209, 210]. The resulting O.R.C.U.S. data base contains 3,323 entries of cities and villages, including population numbers, population density per square kilometre as well as associated county and federal state, for which also population numbers and densities are provided.

Second, it was necessary to create a movement prediction of the inhabitants. By approaching this aim, it was soon found out, that a *precise* model to predict human movement during a day is only possible with extensive data input and calculation effort, as well as continuous monitoring. The German Ministry of Transport and Digital Infrastructure started to monitor day to day movement in Germany in the mid 1970s'. One of the outcomes of this monitoring was an extensive report, generated by the German Aerospace Centre (DLR) and the Institute for Applied Social Sciences (infas), called "Mobility in Germany", which was released for the first time in 2002 and updated in 2010 and 2017 [211-215]. This report provides representative information on daily movement for five layers: individual, household, ways, cars and travel. Based on the given data in the report, it was possible to develop a movement algorithm that contains a time scheme that is related to the percentage value of people which started a way at a building and when the way was completed at their destination.

The 2008 edition of the Mobility in Germany report applied inhabitant numbers as classification. And consequently, this was done for the movement prediction algorithm in O.R.C.U.S. too. However, the update of the report in 2017 rejected this classification and aligned it to the so called *RegioStaR* regional cluster scheme, developed by the German Ministry of Transport and Digital Infrastructure. For the sake of completeness, Table 7-4 presents the first applied city type classification scheme, taken from [211, 212] and the O.R.C.U.S. internal city type key.

City type CT	N_{PPL}	*Examples*
C1	$> 500{,}000$	Frankfurt am Main, Stuttgart
C2	$100{,}000 < N_{PPL} \leq 500{,}000$	Rostock, Braunschweig, Erfurt
C3	$50{,}000 < N_{PPL} \leq 100{,}000$	Bocholt, Rosenheim, Bayreuth
C4	$20{,}000 < N_{PPL} \leq 50{,}000$	Deggendorf, Pfaffenhofen, Forchheim
C5	$5{,}000 < N_{PPL} \leq 20{,}000$	Linsengericht, Giesen, Neufahrn
C6	$2{,}000 < N_{PPL} \leq 5{,}000$	Triptis, Bad Koestritz, Freudenberg
C7	$N_{PPL} \leq 2{,}000$	Bad Suelze, Usedom, Hornbach

Table 7-4 First city type typology applied in O.R.C.U.S. [211, 212].

The updated classification scheme from 2017 is based on the housing development and contains two main categories: urban and rural region. These two main categories are further divided in four sub categories and 17 spatial types. Additionally, a combined cluster is provided, with seven city types [216]. This combined cluster was applied to O.R.C.U.S. and is shown in Table 7-5.

City type CT	*City type description*	*Examples*
R71	Metropolitan area/Metropolis	Berlin, Munich, Leipzig
R72	Major city, urban area	Karlsruhe, Aachen, Kiel
R73	Medium-sized city, urban area	Weimar, Berchtesgarden, Troisdorf
R74	Small city, urban area	Lindau, Todendorf, Wiitingen
R75	Central town, rural area	Neubrandenburg, Bamberg, Kempten
R76	Mid-sized town, rural area	Pegnitz, Kronach, Radolfzell
R77	Small town, rural area	Iffeldorf, Biberach, Dierbach

Table 7-5 RegioStaR spatial typology applied in O.R.C.U.S. [216].

In case O.R.C.U.S. shall be used to simulate a very specific operation, for example the overflight of an open area assembly of people with a known population density of people number, it is possible to enter these values manually. If this is needed, the user may change the appropriate parameter in the *INI* file and afterwards, O.R.C.U.S. will ask for the parameters during the execution.

For each spatial type shown in Table 7-5, a table with respect to the percentage number of inhabitants which are in transit is included in the underlying O.R.C.U.S. database. The transit percentage numbers are related to eight defined time segments (t_{Seg}), presented in Table 7-6.

t_{Seg}	Begin	End
Early morning (t_{EM})	05:00	08:00
Morning (t_{MO})	08:00	10:00
Late morning/noon (t_{LM})	10:00	13:00
Early afternoon (t_{EA})	13:00	16:00
Afternoon (t_{AF})	16:00	19:00
Evening (t_{EV})	19:00	22:00
Night (t_{NI})	22:00	05:00

Table 7-6 Time segments within the O.R.C.U.S. people movement algorithm.

Table 7-7 shows an example of a complete movement table of the underlying O.R.C.U.S. database for the prediction of human movement. The first row contains the abbreviations of the time segments (t_{Seg}) presented in Table 7-6, the second row is divided into two sub-columns of the related cell of the first row. Within these two sub-columns, the column designated as “SA” for “Start”, contains the percentage number of inhabitants of the city type, who left started their way in the specific time frame. The sub-column named “AR” for “Arrival” contains the percentage number of city type inhabitants, who arrived at their designation within the specific time frame. As the data provided within [213-215] is based on surveys, it is also possible that for a specific day a certain percentage amount of the people surveyed, did not answer. This aspect is deemed as uncertainty and documented in the last row “No Ans”. The last column is the sum of the difference between the arrival percentage number and the start percentage number of each time segment per day. This number shows that a residual number of people might be on their way in the outside or already at home. As can be seen in Table 7-7, this number very low and therefore, it is not further applied in the software code.

R72	t_{EM}		t_{MO}		t_{LM}		t_{EA}		t_{AF}		t_{EV}		t_{NI}		t_{NoAns}		Delta
Day	SA	AR	SA	AR	SA	AR	SA	AR	SA	AR	SA	AR	SA	AR	SA	AR	$\sum(AR-SA)$
Monday	12	9	14	14	18	18	22	21	23	24	8	10	2	2	0	0	-1
Tuesday	13	10	12	13	18	17	21	21	25	26	8	9	3	3	0	0	-1
Wednesday	13	11	13	13	17	16	22	21	25	26	9	11	2	3	0	1	1
Thursday	13	10	12	13	18	17	22	21	25	26	8	10	2	3	0	0	0
Friday	12	9	12	13	19	18	23	22	22	23	8	10	3	4	0	1	1
Saturday	3	3	12	10	27	26	23	22	21	22	9	11	5	5	0	1	0
Sunday	2	2	11	8	24	21	29	28	22	26	9	11	2	3	0	1	1

Table 7-7 Example movement table for city type R72.

With the information contained in the movement tables, it is possible to determine an average 24-hour movement profile for each day per week for each city type CT. For these profiles, the following assumptions are considered:

The percentage of people who are in move in a specific city type and for a specific time frame is assumed to be the mean between the percentage number of people who started a way and those who arrived (equation (7-33)).

$$PPL(CT, day)_{OTW_{t_{Seg}}} = \frac{\left(SA(CT, day)_{t_{Seg}} + AR(CT, day)_{t_{Seg}}\right)}{2} \qquad \textbf{(7-33)}$$

If the difference between the percentage numbers start and arrival of the preceding time frame is greater than zero, it must be assumed, that there is still a percentage of people left, who have not arrived at their destination. Therefore, this difference must be added to the current time frame. If the difference is less than zero, it can be assumed, that the people have arrived at their destination before the current time frame had begun. Nevertheless, this would not justify to subtract this percentage number from the percentage number of people in movement of the current time frame (equation (7-34)).

$$PPL\left(SA(CT, day)_{t_{Seg-1}} - AR(CT, day)_{t_{Seg-1}} > 0\right)_{NoArr} = SA(CT, day)_{t_{Seg-1}} - AR(CT, day)_{t_{Seg-1}}$$
$$PPL\left(SA(CT, day)_{t_{Seg-1}} - AR(CT, day)_{t_{Seg-1}} \leq 0\right)_{NoArr} = 0 \qquad \textbf{(7-34)}$$

If for a specific city type and day percentage numbers with respect to people who did not answer to the surveys within [213-215] are present, this shall be added as uncertainty factor by the mean of the no answer cells of the specific day.

$$PPL(CT, day)_{OTW_{NoAns}} = \frac{(SA(CT, day)_{NoAns} + AR(CT, day)_{NoAns})}{2} \quad \textbf{(7-35)}$$

In total, the percentage of people who are on their way in a specific city type, on a specific day during a specific time frame is composed as it shown in equation (7-36).

$$PPL(CT, day, t_{seg})_{OTW} = PPL_{OTW_{t_{Seg}}} + PPL_{NoArr_{t_{Seg-1}}} + PPL_{OTW_{NoAns}} \quad \textbf{(7-36)}$$

Figure 7-34 presents the resulting movement profile for a R72 city type on a Monday as percentage graph based on equation (7-36) and the data obtained from [213-215]. It can be seen that there is the “typical” rush hour in the early morning when people go to work. Furthermore, an increase of people in move can be observed that begins in the early afternoon until late evening around 20:00. During this time period, people typically are on their way back from work to home and also get out for shopping or to meet friends or to have dinner.

Figure 7-35 expands the Monday movement profile with a Sunday movement profile. The comparison shows a clear difference. On Sunday, the vast majority of people will not go to work. If they get out of their houses, for example to visit relatives or for lunch, they start later during the day. An increase can be observed beginning at 10:00, with a climax between 14:00 to 16:00.

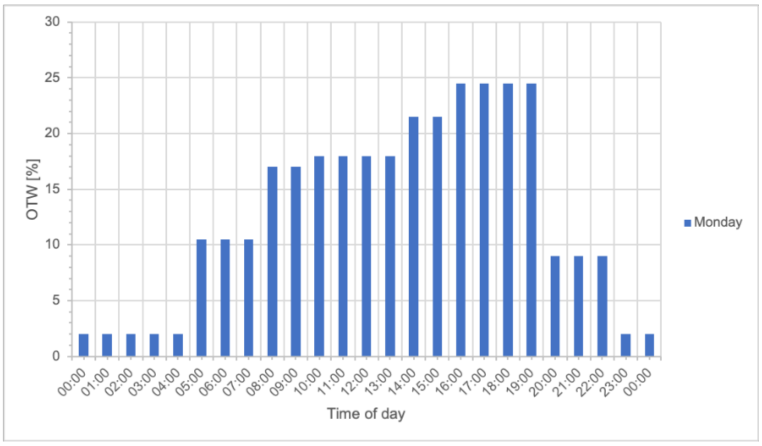


Figure 7-34. People on the way profile R72 city type during a Monday.

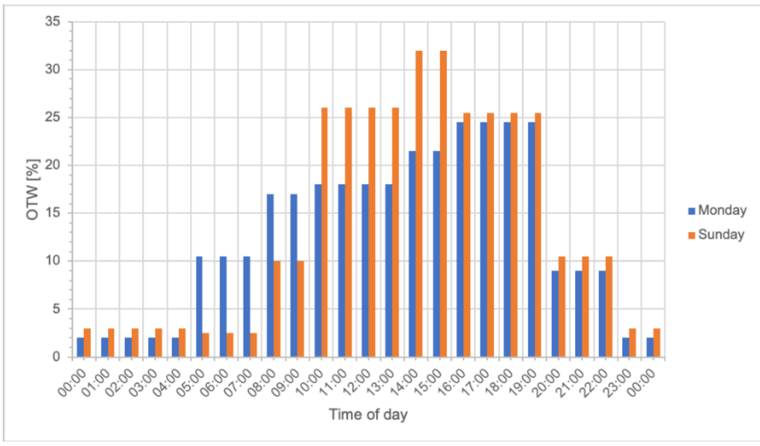


Figure 7-35. People on the way profile R72 city type during a Monday and Sunday.

For the sake of completeness, in Figure 7-36 a complete week is shown for the example city type R72 with the movement profile for each day. As can be seen, the movement profile during the work days from Monday to Friday is very similar, while Saturday and Sunday differ noticeably.

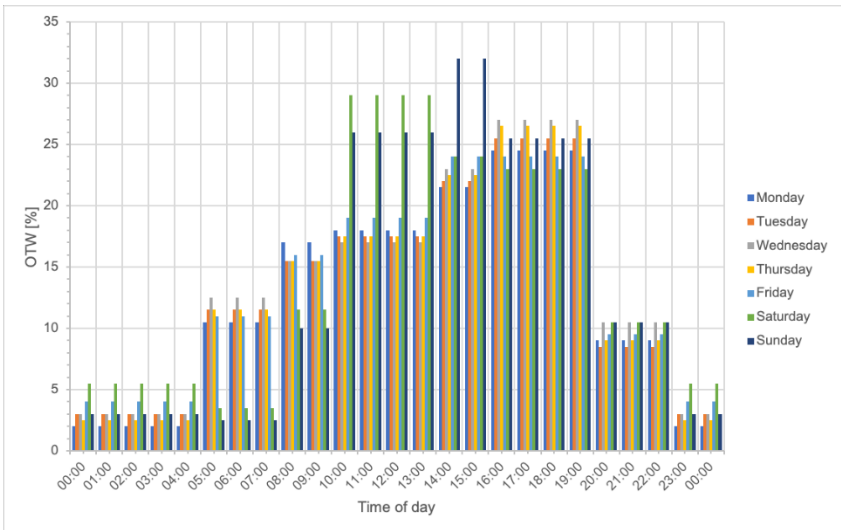


Figure 7-36. People on the way profile R72 city type during a week.

By multiplying equation (7-36) with the census-based number of inhabitants of a city $N_{PPL_{City}}$ [209, 210], the current number of persons who are on a way can be obtained. Alternatively, equation (7-36) might be multiplied with the population density of the overflown area $\rho_{PPL_{Area}}$ and the area size $A\ [\mathrm{km}^2]$ in order to obtain current number of persons who are on a way. Equation (7-37) shows the resulting equation. The result of this equation is rounded up to an integer number, as there are no half persons and as it is a conservative approach. Equation (7-37) is supported by equation (7-38) to underline the connection between number of inhabitants, population density and area of a city. The index *map* is used as synonym for *city*, *county*, or a general *area*. Note that all three variables are stored within the census-based database incorporated in O.R.C.U.S.

$$N(CT, day, t_{seg})_{PPL_{OTW}} = \left\lceil PPL_{OTW} \cdot N_{PPL_{City}} \right\rceil \quad \textbf{(7-37)}$$

$$N_{PPL_{Map}} = \rho_{PPL_{Map}} \cdot A_{Map} \quad \textbf{(7-38)}$$

For a given mission map, O.R.C.U.S. applies equation (7-38) to calculate the basic number of inhabitants in the specific simulation map. Figure 7-37 and Figure 7-38 illustrate equation (7-37) with an example for city type R72, which in this case is the Bavarian city Ingolstadt.

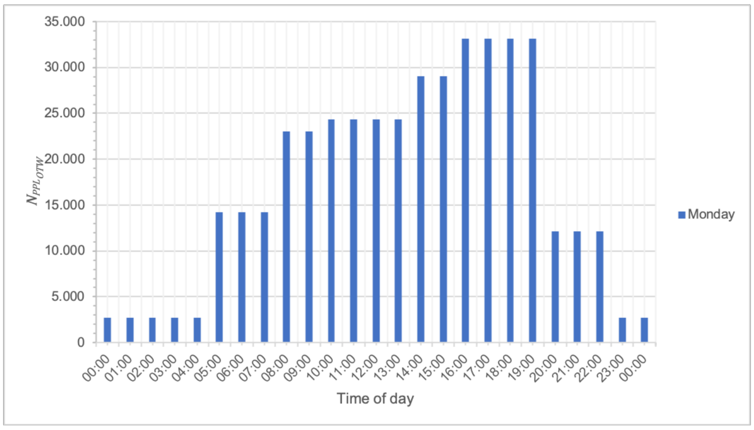


Figure 7-37. Number of people on the way (OTW) example Ingolstadt during a Monday.

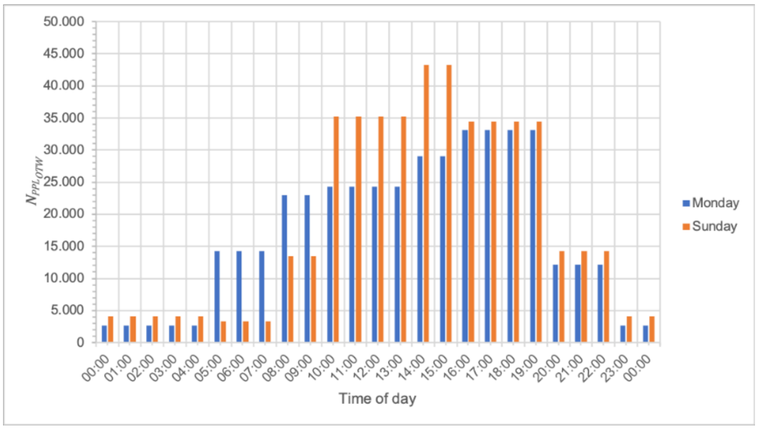


Figure 7-38. Number of people on the way (OTW) example Ingolstadt during a Monday and Sunday.

The O.R.C.U.S. data base extracted from [209, 210, 213-215] provides the capacity to predict how many people are in move during a day for each of the defined city types. However, a precise prediction of start and end place is not incorporated, as this is out of scope of the source data and furthermore, was not seen necessary for O.R.C.U.S. The core information which is relevant for the kind of assessment O.R.C.U.S. performs, is if people are on a way and if they are in the unprotected outside, or not. People who are not on a way, are deemed to be in a building and protected. This number, $N(CT, day, t_{seg})_{PPL_{ATB}}$ is calculated as it shown in equation (7-39).

$$N(CT, day, t_{seg})_{PPL_{ATB}} = \left[(1 - PPL_{OTW}) \cdot N_{PPL_{City}}\right] \quad \textbf{(7-39)}$$

It is noteworthy that O.R.C.U.S. also has a feature to include an average number of tourists and increasing the basic number of inhabitants accordingly. For several regions and cities of Germany, the data extracted from [209, 210] contains statistics regarding number of touristic visits per year. Once activated by the user within the initialization file, O.R.C.U.S. searches its database for entries with respect to tourist data for the area under assessment. If an entry exists, the data entry is broken down to tourists per day and square kilometre and afterwards added to the basic number of inhabitants. If no entry exists, the user can enter the expected number of tourists. The resulting number of people is shown in equation (7-40). This number will then be used for the distribution as shown in equations (7-37) and (7-39).

$$N_{PPL_{City}} = N_{PPL_{City}} + N_{PPL_{City_{Tourists}}} \quad \textbf{(7-40)}$$

Chapter 7.2.2 described the *MapOverlay* function, shown in Figure 7-11, which is also incorporated within the people distribution functions. It cannot be assumed, that people in the surrounding of a very small town which does not cover the whole O.R.C.U.S. map move similar to the inhabitants of the town. To illustrate this, Figure 7-39 shows the difference in a movement profile between a R77 city type and the Federal State Bavaria during a Monday. Although during the night phase the difference is very small and might be treated as neglectable, the difference increases significantly during noon time.

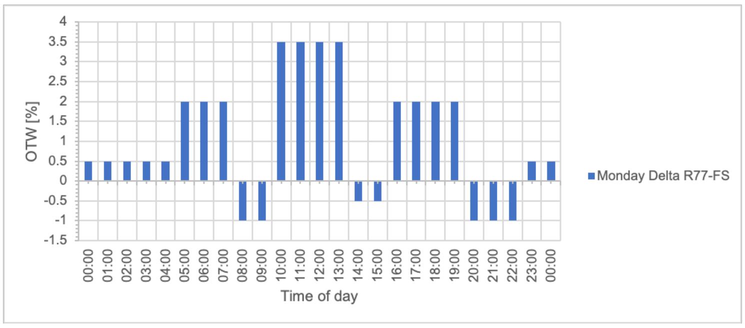


Figure 7-39. Example for a difference between a city type and Federal State.

Therefore, in case *MapOverlay* was applied by the user, O.R.C.U.S. distributes the people outside the overlay with a data set based on the County and Federal State, in which the city is located. Because no sufficient data regarding people movement in counties was existing, the movement profile is based on the Federal State, while the number of people to distribute is based on the County inhabitants.

The underlying functions and equations for the movement of the county inhabitants are identical to those explained before for the city types. The resulting equations numbers of people to be distributed in the surrounding area of the overlay are shown in equation (7-41) and (7-42).

$$N(COU, FS, day, t_{seg})_{PPL_{OTW}} = \lceil PPL_{OTW} \cdot N_{PPL_{COU}} \rceil \quad \textbf{(7-41)}$$

$$N(COU, FS, day, t_{seg})_{PPL_{ATB}} = \lceil (1 - PPL_{OTW}) \cdot N_{PPL_{COU}} \rceil \quad \textbf{(7-42)}$$

It should be noted, that the number of people to distribute within the SMP is set equal to the number of inhabitants of the specific city which the SMP encompasses. By doing so, on the one hand a too optimistic setting is avoided, which could occur that in case the calculation of people to be distributed in the SMP would contain less people than the real inhabitants of the overflown city. On the other hand, it is avoided that more people are distributed in the SMP than the database foresees in case the SMP drawn by the user does overlap the city territory, which would lead to an overconservative approach.

It is recognized, that the approach to deploy people in the SMP surrounding map size in relation to the county inhabitants density taken from the database imposes a conservative approach, as the inhabitants of the city are taken as an independent part with the simulation map and not taken as a part of the surrounding county. A possible solution to overcome this is presented in equation (7-45). By applying equation (7-45) instead of equation (7-38), the number of people simulated in the surrounding map of the SMP would be reduced. Such a probably more realistic yet optimistic approach might be incorporated in a future version of O.R.C.U.S. For the prototype implementation, it was seen as sufficient to strive for the more conservative approach.

$$\rho_{COU_{Mission}} = \frac{\left(N_{PPL_{COU}} - N_{PPL_{City}}\right)}{\left(A_{COU} - A_{City}\right)} \quad \textbf{(7-43)}$$

Note that if no SMP is present, no inhabitant limitation is applied. This is based on the assumption that it can reasonably be assumed, that in case the city covers the whole map image, the city area is usually bigger than the image. Therefore, the inhabitants deployed by O.R.C.U.S. will represent an adequate portion of the real inhabitants based on map image size. The simulation runs confirmed this assumption. Nevertheless, this is seen as a small weakness in O.R.C.U.S. and will also be taken into consideration for the further development of the software tool.

In order to develop an approximation of human movement in a city type, it was decided to distribute the number of people which are on the way randomly. In case a UA crashes during a simulation, O.R.C.U.S. determines the current $N_{PPL_{OTW}}$ and $N_{PPL_{ATB}}$ based on the time of day and the overflown area and distributes them randomly across the overflown map by the pseudorandom number generator *randi*.

Table 7-8 shows the possible sub-structs where it is expected that people might be on a way in the outside and therefore, entirely unsheltered. It is noted that people inside cars have a certain amount of shelter, but they are also assumed to be unsheltered. This is based on the conservative assumption that in case a LUAS crashes close to the car or on it, the driver might get that much distracted that the distraction either leads to an accident which causes injuries or that the car inhabitants get hurt by the impact itself.

#	*Name*	*Description*
1	Streets	Common streets.
2	Trunk roads	Federal roads, might cross cities.
3	Rural roads	Country roads in rural sides, might cross towns.
4	Motor-ways	The German Autobahn.
5	Walks	Pedestrian walks.
10	Open areas	Open spaces in a city.

Table 7-8 Possible sub-structs for people outside (OTW) per O.R.C.U.S. default.

Table 7-9 presents the sub-structs in O.R.C.U.S. for which it is assumed that people inside are sheltered. In case a UA crashes onto such a sub-struct and people are inside, the default definition for the O.R.C.U.S. prototype implementation is that those people will not suffer injuries.

#	*Name*	*Description*
8	Houses	Common houses with inhabitants.
9	Residential areas	Bigger areas with houses.

Table 7-9 Possible sub-structs for people inside (ATB) per O.R.C.U.S. default.

Table 7-10 summarizes the sub-structs in which no people are distributed during an O.R.C.U.S. simulation. Sub-struct #6 and #7 are excluded because it assumed that people inside a tram or a train which commute on these sub-structs are sufficiently protected. Furthermore, a prediction how many people are present there would require an additional simulation of the public transportation system, requiring additional valid data sources. Additionally, it was assumed that the probability that a crashing UA hits a train or a tram is very improbable. With respect to sub-structs #11, #12 and #13, the reasons are similar. The sub-struct #11, non-built areas, are for example fields of farmers, where it reasonably can be assumed that there are no people. Regarding green or water areas, it is expected that even if there are people, such as hikers or boat drivers, the relation between potential impact area and people is big enough, that the probability that those people get hit by a crashing UA is also extremely low. The last sub-struct, airfields, such as big airports or small airfields, prohibits people to be there by definition.

#	*Name*	*Description*
6	Tram ways	Rail lines for trams.
7	Rail roads	Rail lines for trains.
11	Non-built areas	Areas with no buildings.
12	Green areas	Forests, parks etc.
13	Water areas	Lakes, rivers etc.
14	Airfields	Airports, small airfields, etc.

Table 7-10 Sub-structs with no people per O.R.C.U.S. default.

For each person to be distributed within the sub-structs presented in Table 7-8 and Table 7-9 during an O.R.C.U.S. simulation, the default definition is, that only one person per pixel shall be allowed. This rule is in conjunction with the typical r_P found in literature (for example in [42] and in [217]) and incorporates the possibility of a virtual movement radius of the individual person if the O.R.C.U.S. standard relation between pixel and metre discussed in chapter 7.2.2. and which leads to the effect that one pixel equals one square metre. These definitions fit appropriately for regular assessments, e.g. an overflight of a city during a normal day. Nevertheless, these definitions might be changed if necessary, for example if it is necessary to assess operations with more than one person per square metre, e.g. overflight of concerts or football stadiums.

With respect to the software architecture of O.R.C.U.S., the time and place dependent population distribution are deployed in several subfunctions. At the beginning of each simulation run, a basic allocation is done by the subfunction *RdPeopleBasicInput*. The subfunction extracts the necessary area data which is necessary for the simulation, in particular the population data from census from the database *pplCitiesCountiesFS*. The extracted data is aligned to the adequate movement profile extracted from the database *pplDayTime* by activating the *PeopleDayTime* and *PeopleDayTimeFS* subfunctions. In case a UA impacts the ground, the *RdPeopleLoop* subfunctions distribute the people on the map as described above.

The notes regarding the responsible functions conclude the present chapter which presented the basic characteristics of the population simulation included in O.R.C.U.S. Based on the derivatives that led to the program routines as well as the necessary assumptions, a representative time and place dependent population movement simulation for German cities which is non-static was developed. The self-given aim outlined in the beginning of the chapter was fulfilled.

7.2.8 Application, Validation and Evaluation

The application of O.R.C.U.S. is based on the data stored in the *INI* function. Table 7-11 summarizes the necessary mission and UAS parameters which must be provided within the *INI* function by the user. It should be noted that certain parameters are stored within the event tree xlsx file and extracted automatically by the responsible functions. Those values might be changed in accordance with the design of the UAS under assessment in the specific simulation.

Once the user has stored all parameters as needed with the *INI* function, the function can be executed. After successful execution, all necessary data items were handed over to the O.R.C.U.S. Map struct file and the file within the MATLAB workspace is ready for the simulation.

After activation of an O.R.C.U.S. simulation, the UAS mission will be simulated in accordance to the given mission parameters. For example, if the assessor wants to simulate a mission which shall take place from 10:00 am to 16:00 on a Wednesday, t_{Start} would be set to ten and t_{Land} would be set to sixteen, while day_{UA} would be set to three, resulting in a simulation of the six operational flight hours. However, this would be only one simulation run or one probe of the real mission and it is more than questionable to relay only on one single probe. In order to enhance the mean of the simulation outputs, the number of simulation runs can be increased.

Parameter	*Unit*	*Range*	*Description*
day_{UA}	$[\mathrm{d}]$	$1-7$	Day of the UA mission
h_{Alt}	$[\mathrm{m}]$	none	Altitude above the ground
l_{UA}	$[\mathrm{m}]$	none	Length of the UA
L/D	$[/]$	none	Lift to drag ratio of the UA
m_{UA}	$[\mathrm{kg}]$	≤ 150	Mass of the UA, usually MTOW
$n_{Probes0}$	$[/]$	none	Initial number of samples
$N_{Day_{UA}}$	$[\mathrm{d}]$	none	Number of UA mission days
$N_{simDay_{UA}}$	$[\mathrm{d}]$	none	Number of simulated UA mission days
$P_{F0} = P_{CumCat}$	$[1/\mathrm{Fh}]$	none	Cumulative acceptable probability of all catastrophic failure conditions
P_{MSS_k}	$[\%]$	$0-1$	Probability that the k^{th} main sub-system fails
$P_{MSS_kFC_j}$	$[\%]$	$0-1$	Probability of the j^{th} failure condition for the k^{th} failed main sub-system*
$P_{DetectUA}$	$[\%]$	$0-1$	Probability that the UA detects a failure*
$P_{DetectUCS}$	$[\%]$	$0-1$	Probability that the UCS detects a failure*
P_{CM_k}	$[\%]$	$0-1$	Probability that the k^{th} countermeasure succeeds*
$\bar{P}_{CM_k}$	$[\%]$	$0-1$	Probability that the k^{th} countermeasure fails*
t_{Start}	$[\mathrm{hh}]$	$1-24$	Starting time of the UA.
t_{Land}	$[\mathrm{hh}]$	$1-24$	Landing time of the UA
v_{UA}	$[\mathrm{km/h}]$	none	UA mission velocity
w_{UA}	$[\mathrm{m}]$	none	Wingspan of the UA
			* included in event tree file

Table 7-11 Necessary UAS and mission parameters for the *INI* function and O.R.C.U.S.

After the first stable version of O.R.C.U.S. was complete, several example missions were simulated with the aim to achieve around 10,000 simulated flight hours or more. Such a high number was seen as sufficient, although it is quite arbitrary. Furthermore, no differentiation between long and short endurance missions would be necessary. For example, a mission with ten flight hours would have to fulfil the same requirement as a mission with only one flight hour, from the simulation point of view. It is important to note, that in case the UA faces an impact during the simulation, O.R.C.U.S. will save the evaluation data and then continue the simulation and does not require a complete restart. Of course, this would not be the case in reality, however this is the advantage of a simulation. By continuation and not stopping, more simulation data can be generated in one run.

Within the further development of O.R.C.U.S. it was attempted to overcome the 10,000 simulated flight hours aim as validation mean and it was investigated, how a mean can be provided, which shows that the results of an O.R.C.U.S. simulation are valid or not. The obvious mean is the sufficient amount of simulated flight hours or entire mission simulations. However, this determination is challenging as there is no data to compare. One possibility to resolve this was found within the one-sample Student's *t*-test [218].

In general, Student's *t*-Test, which is either a one-sample or two-sample test, can provide an indication if a null hypothesis H_0 is correct or if an alternative hypothesis H_1 is correct. To apply this method, the data to be evaluated must be collected from a simple random probe and the attribute which is investigated is normally distributed. In case of O.R.C.U.S. the attribute of interest is if a person got hit or not in case of a ground impacting UA and the relation to P_{CumCat} (cf. chapter 7.2.6). Based on this, the null hypothesis H_0 is defined as the probability that a person gets hit by a crashing UA P_{Hit} is equal to P_{CumCat} and the alternative hypothesis H_1 is that P_{Hit} is not equal P_{CumCat}. Both hypothesises are shown in equation (7-44) and (7-45).

$$H_0 : P_{Hit} = P_{CumCat} \tag{7-44}$$

$$H_1 : P_{Hit} \neq P_{CumCat} \tag{7-45}$$

Assuming that O.R.C.U.S. simulates one UA mission n times. This simulation series shall be called O.R.C.U.S. simulation series with n samples. The definition of one sample is dependent upon how the mission is planned to be executed, are explained below. Which definition applies is defined by the user within the *INI* function.

Mission definition 1 – UAS operation on a specific day or days

The UAS operation shall take place on a random Monday and Tuesday, between 10:00 and 14:00 o'clock about a specified city. One probe would be equal the simulation of the two days. If ten probes shall be obtained, this would result in a simulation of ten times Monday and ten times Tuesday, in total twenty simulated days with 4 simulated flight hours each, resulting in 80 Fh simulated flight hours.

Mission definition 2 – UAS operation on a random week day

The UAS operation shall take place on a random day during the week, between 08:00 and 18:00. Because the day is not further specified, one probe is equal one simulated day. For this case as a minimum, each day shall be simulated one time, leading to seven samples with a total amount of flight hours of 70.

The simple random sample criterion results from the respective O.R.C.U.S. simulation series, which has the scope n. A sample within this scope is equal to one execution of an O.R.C.U.S. simulation. As the O.R.C.U.S. simulation environment represents the population, an infinite execution of O.R.C.U.S. simulations would correlate with the real world and accordingly represent the UAS mission in real life if the UAS has exactly the same properties as described in O.R.C.U.S.

All elements defined in O.R.C.U.S. have defined probabilities and therefore, always have the same chance to occur each time a simulation is run. Each O.R.C.U.S. simulation series can therefore be regarded as a simple random sample from the population. Since the feature under investigation – "person hit or not" – refers to a normally distributed population, it can be assumed that the feature would occur also normally distributed in real world. The feature will be called "event" in the further proceeding. In order to ensure that this is true for the simulation, the minimum number of samples must be sufficient. Subsequently the minimum number of samples shall be $n_{Min} \geq 30$. In order to strengthen the validation efforts, it was decided to increase n_{Min} at least to 100. The number of samples are also the so-called degrees of freedom df within the *t*-test.

Core of the *t*-Test is the calculation of the critical *t* value t_{Crit}. If this number is passed for a given significance level α, the alternative hypothesis is valid and the null hypothesis can be discarded. Those values are dependent upon the degrees of freedom which are equal to the number of samples. They can be found in statistical tables, e.g. in [218]. The calculation of the t value for a one-sample *t*-Test is presented in equation (7-46).

$$t = \sqrt{n}\left(\frac{\bar{x} - \mu_0}{s}\right) \tag{7-46}$$

The expectation is assumed to be equal to the given P_{CumCat}.

$$\mu_0 = P_{CumCat} \tag{7-47}$$

The determination of the mean value and the standard deviation are presented in equations (7-48) to (7-50). With respect to the mean value $\bar{x}$ of the item under assessment x_i, it should be noted that this number $\bar{x}$ is equal to the cumulative number of persons hit during one sample. Therefore, $\bar{x}$ is the number of people who got hit per simulated flight hour per sample. In case one sample consists of more than one simulated day, $\bar{x}$ does not give back the absolute number of hit persons per flight hours directly. The standard deviation is necessary for the calculation of the t value. It gives back the variability of P_{Hit} for the entire simulation series consisting of n samples with respect to the mean value.

$$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n} \tag{7-48}$$

$$x_i = \frac{N_{PPLHit_i}}{t_{Miss_i}} \tag{7-49}$$

$$s = \sqrt{s^2} = \sqrt{\frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n-1}} \qquad \textbf{(7-50)}$$

Because every value of the item under assessment is normalized with the mission duration, it is beneficial to apply identical mission durations per mission day. Additionally, it must be considered that an event can occur, but does not need necessarily occur during an O.R.C.U.S. simulation sample. Consequently, also those samples with no events must be taken into account for the calculation of the mean value. Furthermore, based on the concept of O.R.C.U.S., it is possible that the UA hits the ground more than one time during one sample, therefore, the event “person hit” might occur also more than one time during one O.R.C.U.S. sample, which needs to be considered for the mean value calculation.

For the validation of the O.R.C.U.S. results, it was chosen to set the significance level $\alpha = 0.01$. As the t-Test is unsigned, $\alpha/2$ must be taken into account. Table 7-12 summarizes t_{Crit} applied for O.R.C.U.S.

	$t_{Crit} = t_{df;99.5}$
$df = n = 30$	2.750
$df = n = 120$	2.617
$df = n \rightarrow \infty$	2.576

Table 7-12 Critical *t*-values.

Once an O.R.C.U.S. simulation series is complete in the automatic mode, the evaluation part is activated. Within this part, a summarizing xlsx spread sheet is generated. This spread sheet contains a short overlook of the results and all events that occurred during the simulation series. Focus is given on how many people got hit at buildings and on the way. Furthermore, the *t*-values for the complete O.R.C.U.S. simulation series and the hit results are calculated. If the resulting *t*-values do not exceed the values shown in Table 7-12, the simulation series shall not be taken as valid. In addition to this, every single impact event is shown with all details: mission information, map information, time and point of occurrence, coordinates on the map, failure condition and impact implications.

With the evaluation file, the resulting risk of the simulated UAS mission can be shown with respect to relation to airworthiness terms at a glance. The evaluation file of O.R.C.U.S. enables the operator to become aware about the risk to the overflown area and to take adequate measures in order to reduce the risk. Furthermore, the simulation results can be used for discussions with the competent authorities to achieve authorization for the desired operation. These remarks conclude the present chapter. Within the next chapter, a recap of the entire prototype implementation by O.R.C.U.S. will be provided.

7.3 Summary

Within chapters 7.2 to 7.2.8, the architecture and capabilities of O.R.C.U.S. were briefly presented. In contrast to the shortcomings of the investigated UAS operations risk assessment O.R.C.U.S. contains significant improvements.

One of the improvements is marked by the inclusion of the operational environment. Instead of requiring an immense amount of data regarding the operational area were the UAS operation takes place, O.R.C.U.S. requires an OSM image only. It is admitted that the current restriction on one zoom level of the maps limits the application, however, as it is a prototype, it is seen as sufficient. The capacity to differentiate the operational area into miscellaneous parts enables a detailed analysis and founds the basis for further developments, e.g. the incorporation of material databases of the overflown buildings in order to represent shelter aspects better. In summary, O.R.C.U.S. operational environment generation is a well-balanced approach fitted to the scope.

By the chosen approach to include the UAS and the airborne aspect, O.R.C.U.S. is able to generate risk assessments tailored to the specific UAS or to give a quick overall assessment based on the default configuration. On the one hand, not requiring every technical detail of a UAS makes the tool quite easy to apply and imposes a further advantage. On the other hand, the more technical specifications are known, O.R.C.U.S. can be modified as required. Taking the root-cause into account permits more precise assessments, especially with respect to the possible implications, than other models which leave this aspect out. Although O.R.C.U.S. does not incorporate the risk of mid-air collisions at the moment, this is seen as neglectable as the risk for people on the ground is seen higher than in the air. Furthermore, this aspect can be covered by taking into account P_{CumCat} which also includes the risk that a UA leaves the designated flight path and therefore, endangers other airspace users.

Another big advantage of O.R.C.U.S. is given by the simulation of the people inhabitants within the operational area. While most of the assessed UAS operations risk models contain generic assumptions and fixed values only, the simulation of the population in the affected operational area done by O.R.C.U.S. is time and place dependent. It is recognized that the developed model does not predict movement of inhabitants exactly and that the model also relies on average assumptions which lead to a certain variance. However, because the developed model and the necessary boundary conditions was derived from official census data, supported by straight forward, transparent and comprehensible calculation methods, O.R.C.U.S. provides a unique, well-founded representative time-and placed population simulation.

The mentioned census data indicates a further benefit of O.R.C.U.S. The whole software package is open and transparent. Everything can be traced from top level to bottom event and vice versa. The applied data sources are taken from official entities and provide reliable data. Furthermore, in contrast to most of other assessed risk tools, a clear mean of results validation is provided, which is not self-evident for the majority of other assessed models. Therefore, O.R.C.U.S. can provide a high-level of trust upfront. Accompanied by a low complexity regarding the application itself, O.R.C.U.S. enables handling without long preparational activities.

From the author's point of view, besides the benefits described above, one substantial achievement that O.R.C.U.S. provides is marked by the direct link to an airworthiness classification. The automatic provision of detailed results or possible implications with respect to per flight hour events allows an improvement of the risk awareness before a UAS operations commences. Rejecting often seen lethality probabilities and focusing on the hit of persons or not hit aspect of persons in case of an impacting UA, O.R.C.U.S. gives clear indications without the need to discuss applied medical models. Once an accepted lethality model for impacting UA is available, this might be included within a future version of O.R.C.U.S. For the prototype implementation, the possibility to relate the risk assessment results directly to the cumulative probability of catastrophic events criterion does provide a well-founded base to accept or to deny a UAS operation above the assessed operational area.

In summary, the development of O.R.C.U.S. is seen as success. The defined design aims were fulfilled and the tool provides a lot of advantages compared to the researched UAS risk assessments. O.R.C.U.S. is therefore also seen as an answer on research question number 2, how relevant operational safety considerations for UAS can be modelled. Within the follow-up chapter, the application of O.R.C.U.S. with respect to the scope of the present thesis will be presented.

8 UAS Operation Assessment with O.R.C.U.S.

After the description of the prototype implementation in the preceding chapter, now an exemplary application will be described which was conducted in the course of the present work. In first place, the UAS operation and the subsequent determination of simulations will be presented. Afterwards, the results of the simulations will be shown, followed by a discussion of these results in the last sub-chapter of the present part. Therefore, the present chapter represents contribution C3 which will be concluded in chapter 9.

8.1 Example UAS Operation

The determination of the example UAS operation followed the primary appliance of civil UAS nowadays: surveillance [11]. It is assumed, that streets in different cities shall be surveyed in order to gather statistical data regarding the amount of traffic. The operation shall be performed during early morning until late evening. In the first phase, the flight shall take place on a random day during the week. In the second phase, the UA shall fly every day during a week. As such a mission requires long endurance capabilities of the UA, a fixed wing UA is used.

For both phases, a UAS is assumed for which only few parameters are known. In particular, the safety parameters are anticipated as unknown. Therefore, a very conservative value of $P_{F0} = P_{CumCat} =$ 0.01 1/Fh, e.g. compared to the required P_{CumCat} within AEP-83 [107], is expected. Furthermore, this very conservative number was chosen in order to avoid too optimistic results. Further parameters of the example UAS are summarized in Table 8-2. In terms of UAS airworthiness codes for a light UAS, e.g. [32, 107], such a P_{CumCat} would not be acceptable for type certification. Therefore, the aim of the simulation series is to assess whether such a non-certifiable UAS could be granted an operational authorization or not.

Parameter	*Phase 1*	*Phase 2*
t_{Start}	06:00	06:00
t_{Land}	20:00	20:00
Day_{UA}	Monday or Tuesday or Wednesday or Thursday or Friday or Saturday or Sunday	Monday and Tuesday and Wednesday and Thursday and Friday and Saturday and Sunday
$N_{Day_{UA}}$	1	7
$n_{Probes0}$	7	1

Table 8-1 Example UAS operation phase 1 and 2.

Because the operation shall take place on a random day in the first phase, every weekday must be simulated and each simulated day can be counted as one sample. Therefore, $n_{Probes0}$ equals seven for the first phase. In the second phase, each day must be simulated but only the simulation of all seven days of a whole week is counted as one sample, because the assumed operation shall take place every day and not only on a random of a week.

Table 8-1 summarizes the two phases at a glance. The UAS parameters which are necessary for the simulation are presented in Table 8-2. It should be noted, that the probability values of the main subsystems represent the default configuration of O.R.C.U.S.

Parameter	*Value*	*Unit*
v_{UA}	100	[km/h]
w_{UA}	5	[m]
l_{UA}	4	[m]
L/D	8	[/]
m_{UA}	90	[kg]
h_{Alt}	100	[m]
$P_{F0} = P_{CumCat}$	0.01	[1/Fh]
$P_{MSS_k}; k = 5$	20	[%]
$P_{MSS_{ENG}FC_j}; j = 3$	33.33	[%]
$P_{MSS_{ELS}FC_j}; j = 3$	33.33	[%]
$P_{MSS_{FCS}FC_j}; j = 4$	25	[%]
$P_{MSS_{NavSys}FC_j}; j = 2$	50	[%]
$P_{MSS_{STR}FC_j}; j = 1$	100	[%]
$P_{DetectUA}$	50	[%]
$P_{DetectUCS}$	50	[%]
P_{CM_k}	50	[%]
$\bar{P}_{CM_k}$	50	[%]

Table 8-2 Example UAS parameters.

In order to determine the cities/areas to be overflown for the simulations, the population distribution database described in chapter 7.2.7 was searched for cities who represent average population density levels. Therefore, an average inhabitant number per city type was calculated [211-215]. Afterwards cities with inhabitants close to these average values were identified and adequate OSM files retrieved. Table 8-3 presents the finally chosen cities.

Key	$\overline{N_{PPL_{City/Area}}}$	*City*	$N_{PPL_{City/Area}}$
R71	919,052.06	Cologne	1,080,394
R72	181,150.17	Saarbrücken	180,966
R73	19,856.04	Gröbenzell	19,835
R74	8,150.84	Arnstein	8,168
R75	52,030.56	Ibbenbueren	52,037
R76	14,576.16	Eberbach	14,578
R77	6,679.29	Georgensgmünd	6,680
C1	992,766.14	Frankfurt am Main	746,878
C2	189,574.44	Hagen	187,730
C3	67,707.47	Aalen	67,849
C4	30,044.37	Schwedt/Oder	30,075
C5	9,796.96	Kemberg	9,799
C6	3,575.55	Bad Köstritz	3,571
C7	1,435.84	Kroppenstedt	1,440

Table 8-3. Representative cities for the example simulations.

It shall be noted that for the simulations conducted in the scope of the present thesis, neither tourists were added to the population numbers nor a modulation of the population numbers were applied, in order to keep the representative character of the chosen cities. Figure 8-1 shows the O.R.C.U.S. map image for city type R71 Cologne and the projected flight path. Figure 8-2 presents the O.R.C.U.S. map image for city type R77 Georgensgmünd. As can be seen within the image, the city does cover only the minority of the map image. Therefore, the *MapOverlay* function was applied (cf. chapters 7.2.2 and 7.2.7). Figure 8-1 and Figure 8-2 shall serve as an exemplary only. Chapter 11.3 contains images of all fourteen example areas with all parameters that were applied for the specific area.

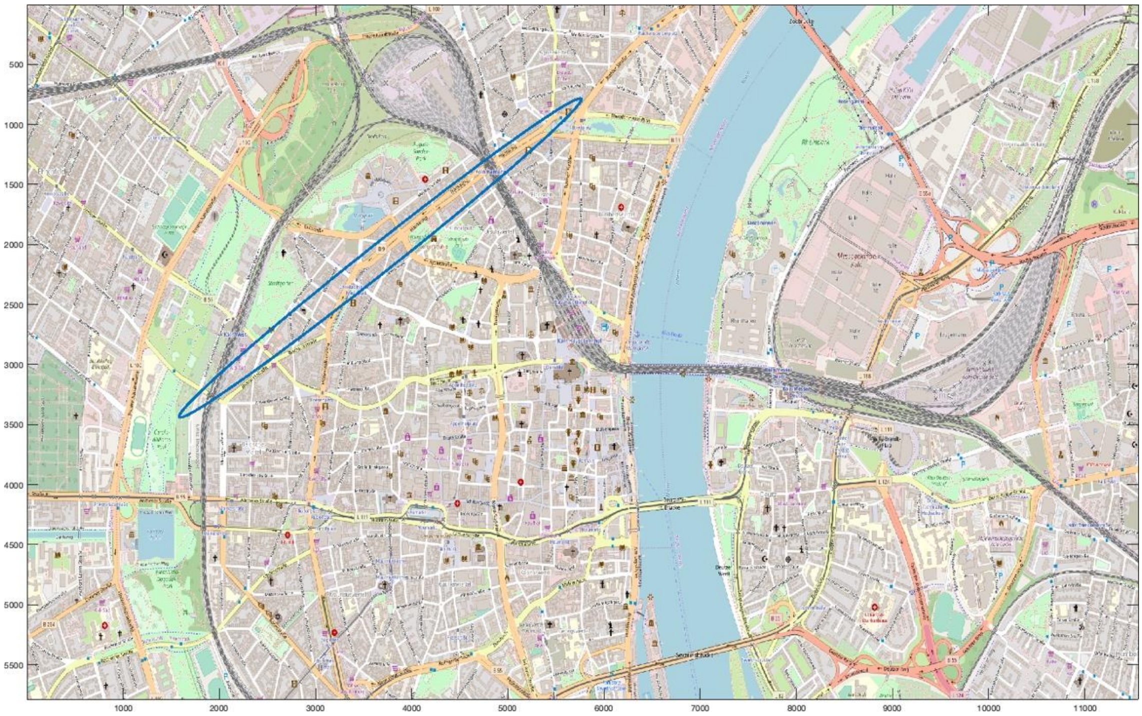


Figure 8-1. Cologne with flight path for example UAS operation.

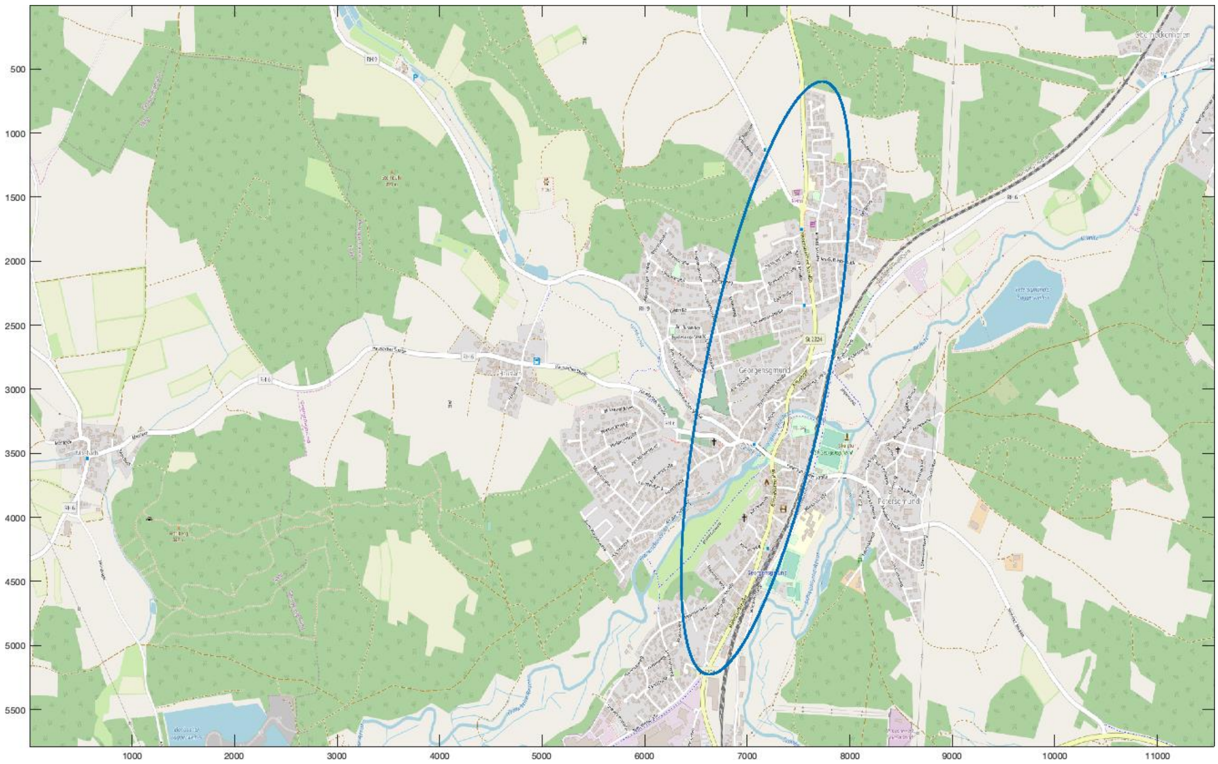


Figure 8-2. Georgensgmünd with flight path for example UAS operation.

Every example area was transferred into an O.R.C.U.S. map struct. Afterwards, the simulation runs were executed. In order to obtain valid results and also to explore the robustness of O.R.C.U.S., it was decided to set up a high initial number of samples. Therefore, for each phase $n_{Probes0}$ was set to 200 amending the values outlined in Table 8-1.

Based on the defined rules for the determination for the number of samples (cf. chapter 7.2.8), this decision resulted in a total relevant number of simulation samples per city of $n_{Probes_{Phase1}} =$ 1,400 and $n_{Probes_{Phase2}} =$ 200. The relevant number of samples is the basis for the resulting absolute number of simulated flight hours N_{simFh}. Equations (8-1) to (8-3) present the calculation of this number for both phases of the example. The number of simulated flight hours will later serve as coupling to the driving airworthiness requirement P_{CumCat}.

$$N_{simDay_{UA}} = n_{Probes} \cdot Day_{UA} \tag{8-1}$$

$$N_{simFh} = t_{Miss} \cdot N_{simDay_{UA}} \tag{8-2}$$

$$\begin{aligned} N_{simFh_{Phase1}} &= 14 \cdot 1400 \cdot 1 = 19{,}600\ [\mathrm{Fh}] \\ N_{simFh_{Phase2}} &= 14 \cdot 200 \cdot 7 = 19{,}600\ [\mathrm{Fh}] \end{aligned} \tag{8-3}$$

With these remarks, the summary of the example UAS operations which were used to apply O.R.C.U.S. is completed. In the next chapter the conclusive results of all simulations will be presented.

8.2 Simulation Results

Before presenting the results of the two phases with the entire 28 simulation series, it is necessary to provide some clarification. As discussed, one driving airworthiness criterion for the overall safety of a UAS is P_{CumCat}. Therefore, one good possibility to assess the results is to calculate a relative difference between the number of events per simulated flight hour with the assumed P_{CumCat} of the simulated UAS. This dimensionless factor will be called “Delta (Δ)”. In addition, the same difference can be calculated for the number of actual hits during the events. Equations (8-4) to (8-7) present the calculation method. Note that the equations include the formulation for the probability of an event P_{Event} and the probability that a person got hit P_{Hit} during a simulation series. Both probabilities have the unit $[1/\mathrm{Fh}]$.

$$P_{Event} = N_{Events}/N_{simFh} \tag{8-4}$$

$$P_{Hit} = N_{Hits}/N_{simFh} \tag{8-5}$$

$$\Delta_{Event} = \left(1 - \frac{P_{Event}}{P_{CumCat}}\right) \cdot 100 \tag{8-6}$$

$$\Delta_{Hit} = \left(1 - \frac{P_{Hit}}{P_{CumCat}}\right) \cdot 100 \tag{8-7}$$

The relative difference Delta Δ factor can be further differentiated into hits at building sites and hits of people on the way, which is shown by equations (8-8) and (8-9).

$$\Delta_{HitATB} = \left(1 - \frac{P_{HitATB}}{P_{CumCat}}\right) \cdot 100 \tag{8-8}$$

$$\Delta_{HitOTW} = \left(1 - \frac{P_{HitOTW}}{P_{CumCat}}\right) \cdot 100 \tag{8-9}$$

If Delta is a negative value, the simulation series indicated that the intended UAS mission would impose an operational risk which is of this factor worse than the estimated P_{CumCat}. If the relative difference has a positive value, the simulation series indicated that the intended UAS mission would impose an operational risk which is of factor Delta times better than the estimated P_{CumCat}.

A special case is given if no event or hit occurred during a simulation series. Consequently, equations (8-6) to (8-9) will give back the value “100”. This usually can happen in the following cases:

a) The assumed P_{CumCat} is very low, e.g. in the order of 10^{-4} [1/Fh] or less and it is unlikely that the UA crashes.
b) The operation takes place over sparsely populated areas and it is unlikely that in case of a UA crash someone gets hit.
c) The combination of a) and b).

In such a case, the resulting expected operational risk given by the simulation can be probably be seen as sufficiently low. Nevertheless, such a case requires a careful interpretation. The details which led to the specific Delta value should be inspected in order to avoid shortfalls.

Before entering these values, it is worth to have a look at the resulting validation parameters from the t-Test. Table 8-4 and Table 8-5 present the all parameters. The tables are further illustrated by Figure 8-3 and Figure 8-4. The two figures include two horizontal lines to indicate the two critical t-values, defined in Table 7-12, in order to show whether or not the specific simulation series has passed the critical value. Note that the standard deviation is related to the entire simulation series consisting of n samples with respect to the mean value $\bar{x}$.

As can be seen in Table 8-4, Figure 8-3, Table 8-5 and Figure 8-4, every simulation series passed the critical *t*-values. Because of the different number of probes, the *t*-values are in phase 1 significantly higher than in phase 2. Along with the calculation of the t-Test values, the variance was calculated for all simulation series. Table 8-4 and Table 8-5 include these values, which are differentiated again into the parts ATB, OTW and Series. With exemption for the results of Cologne and Frankfurt, the standard deviation for the validation proof of all simulation series is low.

Area	*Short*	t_{ATB}	s_{ATB}	t_{OTW}	s_{OTW}	t_{Series}	s_{Series}
Cologne	CGN	35.467	1.179	34.781	0.276	36.100	1.435
Saarbrücken	SBN	33.633	0.401	31.625	0.097	34.675	0.489
Gröbenzell	GBZ	33.352	0.272	28.756	0.066	33.978	0.334
Arnstein	ASN	24.356	0.189	22.561	0.036	27.424	0.21
Ibbenbueren	IBN	33.216	0.245	15.260	0.021	33.580	0.263
Eberbach	EBH	31.223	0.233	28.705	0.064	32.891	0.288
Georgensgmünd	GMD	22.456	0.067	25.408	0.043	28.927	0.103
Frankfurt a.M.	FRA	35.009	1.015	33.145	0.192	35.527	1.189
Hagen	HGN	32.555	0.31	30.998	0.101	34.168	0.398
Aalen	ALN	31.376	0.241	26.996	0.051	32.939	0.283
Schwedt/Oder	SOR	26.043	0.078	7.808	0.017	27.670	0.092
Kemberg	KBG	22.110	0.099	25.818	0.043	28.033	0.132
Bad Köstritz	BKZ	24.709	0.145	19.009	0.027	27.073	0.165
Kroppenstedt	KST	2.907	0.018	11.664	0.034	18.533	0.045

Table 8-4. Phase 1 simulation series *t*-values and standard deviation.

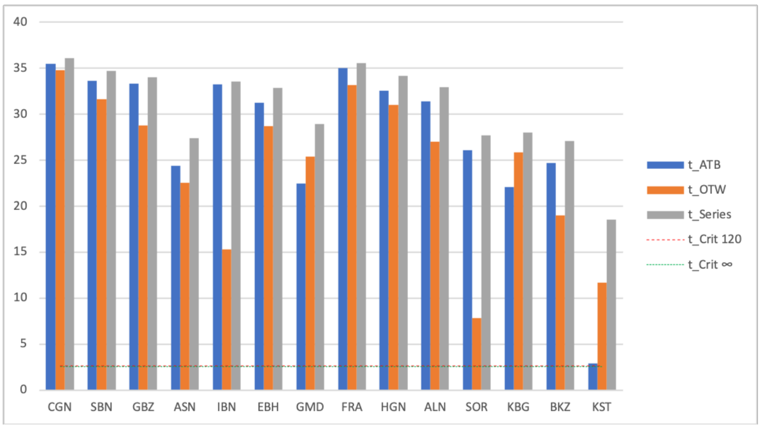


Figure 8-3. *t*-Test results phase 1.

Area	*Short*	t_{ATB}	s_{ATB}	t_{OTW}	s_{OTW}	t_{Series}	s_{Series}
Cologne	CGN	14.961	8.456	14.872	1.683	14.990	10.118
Saarbrücken	SBN	14.781	2.674	14.493	0.454	14.842	3.116
Gröbenzell	GBZ	14.807	2.101	14.468	0.362	14.849	2.457
Arnstein	ASN	13.822	0.921	13.994	0.227	14.231	1.128
Ibbenbueren	IBN	14.565	0.995	14.003	0.182	14.649	1.173
Eberbach	EBH	14.435	1.925	14.428	0.426	14.624	2.331
Georgensgmünd	GMD	14.389	0.609	14.260	0.258	14.639	0.860
Frankfurt a.M.	FRA	14.977	9.490	14.904	1.656	15.001	11.129
Hagen	HGN	14.655	1.867	14.755	0.700	14.824	2.552
Aalen	ALN	14.772	1.934	14.538	0.428	14.868	2.349
Schwedt/Oder	SOR	14.296	0.519	13.337	0.122	14.461	0.636
Kemberg	KBG	13.839	0.547	14.413	0.309	14.444	0.842
Bad Köstritz	BKZ	13.797	1.051	13.248	0.117	14.005	1.156
Kroppenstedt	KST	11.642	0.091	12.151	0.093	13.172	0.177

Table 8-5. Phase 2 simulation series *t*-values and standard deviation.

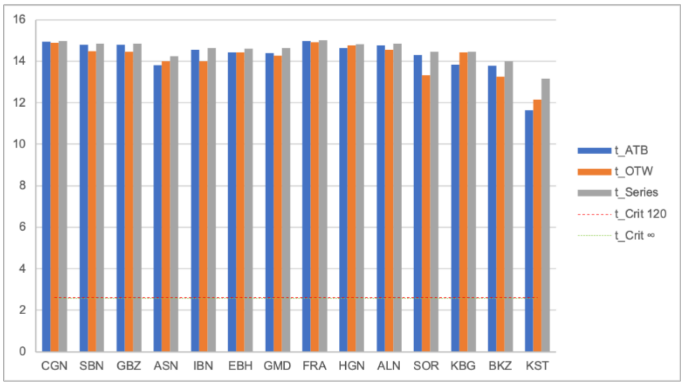


Figure 8-4. *t*-Test results phase 2.

While almost all simulation series resulted for both phases in very high *t*-values, it is noteworthy the series conducted above Schwedt/Oder in phase 1 resulted in a very low *t*-value for the ATB part and for the series above Kroppenstedt in a low t-value for the ATB part respectively. Although these *t*-values are lower than expected, the critical *t*-values were passed. Furthermore, the overall *t*-values for the series are more than sufficient and therefore, both simulation series can be treated as valid.

Now that it was shown that all simulation series can be treated as valid, the following tables will summarize the results with respect to the complete simulation series above the specific area. Table 8-6 to Table 8-8 show the results of the first phase of the example UAS operation and Table 8-9 to Table 8-11 show the results of the second phase of the example UAS operation.

For both phases, three tables are presented. At first the general results are shown for each phase without further disambiguation regarding aspects if a hit occurred in the outside (OTW) or in a sheltered area (ATB). In the second step, a differentiation is done with respect to the place where a hit occurred including a disambiguation if a hit occurred in the surrounding map or in the core city overflown by the UA, if applicable.

The tables are complemented by Figure 8-5 to Figure 8-12 in order to provide a graphical illustration of the results with respect to the relative difference of events and hits shown in equations (8-6) to (8-9). Please note that the dashed lines do not represent a mathematical function, they are only for illustrative purposes.

Area	N_{Events} [/]	P_{Event} [1/Fh]	Δ_{Event} [/]	$N_{HitsTotal}$ [/]	$P_{HitTotal}$ [1/Fh]	$\Delta_{HitTotal}$ [/]
Cologne	217	$1.11 \cdot 10^{-02}$	-10.71	1,952	$9.96 \cdot 10^{-02}$	-895.92
Saarbrücken	180	$9.18 \cdot 10^{-03}$	8.16	648	$3.31 \cdot 10^{-02}$	-230.61
Gröbenzell	185	$9.44 \cdot 10^{-03}$	5.61	439	$2.24 \cdot 10^{-02}$	-123.98
Arnstein	188	$9.59 \cdot 10^{-03}$	4.08	230	$1.17 \cdot 10^{-02}$	-17.35
Ibbenbueren	175	$8.93 \cdot 10^{-03}$	10.71	345	$1.76 \cdot 10^{-02}$	-76.02
Eberbach	191	$9.74 \cdot 10^{-03}$	2.55	369	$1.88 \cdot 10^{-02}$	-88.27
Georgensgmünd	193	$9.85 \cdot 10^{-03}$	1.53	125	$6.38 \cdot 10^{-03}$	36.22
Frankfurt a.M.	188	$9.59 \cdot 10^{-03}$	4.08	1595	$8.14 \cdot 10^{-02}$	-713.78
Hagen	199	$1.02 \cdot 10^{-02}$	-1.53	523	$2.67 \cdot 10^{-02}$	-166.84
Aalen	186	$9.49 \cdot 10^{-03}$	5.10	363	$1.85 \cdot 10^{-02}$	-85.20
Schwedt/Oder	193	$9.85 \cdot 10^{-03}$	1.53	109	$5.56 \cdot 10^{-03}$	44.39
Kemberg	215	$1.10 \cdot 10^{-02}$	-9.69	152	$7.76 \cdot 10^{-03}$	22.45
Bad Köstritz	190	$9.69 \cdot 10^{-03}$	3.06	181	$9.23 \cdot 10^{-03}$	7.65
Kroppenstedt	220	$1.12 \cdot 10^{-02}$	-12.24	45	$2.30 \cdot 10^{-03}$	77.04

Table 8-6. Phase 1 simulation series general results.

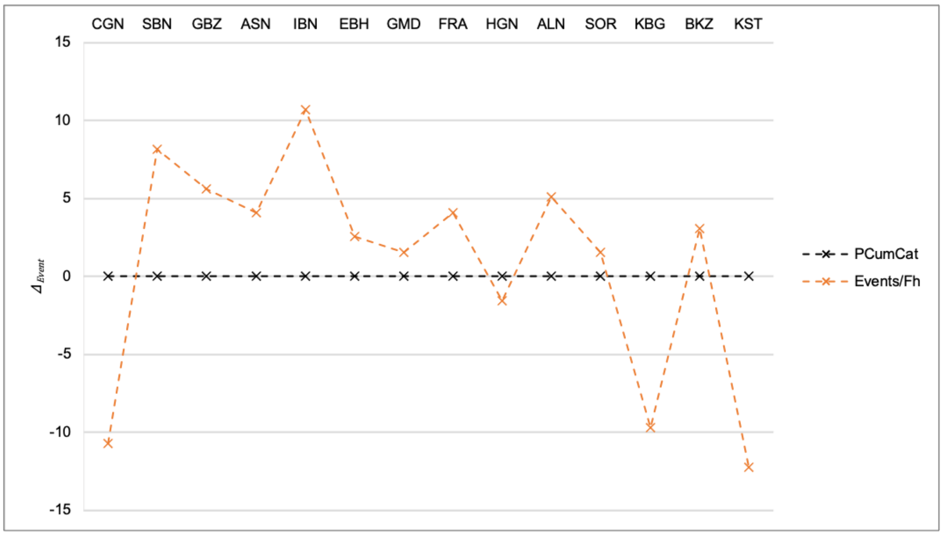


Figure 8-5. Phase 1 relative difference Delta of Events.

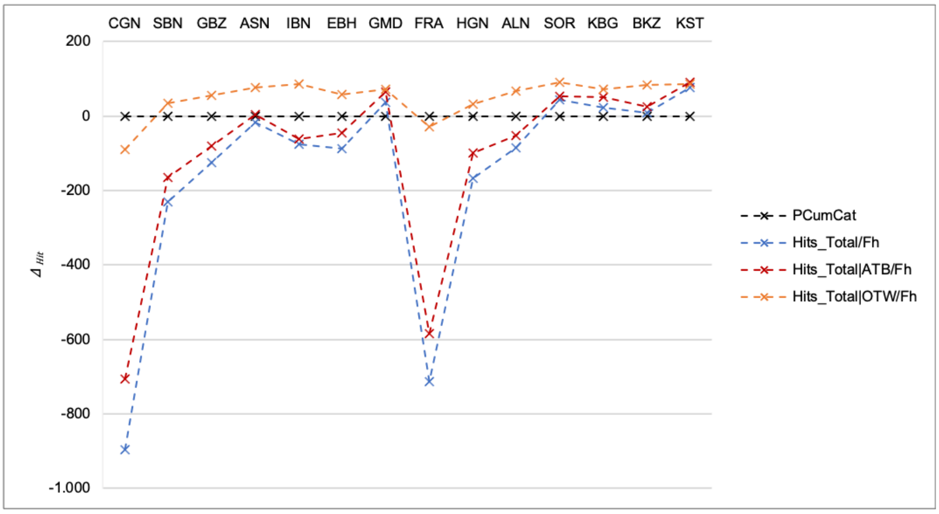


Figure 8-6. Phase 1 relative difference Delta of Total Hits ATB and OTW.

		City / Sub Map Polygon			*Surrounding Map*		
Area	*SMP/ SurM*	$N_{HitsATB}$ [/]	P_{HitATB} $[1/Fh]$	Δ_{HitATB} [/]	$N_{HitsATB}$ [/]	P_{HitATB} $[1/Fh]$	Δ_{HitATB} [/]
Cologne	No	1,579	$8.06 \cdot 10^{-02}$	-705.61	N/A	N/A	N/A
Saarbrücken	No	519	$2.65 \cdot 10^{-02}$	-164.80	N/A	N/A	N/A
Gröbenzell	Yes	354	$1.81 \cdot 10^{-02}$	-80.61	0	0	100.00
Arnstein	Yes	160	$8.16 \cdot 10^{-03}$	18.37	26	$1.33 \cdot 10^{-03}$	86.73
Ibbenbueren	No	319	$1.63 \cdot 10^{-02}$	-62.76	N/A	N/A	N/A
Eberbach	Yes	286	$1.46 \cdot 10^{-02}$	-45.92	0	0	100.00
Georgensgmünd	Yes	70	$3.57 \cdot 10^{-03}$	64.29	0	0	100.00
Frankfurt a.M.	No	1,343	$6.85 \cdot 10^{-02}$	-585.20	N/A	N/A	N/A
Hagen	No	392	$2.00 \cdot 10^{-02}$	-100.00	N/A	N/A	N/A
Aalen	No	297	$1.52 \cdot 10^{-02}$	-51.53	N/A	N/A	N/A
Schwedt/Oder	No	90	$4.59 \cdot 10^{-03}$	54.08	N/A	N/A	N/A
Kemberg	Yes	96	$4.90 \cdot 10^{-03}$	51.02	0	0	100.00
Bad Köstritz	Yes	148	$7.55 \cdot 10^{-03}$	24.49	0	0	100.00
Kroppenstedt	Yes	16	$8.16 \cdot 10^{-04}$	91.84	0	0	100.00

Table 8-7. Phase 1 simulation series SMP/SurM ATB results.

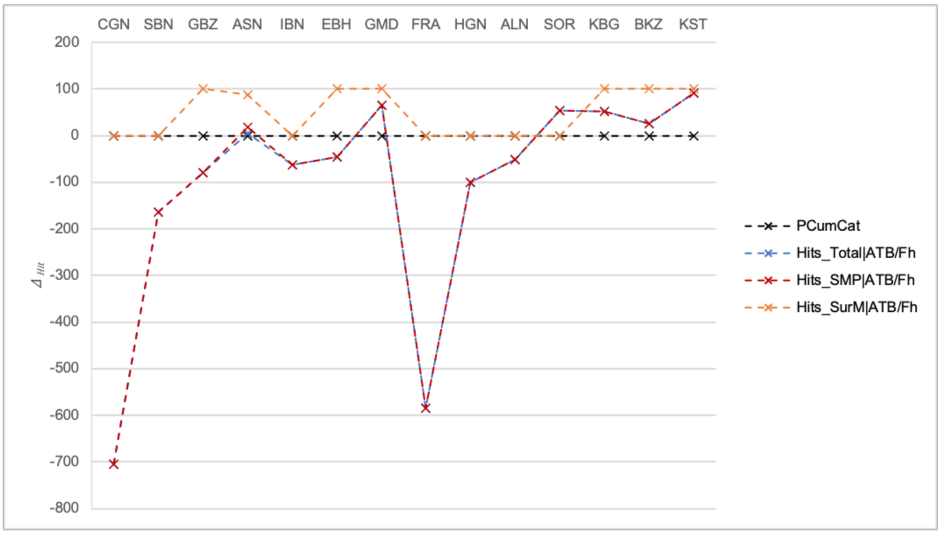


Figure 8-7. Phase 1 relative difference Delta of all Hits ATB.

		City / Sub Map Polygon			*Surrounding Map*		
Area	*SMP/ SurM*	$N_{HitsOTW}$ [/]	P_{HitOTW} $[1/Fh]$	Δ_{HitOTW} [/]	$N_{HitsOTW}$ [/]	P_{HitOTW} $[1/Fh]$	Δ_{HitOTW} [/]
Cologne	No	373	$1.90 \cdot 10^{-02}$	-90.31	N/A	N/A	N/A
Saarbrücken	No	129	$6.58 \cdot 10^{-03}$	34.18	N/A	N/A	N/A
Gröbenzell	Yes	79	$4.03 \cdot 10^{-03}$	59.69	6	$3.06 \cdot 10^{-04}$	96.94
Arnstein	Yes	40	$2.04 \cdot 10^{-03}$	79.59	4	$2.04 \cdot 10^{-04}$	97.96
Ibbenbueren	No	26	$1.33 \cdot 10^{-03}$	86.73	N/A	N/A	N/A
Eberbach	Yes	83	$4.23 \cdot 10^{-03}$	57.65	0	0	100.00
Georgensgmünd	Yes	52	$2.65 \cdot 10^{-03}$	73.47	3	$1.53 \cdot 10^{-04}$	98.47
Frankfurt a.M.	No	252	$1.29 \cdot 10^{-02}$	-28.57	N/A	N/A	N/A
Hagen	No	131	$6.68 \cdot 10^{-03}$	33.16	N/A	N/A	N/A
Aalen	No	66	$3.37 \cdot 10^{-03}$	66.33	N/A	N/A	N/A
Schwedt/Oder	No	19	$9.69 \cdot 10^{-04}$	90.31	N/A	N/A	N/A
Kemberg	Yes	53	$2.70 \cdot 10^{-03}$	72.96	3	$1.53 \cdot 10^{-04}$	98.47
Bad Köstritz	Yes	32	$1.63 \cdot 10^{-03}$	83.67	1	$5.10 \cdot 10^{-05}$	99.49
Kroppenstedt	Yes	8	$4.08 \cdot 10^{-04}$	95.92	21	$1.07 \cdot 10^{-03}$	89.29

Table 8-8. Phase 1 simulation series SMP/SurM OTW results.

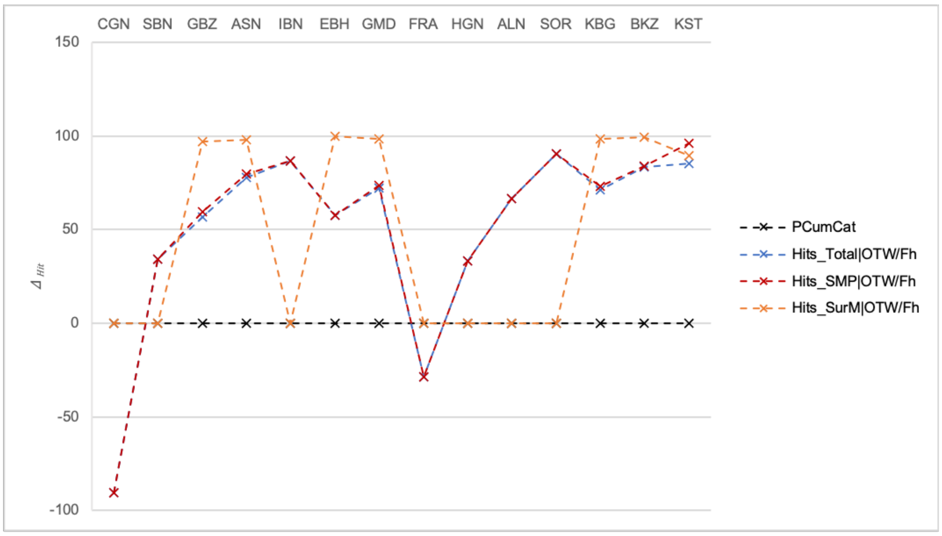


Figure 8-8. Phase 1 relative difference Delta of all Hits OTW.

Area	N_{Events} [/]	P_{Event} [1/Fh]	Δ_{Event} [/]	$N_{HitsTotal}$ [/]	$P_{HitTotal}$ [1/Fh]	$\Delta_{HitTotal}$ [/]
Cologne	223	$1.14 \cdot 10^{-02}$	-13.78	2,147	$1.10 \cdot 10^{-01}$	-995.41
Saarbrücken	217	$1.11 \cdot 10^{-02}$	-10.71	656	$3.35 \cdot 10^{-02}$	-234.69
Gröbenzell	202	$1.03 \cdot 10^{-02}$	-3.06	518	$2.64 \cdot 10^{-02}$	-164.29
Arnstein	195	$9.95 \cdot 10^{-03}$	0.51	229	$1.17 \cdot 10^{-02}$	-16.84
Ibbenbueren	203	$1.04 \cdot 10^{-02}$	-3.57	245	$1.25 \cdot 10^{-02}$	-25.00
Eberbach	184	$9.39 \cdot 10^{-03}$	6.12	484	$2.47 \cdot 10^{-02}$	-146.94
Georgensgmünd	195	$9.95 \cdot 10^{-03}$	0.51	180	$9.18 \cdot 10^{-03}$	8.16
Frankfurt a.M.	198	$1.01 \cdot 10^{-02}$	-1.02	2,363	$1.21 \cdot 10^{-01}$	-1105.61
Hagen	209	$1.07 \cdot 10^{-02}$	-6.63	537	$2.74 \cdot 10^{-02}$	-173.98
Aalen	200	$1.02 \cdot 10^{-02}$	-2.04	496	$2.53 \cdot 10^{-02}$	-153.06
Schwedt/Oder	213	$1.09 \cdot 10^{-02}$	-8.67	132	$6.73 \cdot 10^{-03}$	32.65
Kemberg	228	$1.16 \cdot 10^{-02}$	-16.33	174	$8.88 \cdot 10^{-03}$	11.22
Bad Köstritz	193	$9.85 \cdot 10^{-03}$	1.53	231	$1.18 \cdot 10^{-02}$	-17.86
Kroppenstedt	192	$9.80 \cdot 10^{-03}$	2.04	35	$1.79 \cdot 10^{-03}$	82.14

Table 8-9. Phase 2 simulation series general results.

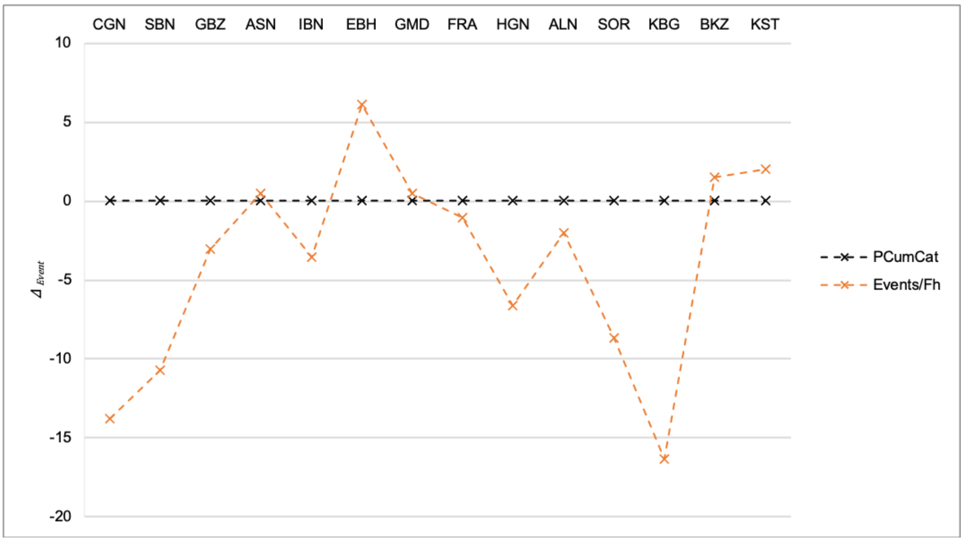


Figure 8-9. Phase 2 relative difference Delta of Events.

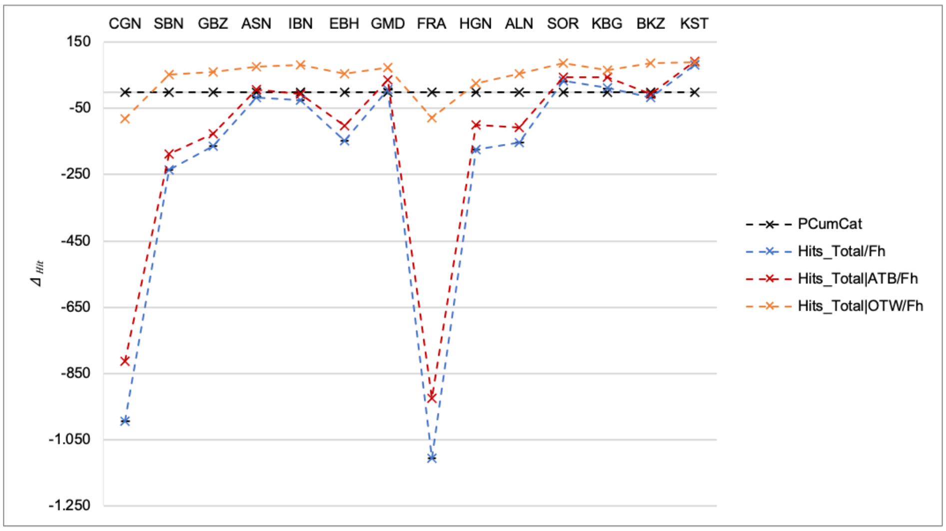


Figure 8-10. Phase 2 relative difference Delta of Total Hits ATB and OTW.

		City / Sub Map Polygon			Surrounding Map		
	SMP/ SurM	$N_{HitsATB}$ [/]	P_{HitATB} $[1/Fh]$	Δ_{HitATB} [/]	$N_{HitsATB}$ [/]	P_{HitATB} $[1/Fh]$	Δ_{HitATB} [/]
Cologne	No	1,791	$9.14 \cdot 10^{-02}$	-813.78	N/A	N/A	N/A
Saarbrücken	No	561	$2.86 \cdot 10^{-02}$	-186.22	N/A	N/A	N/A
Gröbenzell	Yes	429	$2.19 \cdot 10^{-02}$	-118.88	13	6.63^{-04}	93.37
Arnstein	Yes	182	$9.29 \cdot 10^{-03}$	7.14	0	0.00	100.00
Ibbenbueren	No	207	$1.06 \cdot 10^{-02}$	-5.61	N/A	N/A	N/A
Eberbach	Yes	395	$2.02 \cdot 10^{-02}$	-101.53	0	0.00	100.00
Georgensgmünd	Yes	126	$6.43 \cdot 10^{-03}$	35.71	0	0.00	100.00
Frankfurt a.M.	No	2,012	$1.03 \cdot 10^{-01}$	-926.53	N/A	N/A	N/A
Hagen	No	389	$1.98 \cdot 10^{-02}$	-98.47	N/A	N/A	N/A
Aalen	No	406	$2.07 \cdot 10^{-02}$	-107.14	N/A	N/A	N/A
Schwedt/Oder	No	107	$5.46 \cdot 10^{-03}$	45.41	N/A	N/A	N/A
Kemberg	Yes	109	$5.56 \cdot 10^{-03}$	44.39	0	0.00	100.00
Bad Köstritz	Yes	207	$1.06 \cdot 10^{-02}$	-5.61	0	0.00	100.00
Kroppenstedt	Yes	17	$8.67 \cdot 10^{-04}$	91.33	0	0.00	100.00

Table 8-10. Phase 2 simulation series SMP/SurM ATB results.

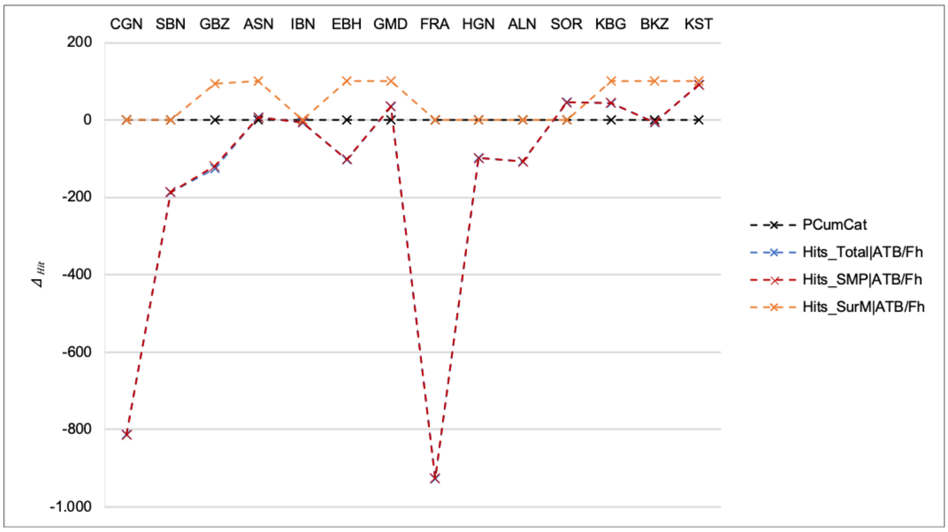


Figure 8-11. Phase 2 relative difference Delta of all Hits ATB.

		City / Sub Map Polygon			*Surrounding Map*		
Area	*SMP/ SurM*	$N_{HitsOTW}$ $[/]$	P_{HitOTW} $[1/Fh]$	Δ_{HitOTW} $[/]$	$N_{HitsOTW}$ $[/]$	P_{HitOTW} $[1/Fh]$	Δ_{HitOTW} $[/]$
Cologne	No	356	$1.82 \cdot 10^{-02}$	-81.63	N/A	N/A	N/A
Saarbrücken	No	95	$4.85 \cdot 10^{-03}$	51.53	N/A	N/A	N/A
Gröbenzell	Yes	73	$3.72 \cdot 10^{-03}$	62.76	3	$1.53 \cdot 10^{-04}$	98.47
Arnstein	Yes	38	$1.94 \cdot 10^{-03}$	80.61	9	$4.59 \cdot 10^{-04}$	95.41
Ibbenbueren	No	38	$1.94 \cdot 10^{-03}$	80.61	N/A	N/A	N/A
Eberbach	Yes	87	$4.44 \cdot 10^{-03}$	55.61	2	$1.02 \cdot 10^{-04}$	98.98
Georgensgmünd	Yes	50	$2.55 \cdot 10^{-03}$	74.49	4	$2.04 \cdot 10^{-04}$	97.96
Frankfurt a.M.	No	351	$1.79 \cdot 10^{-02}$	-79.08	N/A	N/A	N/A
Hagen	No	148	$7.55 \cdot 10^{-03}$	24.49	N/A	N/A	N/A
Aalen	No	90	$4.59 \cdot 10^{-03}$	54.08	N/A	N/A	N/A
Schwedt/Oder	No	25	$1.28 \cdot 10^{-03}$	87.24	N/A	N/A	N/A
Kemberg	Yes	62	$3.16 \cdot 10^{-03}$	68.37	3	$1.53 \cdot 10^{-04}$	98.47
Bad Köstritz	Yes	23	$1.17 \cdot 10^{-03}$	88.27	1	$5.10 \cdot 10^{-05}$	99.49
Kroppenstedt	Yes	12	$6.12 \cdot 10^{-04}$	93.88	6	$3.06 \cdot 10^{-04}$	96.94

Table 8-11. Phase 2 simulation series SMP/SurM OTW results.

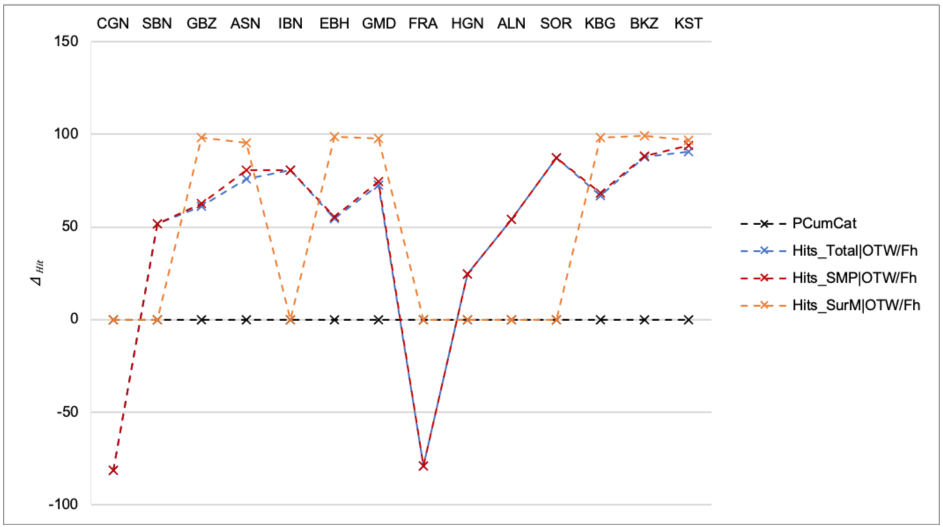


Figure 8-12. Phase 2 relative difference Delta of all Hits OTW.

Table 8-4 to Table 8-11 and Figure 8-5 to Figure 8-12 summarized the core results the in total twenty-eight simulation series. Within the next and final chapter of this part, the results will be discussed.

8.3 Discussion

To start the discussion about the results and for the further deductions regarding the research questions, a first look is given on the general number of events that occurred during a simulation series.

For both phases, the fraction between N_{Events} and the total number of simulated flight hours N_{Fh} has a maximum relative difference of < 20, while the majority of Delta values lie within a range of – 8 to 10. For phase 1, the mean of all occurred events during all simulation runs is 194.29 leading to a Delta to the assumed cumulative probability of a catastrophic event of 0.875 only. For phase 2 the mean number of all occurred events is 203.71, which leads to relative difference of – 3.94. Based on the small deviations to P_{CumCat} with regard to the simulated amount of flight hours in the individual simulation series, it can be said, that the applied algorithms to determine if a failure occurred or not within the UA worked as expected. With respect to the aspect that the mean of all simulation series is very close to P_{CumCat} this deduction is further supported.

While the Δ_{Events} remained close to the driving comparative airworthiness requirement P_{CumCat}, the relative difference between hit persons after an impact and P_{CumCat} did not. In both phases, there were significant differences between the expected number of fatalities per flight hour based on the assumed P_{CumCat} and the resulting numbers from the simulations. For example, the simulation series above Cologne resulted in a total relative difference of $\Delta_{Hits}=$ – 895.92 for phase one. A UAS operation that would impose such a high risk compared to the assumed P_{CumCat} would hardly get an authorization. On second look, with respect to the ATB and OTW differentiation, $\Delta_{HitsATB}$ remained at a high negative value of – 705.61, and $\Delta_{HitsOTW}$ turned to – 90.31. By assuming the total number of hits without regard if the people hit were under shelter or not, the cumulative probability would be $9.96 \cdot 10^{-02}$ [1/Fh] instead of the expected $1.0 \cdot 10^{-02}$ [1/Fh] of P_{CumCat}. For people at buildings and therefore sheltered, this number would have to be assumed as $8.06 \cdot 10^{-02}$ [1/Fh] based on the simulation results. And for unsheltered people, the result of the simulation runs for Cologne were $1.90 \cdot 10^{-02}$ [1/Fh] instead of the expected $1.0 \cdot 10^{-02}$ [1/Fh]. All values are basically unacceptable from an airworthiness point of view if they are seen equal to P_{CumCat}, yet, especially for the OTW part, there might be room to lower this value by adequate measures.

Nevertheless, not only the phase 1 simulation series above Cologne showed such differences. But not only in a negative way. In particular, for people in the unprotected outside, the resulting values are promising for the vast majority of simulation series. The simulation series with the highest negative differences were Cologne and Frankfurt. By excluding them, the remaining results can be shown better, which are presented in Figure 8-13 and Figure 8-14.

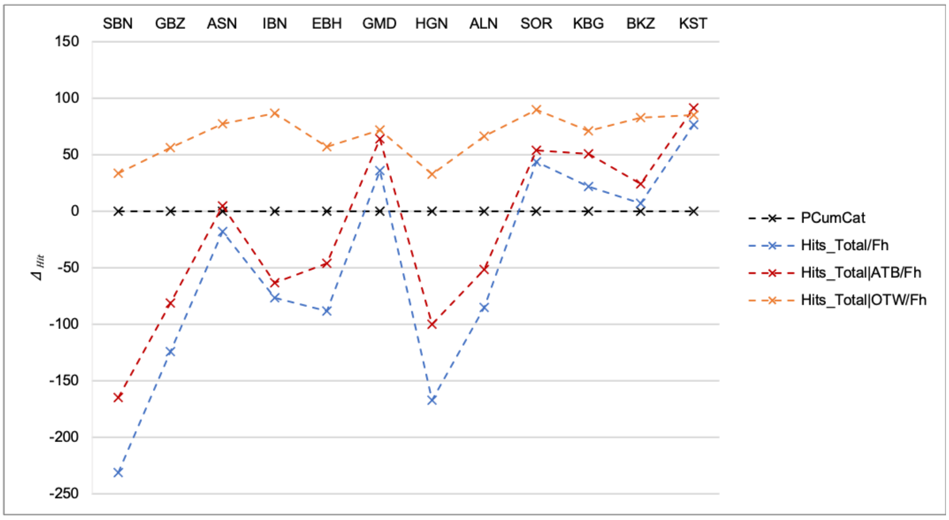


Figure 8-13. Phase 1 relative difference Delta without CGN and FRA.

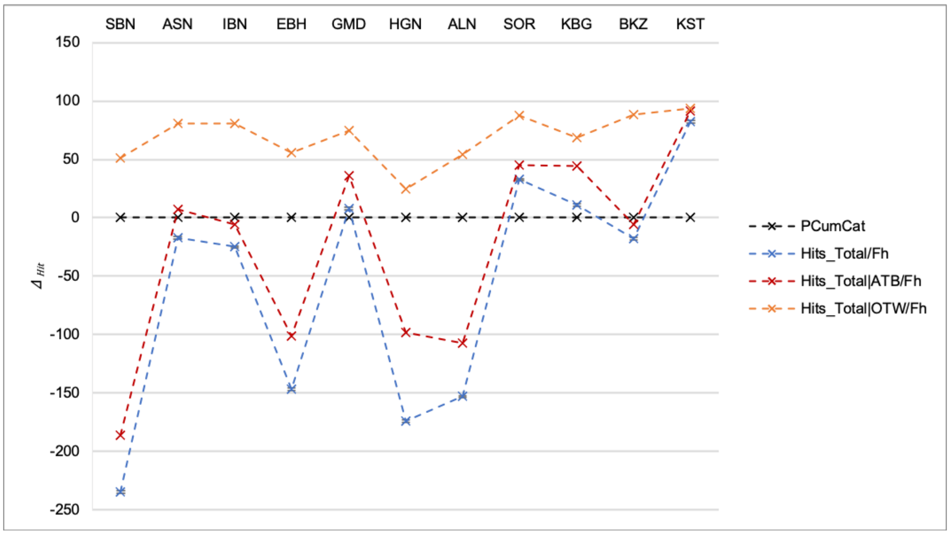


Figure 8-14. Phase 2 relative difference Delta without CGN and FRA.

The exclusion of the two extreme results from the simulation series above Cologne and Frankfurt given in Figure 8-13 and Figure 8-14 allow a focus on the most relevant aspect of people hit in the outside and the according relative difference to P_{CumCat}. As can be seen within these two figures, the resulting cumulative probabilities per flight hour of people get hit in the unprotected outside $P_{HitsOTW}$ are much lower than the assumed P_{CumCat} of $1.0 \cdot 10^{-02}$ [1/Fh].

The negative peaks of the simulation series above Cologne and Frankfurt are remarkable. However, the standard deviations of those simulation series calculated by the evaluation function gave an indication that such a difference could reasonably occur. The obvious trace-back of Δ_{Hits} for the mission areas Cologne and Frankfurt are the high population densities and high inhabitant numbers of the cities itself.

For a further interpretation of the results, it was decided to generate confidence bounds for the total mean probabilities of a hit. The confidence bounds are intended to classify the resulting P_{Hit} with respect to the extrema which still could be acceptable from a statistical point of view. Based on the number of samples, a normal distribution can be assumed. To calculate the confidence bounds, it is necessary to estimate the standard deviation of the simulation series mean. This estimation is done by dividing the standard deviation of an entire simulation series from the afore performed t-Test with the square root of number of samples. Equations (8-10) to (8-12) show these relations which are based on [218]. Note that in case a submap is present, these total values are composed out of the addition between the submap and surrounding map values. Again, α is set to 1 % in order to achieve a 99 % confidence interval. The resulting confidence bounds are shown in Table 8-12 to Table 8-15.

$$s_{\bar{x}} = \frac{s}{\sqrt{n}} \tag{8-10}$$

$$C_{Lo} = \bar{x} - z_{1-\frac{\alpha}{2}} \cdot s_{\bar{x}} = \bar{x} - 2.576 \cdot s_{\bar{x}} \tag{8-11}$$

$$C_{Up} = \bar{x} + z_{1-\alpha/2} \cdot s_{\bar{x}} = \bar{x} + 2.576 \cdot s_{\bar{x}} \tag{8-12}$$

Please note, that due to the confidence bound calculation equations, also negative values might occur. As probability values cannot be negative, should be treated as zero. Within the following tables and figures, for the sake of completeness, the original results are shown, including negative values.

Area	*SMP/ SurM*	$\bar{x} = P_{HitATB}$ [1/Fh]	$s_{\bar{x}}$ [1/Fh]	C_{Lo} [1/Fh]	C_{Up} [1/Fh]
Cologne	No	$8.06 \cdot 10^{-02}$	$8.42 \cdot 10^{-04}$	$7.84 \cdot 10^{-02}$	$8.27 \cdot 10^{-02}$
Saarbrücken	No	$2.65 \cdot 10^{-02}$	$2.87 \cdot 10^{-04}$	$2.57 \cdot 10^{-02}$	$2.72 \cdot 10^{-02}$
Gröbenzell	Yes	$1.81 \cdot 10^{-02}$	$1.95 \cdot 10^{-04}$	$1.76 \cdot 10^{-02}$	$1.86 \cdot 10^{-02}$
Arnstein	Yes	$9.49 \cdot 10^{-03}$	$1.35 \cdot 10^{-04}$	$9.14 \cdot 10^{-03}$	$9.84 \cdot 10^{-03}$
Ibbenbueren	No	$1.63 \cdot 10^{-02}$	$1.75 \cdot 10^{-04}$	$1.58 \cdot 10^{-02}$	$1.67 \cdot 10^{-02}$
Eberbach	Yes	$1.46 \cdot 10^{-02}$	$1.66 \cdot 10^{-04}$	$1.42 \cdot 10^{-02}$	$1.50 \cdot 10^{-02}$
Georgensgmünd	Yes	$3.57 \cdot 10^{-03}$	$4.76 \cdot 10^{-05}$	$3.45 \cdot 10^{-03}$	$3.69 \cdot 10^{-03}$
Frankfurt a.M.	No	$6.85 \cdot 10^{-02}$	$7.25 \cdot 10^{-04}$	$6.67 \cdot 10^{-02}$	$7.04 \cdot 10^{-02}$
Hagen	No	$2.00 \cdot 10^{-02}$	$2.22 \cdot 10^{-04}$	$1.94 \cdot 10^{-02}$	$2.06 \cdot 10^{-02}$
Aalen	No	$1.52 \cdot 10^{-02}$	$1.72 \cdot 10^{-04}$	$1.47 \cdot 10^{-02}$	$1.56 \cdot 10^{-02}$
Schwedt/Oder	No	$4.59 \cdot 10^{-03}$	$5.57 \cdot 10^{-05}$	$4.45 \cdot 10^{-03}$	$4.74 \cdot 10^{-03}$
Kemberg	Yes	$4.90 \cdot 10^{-03}$	$7.08 \cdot 10^{-05}$	$4.72 \cdot 10^{-03}$	$5.08 \cdot 10^{-03}$
Bad Köstritz	Yes	$7.55 \cdot 10^{-03}$	$1.04 \cdot 10^{-04}$	$7.28 \cdot 10^{-03}$	$7.82 \cdot 10^{-03}$
Kroppenstedt	Yes	$8.16 \cdot 10^{-04}$	$1.31 \cdot 10^{-05}$	$7.82 \cdot 10^{-04}$	$8.50 \cdot 10^{-04}$

Table 8-12. Phase 1 simulation series ATB results confidence bounds.

Area	*SMP/ SurM*	$\bar{x} = P_{HitOTW}$ [1/Fh]	$s_{\bar{x}}$ [1/Fh]	C_{Lo} [1/Fh]	C_{Up} [1/Fh]
Cologne	No	$1.90 \cdot 10^{-02}$	$7.37 \cdot 10^{-03}$	$3.87 \cdot 10^{-05}$	$3.80 \cdot 10^{-02}$
Saarbrücken	No	$6.58 \cdot 10^{-03}$	$2.60 \cdot 10^{-03}$	$-1.09 \cdot 10^{-04}$	$1.33 \cdot 10^{-02}$
Gröbenzell	Yes	$4.34 \cdot 10^{-03}$	$1.76 \cdot 10^{-03}$	$-2.06 \cdot 10^{-04}$	$8.88 \cdot 10^{-03}$
Arnstein	Yes	$2.24 \cdot 10^{-03}$	$9.50 \cdot 10^{-04}$	$-2.02 \cdot 10^{-04}$	$4.69 \cdot 10^{-03}$
Ibbenbueren	No	$1.33 \cdot 10^{-03}$	$5.62 \cdot 10^{-04}$	$-1.20 \cdot 10^{-04}$	$2.77 \cdot 10^{-03}$
Eberbach	Yes	$4.23 \cdot 10^{-03}$	$1.72 \cdot 10^{-03}$	$-1.88 \cdot 10^{-04}$	$8.66 \cdot 10^{-03}$
Georgensgmünd	Yes	$2.81 \cdot 10^{-03}$	$1.15 \cdot 10^{-03}$	$-1.63 \cdot 10^{-04}$	$5.78 \cdot 10^{-03}$
Frankfurt a.M.	No	$1.29 \cdot 10^{-02}$	$5.13 \cdot 10^{-03}$	$-3.55 \cdot 10^{-04}$	$2.61 \cdot 10^{-02}$
Hagen	No	$6.68 \cdot 10^{-03}$	$2.70 \cdot 10^{-03}$	$-2.61 \cdot 10^{-04}$	$1.36 \cdot 10^{-02}$
Aalen	No	$3.37 \cdot 10^{-03}$	$1.38 \cdot 10^{-03}$	$-1.77 \cdot 10^{-04}$	$6.91 \cdot 10^{-03}$
Schwedt/Oder	No	$9.69 \cdot 10^{-04}$	$4.57 \cdot 10^{-04}$	$-2.09 \cdot 10^{-04}$	$2.15 \cdot 10^{-03}$
Kemberg	Yes	$2.86 \cdot 10^{-03}$	$1.16 \cdot 10^{-03}$	$-1.36 \cdot 10^{-04}$	$5.85 \cdot 10^{-03}$
Bad Köstritz	Yes	$1.68 \cdot 10^{-03}$	$7.14 \cdot 10^{-04}$	$-1.55 \cdot 10^{-04}$	$3.52 \cdot 10^{-03}$
Kroppenstedt	Yes	$1.48 \cdot 10^{-03}$	$9.19 \cdot 10^{-04}$	$-8.87 \cdot 10^{-04}$	$3.85 \cdot 10^{-03}$

Table 8-13 Phase 1 simulation series OTW results confidence bounds.

Area	*SMP/ SurM*	$\bar{x} = P_{HitATB}$ [1/Fh]	$s_{\bar{x}}$ [1/Fh]	C_{Lo} [1/Fh]	C_{Up} [1/Fh]
Cologne	No	$9.14 \cdot 10^{-02}$	0.598	-1.449	1.632
Saarbrücken	No	$2.86 \cdot 10^{-02}$	0.189	-0.458	0.516
Gröbenzell	Yes	$2.26 \cdot 10^{-02}$	0.149	-0.360	0.405
Arnstein	Yes	$9.29 \cdot 10^{-03}$	0.065	-0.158	0.177
Ibbenbueren	No	$1.06 \cdot 10^{-02}$	0.070	-0.171	0.192
Eberbach	Yes	$2.02 \cdot 10^{-02}$	0.136	-0.331	0.371
Georgensgmünd	Yes	$6.43 \cdot 10^{-03}$	0.043	-0.105	0.117
Frankfurt a.M.	No	$1.03 \cdot 10^{-01}$	0.671	-1.626	1.831
Hagen	No	$1.98 \cdot 10^{-02}$	0.132	-0.320	0.360
Aalen	No	$2.07 \cdot 10^{-02}$	0.137	-0.332	0.373
Schwedt/Oder	No	$5.46 \cdot 10^{-03}$	0.037	-0.089	0.100
Kemberg	Yes	$5.56 \cdot 10^{-03}$	0.039	-0.094	0.105
Bad Köstritz	Yes	$1.06 \cdot 10^{-02}$	0.074	-0.181	0.202
Kroppenstedt	Yes	$8.67 \cdot 10^{-04}$	0.006	-0.016	0.017

Table 8-14. Phase 2 simulation series ATB results confidence bounds.

Area	*SMP/ SurM*	$\bar{x} = P_{HtOTW}$ [1/Fh]	$s_{\bar{x}}$ [1/Fh]	C_{Lo} [1/Fh]	C_{Up} [1/Fh]
Cologne	No	$1.82 \cdot 10^{-02}$	$8.42 \cdot 10^{-03}$	$-3.51 \cdot 10^{-03}$	$3.98 \cdot 10^{-02}$
Saarbrücken	No	$4.85 \cdot 10^{-03}$	$2.27 \cdot 10^{-03}$	$-9.97 \cdot 10^{-04}$	$1.07 \cdot 10^{-02}$
Gröbenzell	Yes	$3.88 \cdot 10^{-03}$	$1.81 \cdot 10^{-03}$	$-7.81 \cdot 10^{-04}$	$8.54 \cdot 10^{-03}$
Arnstein	Yes	$2.40 \cdot 10^{-03}$	$1.14 \cdot 10^{-03}$	$-5.31 \cdot 10^{-04}$	$5.33 \cdot 10^{-03}$
Ibbenbueren	No	$1.94 \cdot 10^{-03}$	$9.09 \cdot 10^{-04}$	$-4.03 \cdot 10^{-04}$	$4.28 \cdot 10^{-03}$
Eberbach	Yes	$4.54 \cdot 10^{-03}$	$2.13 \cdot 10^{-03}$	$-9.51 \cdot 10^{-04}$	$1.00 \cdot 10^{-02}$
Georgensgmünd	Yes	$2.76 \cdot 10^{-03}$	$1.29 \cdot 10^{-03}$	$-5.66 \cdot 10^{-04}$	$6.08 \cdot 10^{-03}$
Frankfurt a.M.	No	$1.79 \cdot 10^{-02}$	$8.28 \cdot 10^{-03}$	$-3.42 \cdot 10^{-03}$	$3.92 \cdot 10^{-02}$
Hagen	No	$7.55 \cdot 10^{-03}$	$3.50 \cdot 10^{-03}$	$-1.46 \cdot 10^{-03}$	$1.66 \cdot 10^{-02}$
Aalen	No	$4.59 \cdot 10^{-03}$	$2.14 \cdot 10^{-03}$	$-9.21 \cdot 10^{-04}$	$1.01 \cdot 10^{-02}$
Schwedt/Oder	No	$1.28 \cdot 10^{-03}$	$6.10 \cdot 10^{-04}$	$-2.95 \cdot 10^{-04}$	$2.85 \cdot 10^{-03}$
Kemberg	Yes	$3.32 \cdot 10^{-03}$	$1.55 \cdot 10^{-03}$	$-6.65 \cdot 10^{-04}$	$7.30 \cdot 10^{-03}$
Bad Köstritz	Yes	$1.22 \cdot 10^{-03}$	$5.87 \cdot 10^{-04}$	$-2.88 \cdot 10^{-04}$	$2.74 \cdot 10^{-03}$
Kroppenstedt	Yes	$9.18 \cdot 10^{-04}$	$4.66 \cdot 10^{-04}$	$-2.81 \cdot 10^{-04}$	$2.12 \cdot 10^{-03}$

Table 8-15 Phase 2 simulation series OTW results confidence bounds.

To provide an improved overview of the confidence bounds, the results shown in the afore tables were plotted into diagrams with respect to the two phases and the individual P_{Hit}. As the simulations Cologne and Frankfurt lead to a distorted graph which hinders the view on the other simulations, for all graphs a second graph was generated without these two simulations. Figure 8-15 to Figure 8-18 present the comparative graphs for the ATB and OTW parts. On the left all simulation series are shown, on the right the simulation series are shown without Cologne and Frankfurt.

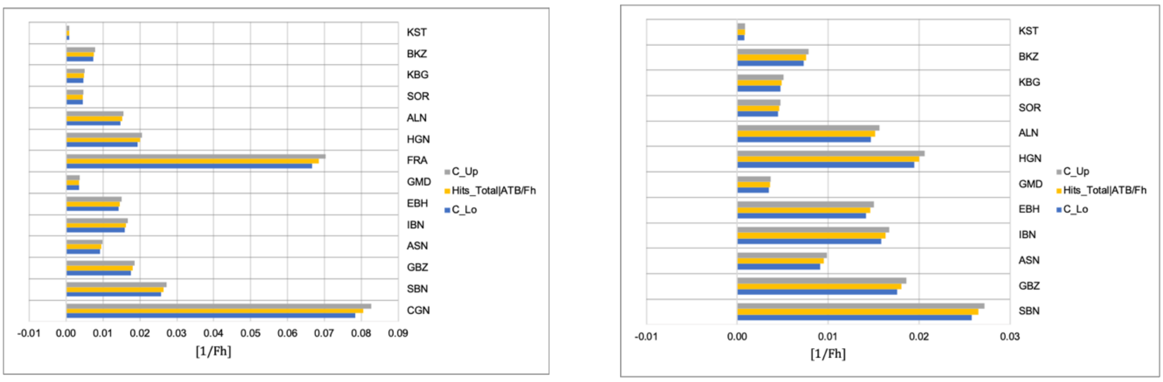


Figure 8-15. Phase 1 simulation series ATB results confidence bounds.

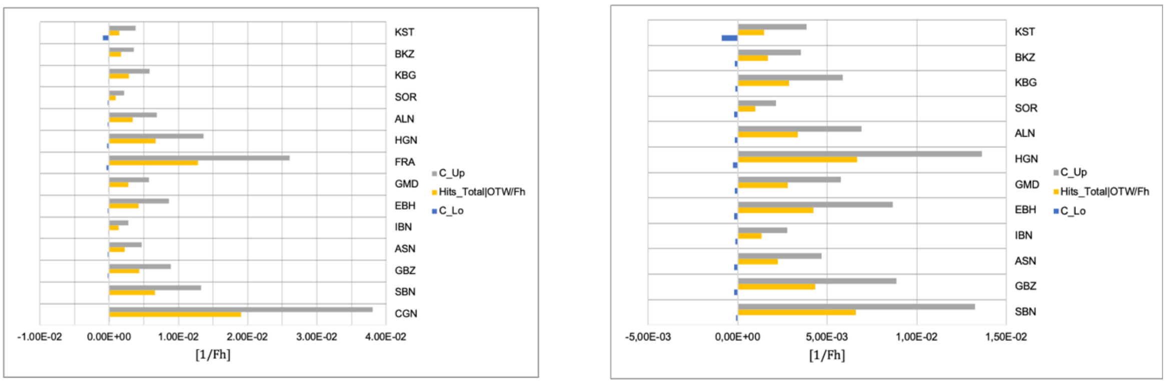


Figure 8-16. Phase 1 simulation series OTW results confidence bounds.

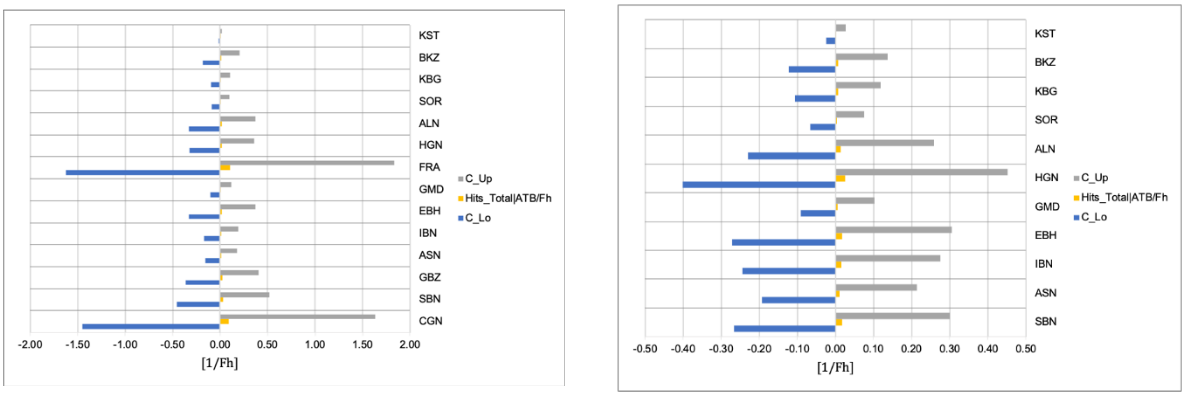


Figure 8-17. Phase 2 simulation series ATB results confidence bounds.

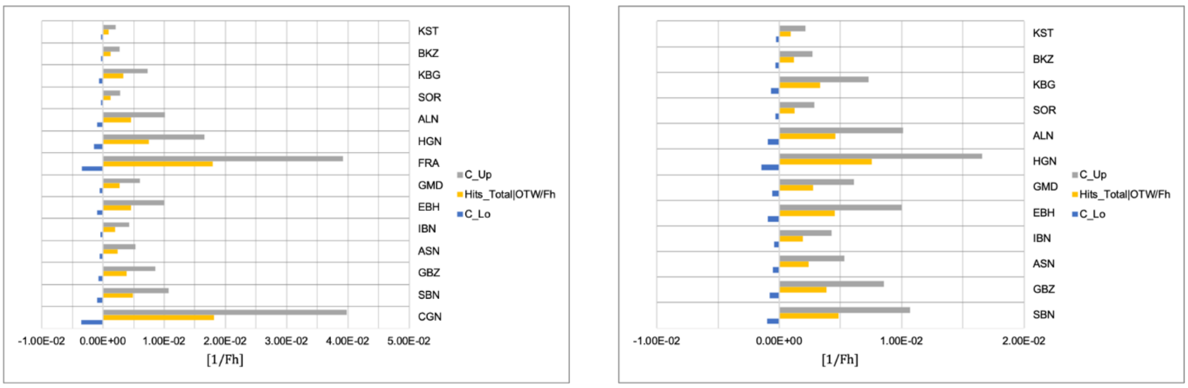


Figure 8-18. Phase 2 simulation series OTW results confidence bounds.

The graphical representation of the confidence bounds and the relation to the resulting hits show a broad range hit probabilities per hour with respect to the conducted samples which would be acceptable from the statistical point of view. As mentioned before, the negative values in the figures as well as in the tables must be treated as zero. But also, by having this in mind, the range is still broad. Obviously, in particular for the two simulations above Cologne and Frankfurt this range is very high. Noteworthy is the aspect that all resulting P_{Hit} lie within the confidence bounds. Based on the sample definition for the two phases and the resulting number of samples, the first phase shows a lower and narrower standard deviation for the mean values than the second phase does. Consequently, the confidence bounds are also closer in the first phase than in the second phase. Although the second set of simulation series impose a broader acceptable range, for both sets of simulation series, it is again shown that the probability that a person gets hit in the outside P_{HitOTW} is for the vast majority of simulation series much less than the assumed P_{CumCat}, if the two extreme results of Cologne and Frankfurt are left out.

In case the comparison between the assumed P_{CumCat} and P_{HitOTW} would be the singular metric for the authorization of the example UAS operations, it can be said, that based on the simulation results, an operation authorization could be possible for both types of example operations for all except Cologne and Frankfurt. The results clearly indicate, that even if a UAS only fulfills such an assumed worse P_{CumCat}, which even is not close to those P_{CumCat} as they are required by several airworthiness code, the expected probability that a person gets hit due to a crash during the example operations would be lower. This finding underlines the widely expectation that although a UAS, in particular light UAS, might be much less safe than a manned aircraft in terms of technical failure probability per flight hour, the risk that people get hurt due to a crash is very low.

However, the partly immense negative difference between the total P_{Hit} and P_{CumCat} and especially between P_{HitATB} and P_{CumCat} raises the question why this occurred during the simulation runs. Therefore, a review of the distribution of the different impact types and the related number of people who got hit was done. Table 8-16 and Table 8-17 summarize the number of occurred events and related impact scenarios described in chapter 7.2.5: Emergency Landing (ELF), Impact at a random point on the map (IRP), Flight termination and immediate impact (FTI), Impact after glide with best glide-ratio on the flight path (IGR), Impact close to the flight path in forward flight direction (IFD), Tangential to the flight path impact (TFP) and Debris impact (DIP). Additionally, for the sake of completeness the No Ground Effect (NGE) case was added, which occurs if a countermeasure was successful and the UA continued the flight.

N_{Events}	NGE	ELF	IRP	FTI	IGR	IFD	TFP	DIP
Cologne	4	50	14	78	7	5	14	45
Saarbrücken	4	33	9	67	9	6	11	41
Gröbenzell	6	49	19	68	6	5	16	51
Arnstein	5	39	15	68	8	5	11	37
Ibbenbueren	7	36	12	67	5	5	8	35
Eberbach	4	34	17	67	9	1	18	41
Georgensgmünd	6	43	11	83	3	2	6	39
Frankfurt a.M.	4	31	15	68	4	2	25	39
Hagen	7	35	15	82	4	2	14	40
Aalen	7	33	12	63	8	4	18	41
Schwedt/Oder	6	37	9	76	8	2	20	35
Kemberg	3	51	15	80	8	1	14	43
Bad Köstritz	7	39	9	67	2	4	18	44
Kroppenstedt	10	33	21	80	6	5	21	44

Table 8-16 Phase 1 number of events.

N_{Events}	NGE	ELF	IRP	FTI	IGR	IFD	TFP	DIP
Cologne	3	44	19	77	5	5	21	49
Saarbrücken	4	43	15	65	4	4	13	37
Gröbenzell	4	35	17	69	9	5	14	42
Arnstein	3	46	13	76	6	3	23	33
Ibbenbueren	11	31	16	64	10	3	16	33
Eberbach	4	44	17	61	7	0	16	46
Georgensgmünd	4	41	18	61	5	6	13	50
Frankfurt a.M.	6	44	20	69	5	7	16	42
Hagen	4	37	18	69	10	1	15	46
Aalen	2	38	18	82	5	0	14	54
Schwedt/Oder	3	40	19	90	7	8	20	41
Kemberg	4	37	13	69	11	3	21	35
Bad Köstritz	1	32	16	82	8	4	13	36
Kroppenstedt	3	44	19	77	5	5	21	49

Table 8-17 Phase 2 number of events.

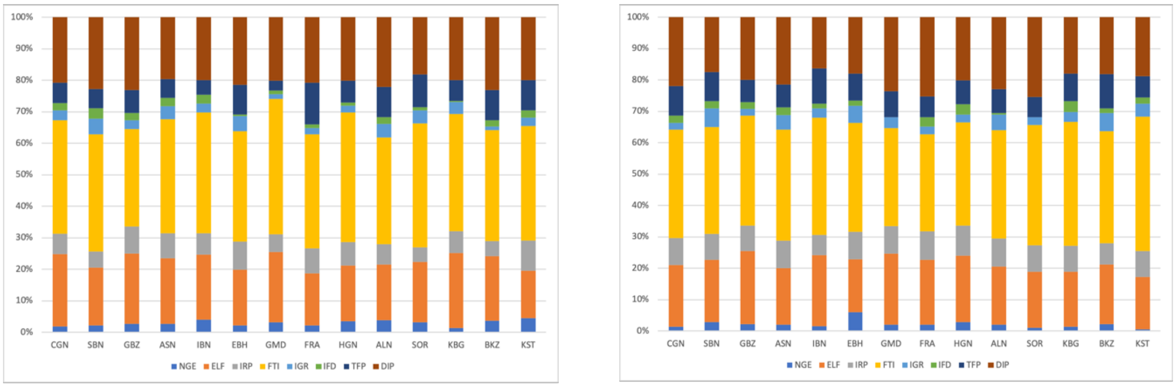


Figure 8-19. Left phase 1, right phase 2 right event and impact distributions.

Figure 8-19 picturizes Table 8-16 and Table 8-17. By this figure, it can be seen that the distribution of events and impacts is for both phases more or less similar regarding the occurrence. This was expected, as the distribution follows the underlying event tree and given occurrence probabilities within the UAS. If this was not the case, the algorithms for the generation of initiating failures inside the UAS would not work correctly (cf. chapters 7.2.3 and 7.2.5).

While the general event distribution does not provide an explanation for the big deviation to the assumed cumulative probability of a catastrophic event, a review of the number of people hit due to the different impact scenarios gives a better insight. Figure 8-20 to Figure 8-23 conclude the number of people hit due to the different impact scenarios with respect to the two phases and to ATB and OTW. In order to visualize all impacts adequately, it was necessary to apply a logarithmic scale on the y-axis for the ATB parts. Note that the cases Emergency Landing and No Ground Effect are not included because in these cases obviously no people got hit.

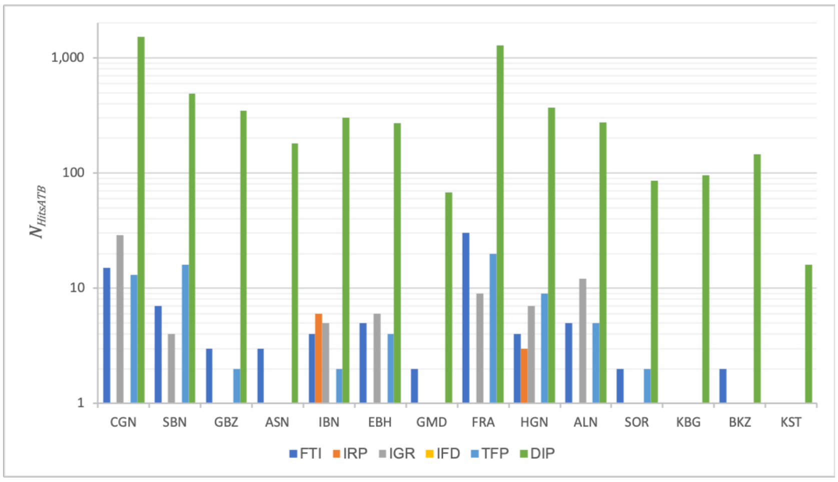


Figure 8-20. Phase 1 ATB number of hits due to impact.

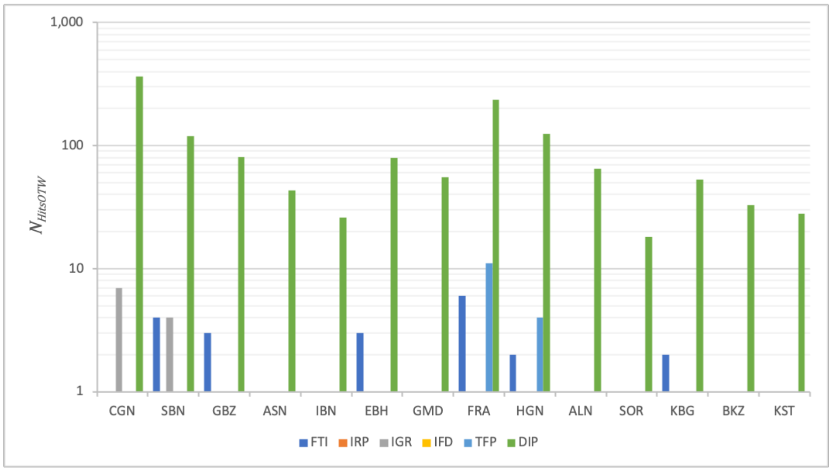


Figure 8-21. Phase 1 OTW number of hits due to impact.

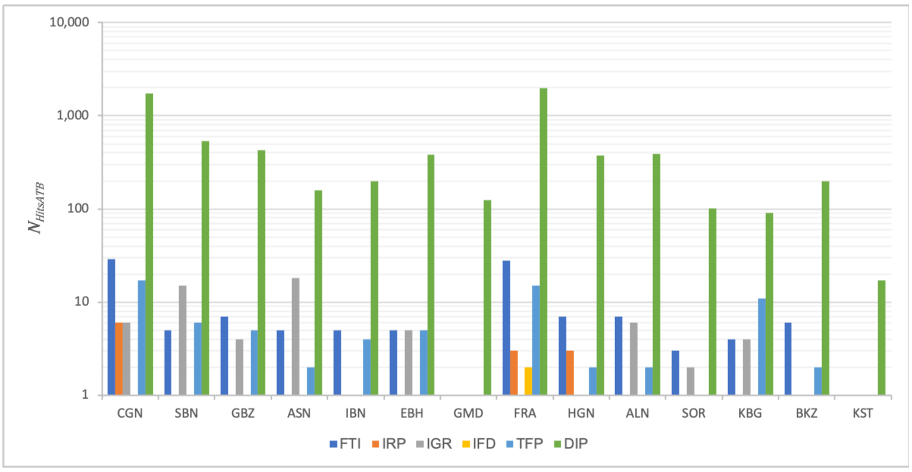


Figure 8-22. Phase 2 ATB number of hits due to impact.

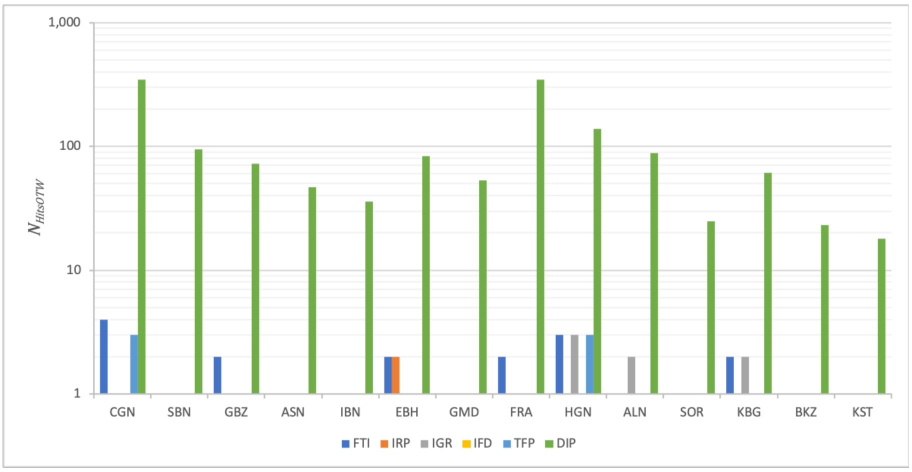


Figure 8-23. Phase 2 OTW number of hits due to impact.

Figure 8-20 to Figure 8-23 show that in each simulation series for every overflown area the most people got hit due to debris impacts in both phases. The noticeable difference between ATB and OTW regarding the number of hit persons can be traced back to the fact that in accordance with the movement algorithms and the source data of them, a majority of people is not in the outside (cf. chapter 7.2.7). Taking out the hit data caused by debris impacts results in a much clearer picture of the number of people who got hit. Figure 8-24 to Figure 8-27 present this reduced data set.

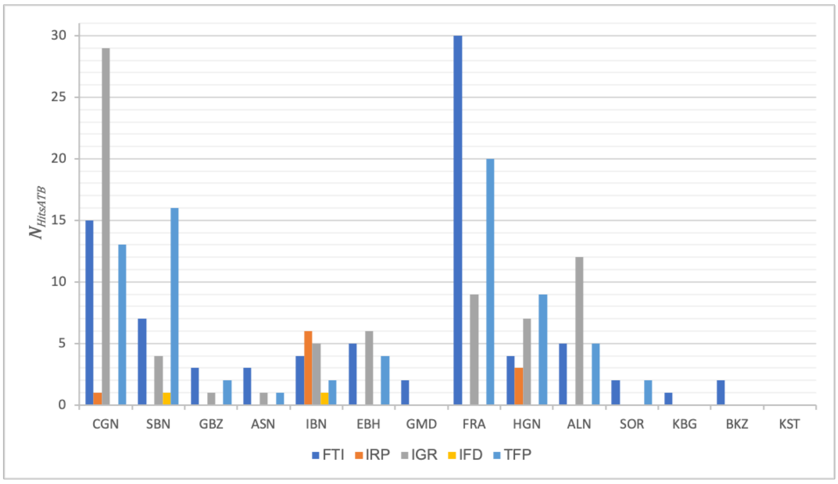


Figure 8-24. Phase 1 ATB number of hits due to impact without DIP.

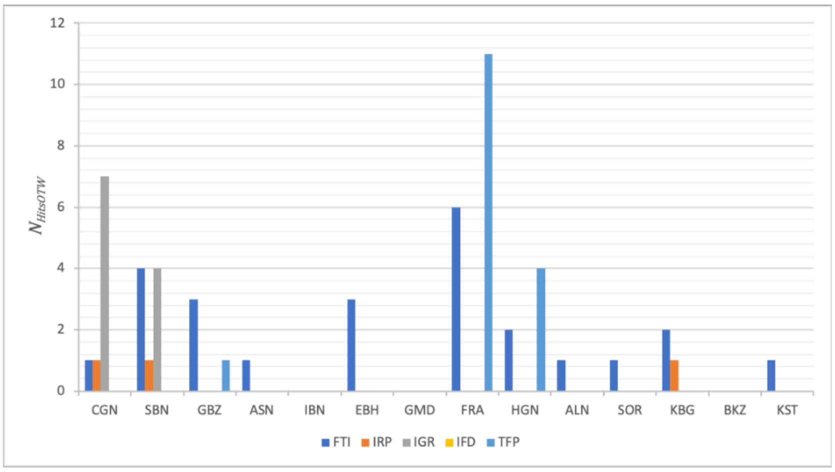


Figure 8-25. Phase 1 OTW number of hits due to impact without DIP.

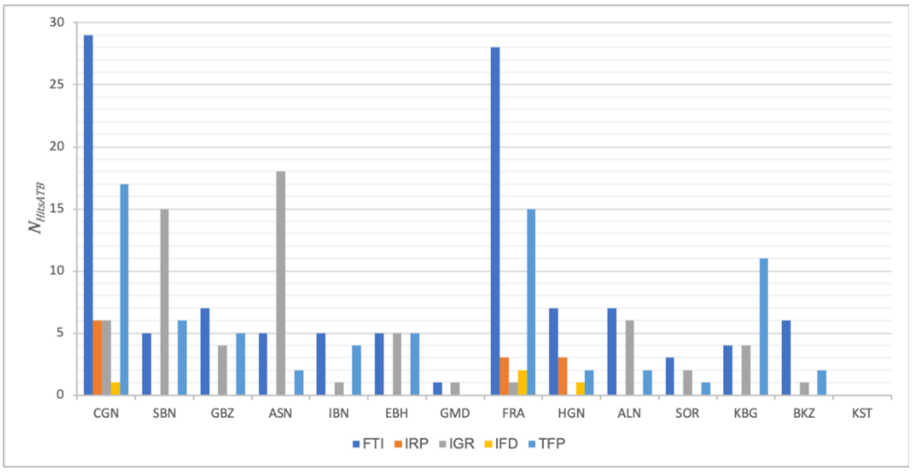


Figure 8-26. Phase 2 ATB number of hits due to impact without DIP.

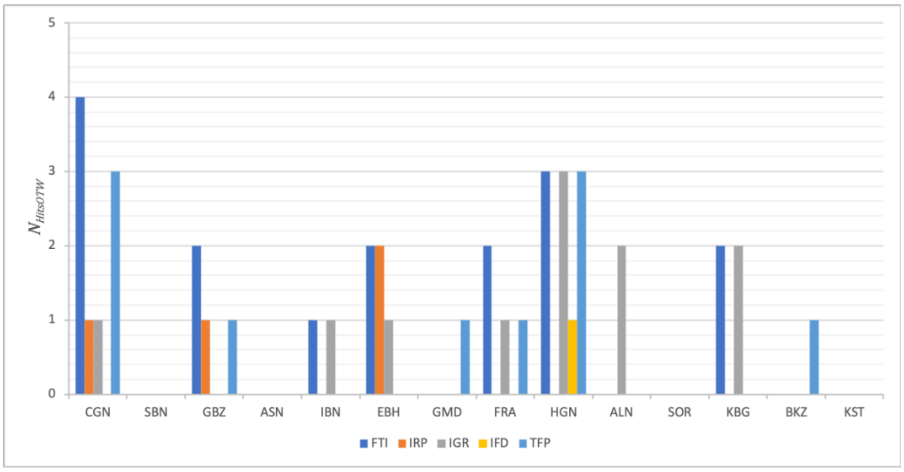


Figure 8-27. Phase 2 OTW number of hits due to impact without DIP.

The reduced data set illustrated in Figure 8-24 to Figure 8-27 show that the remaining hit numbers are very low, in particular for people in the outside. Actually, for the more rural areas, the simulations resulted in zero person hits in the outside. Based on this one can deduce that at first sight the debris impact scenario implies a disproportionate number of hits. There are two major causes for this disproportion: The design of the debris impact scenario incorporates a very conservative approach to calculate the resulting impact area, which might lead to large impact areas (cf. equations (7-28) to (7-31)) and consequently to more potential persons hit, as the impact area directly affects the possible number of persons hit (cf. equation (5-2)). In case of the executed simulations and the applied mission parameters, the resulting debris impact area has a size of A_{Impact} = 12,469 m^2. Compared to the impact areas that occur due to the other impact scenarios, the size of the debris impact area inflicts an immense increase of the impact area. The size of a non-gliding impact is 113.10 m^2 and in case of a glide impact the size is 240 m^2. Based on this difference, the large numbers of people who got hit due to failures in the UAS that led to debris impact scenarios are corollary.

Subsequently, this follows the predictions given by equation (5-2). By this, another aspect becomes evident. One variable like an assumed impact area can affect the whole probability that persons get hurt due to a UA impact vastly. Although this is directly linked to the occurrence probability of such an impact scenario, one can deduce an indication of the general reliability of such assumptions and also the reliability of operational safety aspects. At this point, the core research question as well as the three detailed research questions from chapter 1.3 shall be recalled:

Is it possible to proof the airworthiness of a light UAS with operational safety considerations instead of traditional airworthiness requirements in order to obtain a type certificate?

1. What are relevant operational safety considerations in the context of light UAS operations in Germany?
2. How can these operational safety considerations for light UAS be modelled?
3. How reliable are such operational safety considerations for light UAS?

At first, the three detailed questions will be discussed. Regarding the first detailed question, in accordance with chapter 5 and 6 as well as based on the review of selected operational safety assessments for UAS, the relevant operational safety considerations in the context of light UAS operations above Germany are primary the area to be the operational environment and overflown area itself, infrastructure, the inhabitation grade and population density and in particular the movement of the inhabitants in relation to the time of day. Another operational safety consideration that needs to be taken into account is given by the impact area of the UA. Although this is an implicit operational safety consideration as it is not directly related to the environment where the operation takes place and rather related to the UAS design, the performed O.R.C.U.S. simulation runs exposed the enormous potential effects of this aspect on the simulation results.

With respect to the second question, chapter 5.7 provided an oversight of different model method across the reviewed operational risk assessments which then was completed by the resulting shortcomings shown in chapter 6 and an exemplary method to overcome them by the prototype implementation with O.R.C.U.S. presented in chapter 7. O.R.C.U.S. provides an exemplary method to model the relevant operational safety considerations as described in the passage above. Furthermore, the simulation environment of O.R.C.U.S. is not limited to these aspects only, the technical aspects from the UAS itself are also included, providing a comprehensive simulation environment. In any case, any model including O.R.C.U.S., must rely on several assumptions. The more robust these assumptions are, the more trust can be given to the model. This includes also a mean to validate the results, which was also provided by O.R.C.U.S. It can be said, that the methods applied for the generation of the O.R.C.U.S. simulation environment are founded on well-defined assumptions and derivations. For example, O.R.C.U.S. does not include an explicit infrastructure model which predicts the ability to withstand an impacting UA or which predicts the grade of injury, as it was found that this deems a too high uncertainty. However, after development competition, the application of O.R.C.U.S. showed that for example the chosen impact area methodology should be reassessed. While the UA non-debris impact areas, which were derived out of common impact area approaches, resulted in hit numbers that can be deemed as expected, the debris-impact scenario did result in hit numbers much higher than expected because of the pure impact area size. This underlines that any model decision for operational safety considerations might influence the entire simulation more than anticipated and therefore, must be handled with care.

At last, the third question needs to be assessed with respect to the findings out of the O.R.C.U.S. simulations. The common assumption that the probability of people getting hit due to a crashing UA is dependent upon time and place where the operation takes place could be shown. Aspects like inhabitation grade, the area itself and the defined population density must be deemed basically as unchangeable for a given operation. For example, if an operation shall be executed above the down town centre of Munich in order to asses traffic movement, it would not make sense to execute this operation above a rural area outside of Munich. Obviously, the risk to the inhabitants in Munich would be reduced significantly, but the whole operation would not fulfill the operational aim at all. With respect to the operational environment, it can be said, if the source material to outline the environment is taken from an acceptable source, this part of the model should be deemed as trustworthy.

The aspect of population movement provides a variable that can be used to reduce the risk to the overflown population in a given area to be overflown people, if the operational requirements allow it. For example, if the aim of the UAS operation shall be to investigate the structural integrity of buildings by using radar technology in a densely populated area, this could also be done at night when the vast majority of inhabitants is inside protective buildings. An example is shown in Figure 8-28 and Figure 8-29. These figures present the cumulated people distributions for people at buildings and in the outside for the example cities Saarbrücken and Ibbenbueren during the phase 1 simulation series. For Saarbrücken a Tuesday progression is shown and for Ibbenbueren a Monday progression. The time scale is in accordance to occurred UA failure events during the particular simulation. Figure 8-30 and Figure 8-31 present the cumulated numbers of people that got hit or not hit due to the crashing UA during the simulation series above Saarbrücken and Ibbenbeuren in phase 1.

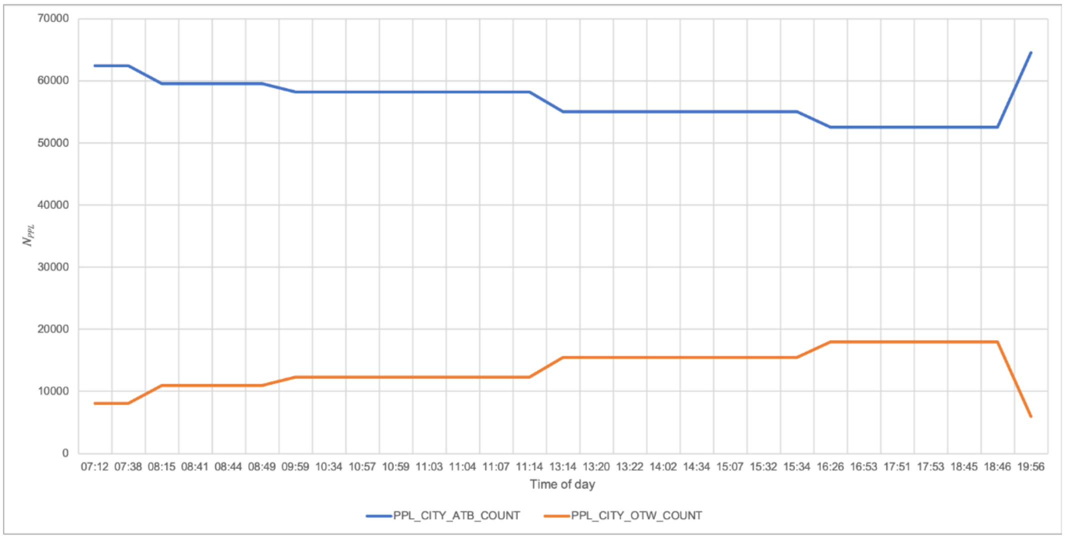


Figure 8-28. Phase 1 SBN: Cumulated Tuesday people distribution during simulation.

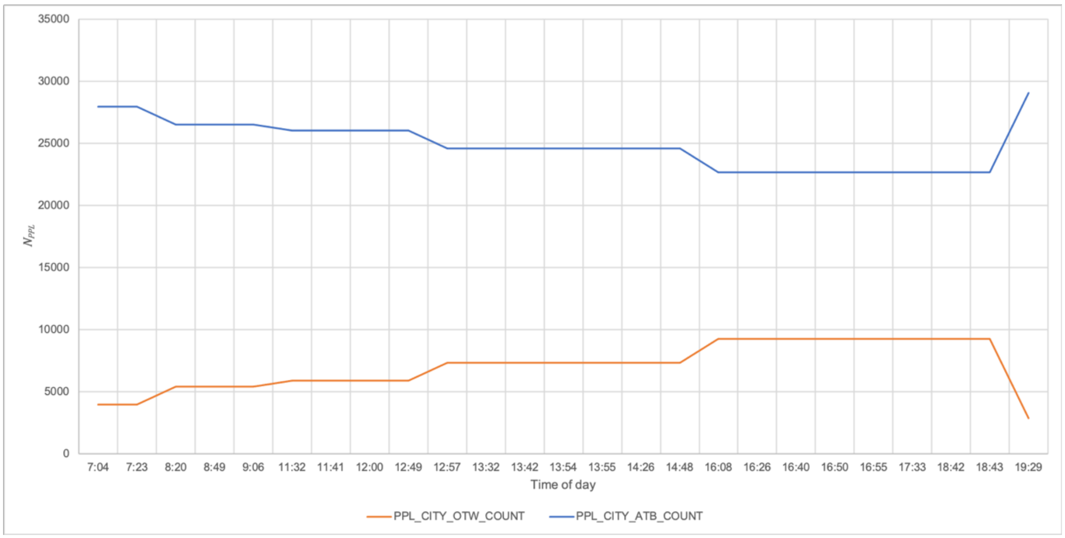


Figure 8-29. Phase 1 IBN: Cumulated Monday people distribution during simulation.

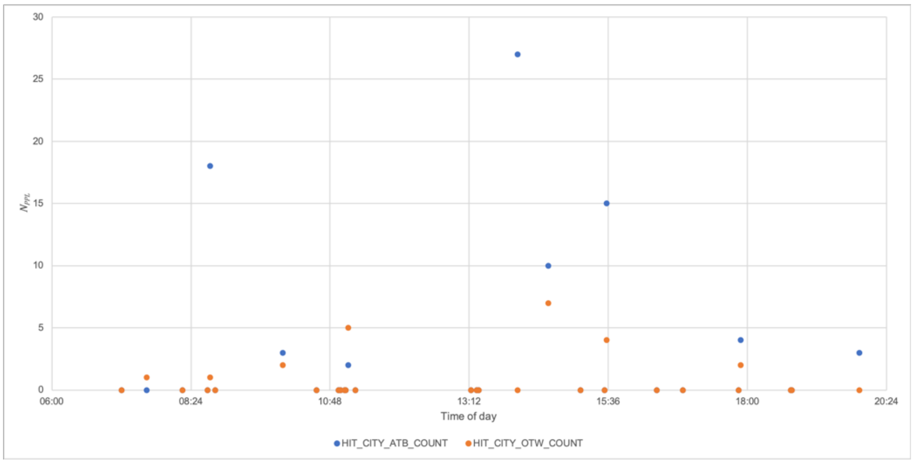


Figure 8-30. Phase 1 SBN: Cumulated Tuesday numbers of people hit.

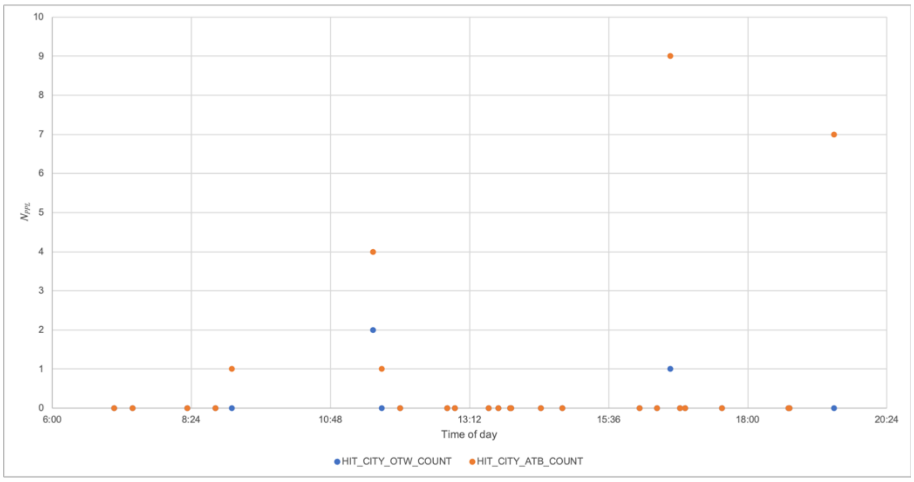


Figure 8-31. Phase 1 IBN: Cumulated Monday numbers of people hit.

As can be seen in Figure 8-30, there are peaks for people who got hit in the outside in the timeframes of around 11:00, 14:30 as well as around 18:00. Compared to the people progression shown in Figure 8-28, this relates to an increased movement of people in the outside. Similar observations can be made for Figure 8-31 and Figure 8-29. There are peaks regarding people who got hit in the outside around 13:00, 17:00 and 20:00. The timeframes around noon are typical lunch times when a noticeable percentage of people are in the outside in order to get food. The timeframe of roughly two hours before and after 18:00 is a common time to go home from work or to go to dinner and an increased number of people is in the outside. Nevertheless, it can also be seen, that although several crashes occurred, for the majority of crashes no person got hit. Neither in buildings, nor, and this is of particular interest, in the outside.

This leads to two conclusions: First, phases of increased people movement in the overflown area should be avoided in general for conducting a mission. It is felt better to have an almost constant number of people movement in the overflown area instead to have a constant varying number. It is recognized, that this would basically contradict the example mission, as the example mission required a constant surveillance of the area and this obviously implies a constant variation of people in move. In any case, it was shown by the prototype implementation with O.R.C.U.S. that it is possible to model the movement of people in Germany by applying clear methods and sources.

However, it must be said, that people movement cannot be controlled to that amount as for example the failure probability of the UAS itself. Therefore, the reliability is limited. The O.R.C.U.S. people movement algorithm can only represent a good basis and increase the risk awareness during the mission planning process. As suggested in [190], such an awareness can be augmented by a life data feed from the airborne UA.

Second, the risk to get hit by an impacting UA is present, but compared to the number of crashes in this simulation, the risk is relatively low. It should not be forgotten, that the assumed number of a failure that leads to a crash was set to 0.01 per flight hour. This brings back the point, that a UAS founded on good design techniques and based on clear development processes ensures a high level of reliability and will always surpass a UAS that was developed without respect to any standard. In contrast to people movement, this variable can be controlled almost entirely.

Although time and place can have a noticeable effect, it can be said, that a UAS which was shown to be airworthy, will decrease the risk to the overflown people in a more sustainable way than to focus operations above sparsely populated areas or to focus on operations which take only place during a specific time frame. Those aspects might mitigate deficiencies for certain design factors, like a higher than allowed cumulative safety requirement, but a UA which is composed out of poor materials and a consequently weak structure vulnerable to gusts or wrong commands by an FCS can hardly be mitigated by operational considerations. Mitigating such deficiencies can only be covered by more than strict limitations which probably deny a practical operation execution.

In particular, UAS flight critical software developed without taking into account accepted standards implies a completely uncontrollable inherent risk for the UAS and the overflown people and area. Having this derivation at hand, the hypothesis which was derived out of the fundamental research question shall be recalled:

Operational safety considerations cannot be used as the only proof of airworthiness of a light UAS in an aircraft type inspection process to achieve a type certificate.

The application of O.R.C.U.S. showed that an operation with an assumed non-airworthy UAS that has a high cumulative crash probability can be conducted for specific operation areas without creating an unacceptable high risk for the operational environment. It can be said, that the combination of operational safety consideration factors might surpass the unknown failures within the UAS. Nonetheless, this also shows that operational safety considerations can only be a supportive mean to reduce risk but not to be used as a singular evidence for the airworthiness of a UAS.

Although airworthiness of aircraft is always linked to certain operational aspects, such as the operation of the aircraft in specific climate zones or altitudes only, these aspects cannot be treated the same way as operational safety considerations. For example, the limitation to certain flight altitudes does not limit the aircraft to be flown above specific areas. Such a limitation is part of the definitions made by the technical specification of the aircraft in which the aircraft shall work as expected. Airworthiness of aircraft should always be independent of the operational safety considerations discussed in the present thesis as they indulge a significant level of uncertainty and non-deterministic effects. One core principle of aircraft type inspection and the airworthiness is determinism. This determinism ensures the unlimited operation of the aircraft within the boundaries of the technical specifications. Operational safety considerations as for example shelter structures or population movement cannot be predicted entirely for every mission. Therefore, a mixture or complete reliance on operational safety considerations to obtain a type certificate for a light UAS would be a contradiction. Consequently, the core research question must be answered with no, it is not possible to proof the airworthiness of a light UAS by operational safety considerations alone and the hypothesis of the present thesis is proven.

9 Conclusion and Outlook

In the eight chapters which preceded the present chapter, the idea and also the question was discussed if it is thinkable to proof airworthiness of a light UAS by operational safety considerations in order to obtain a type certificate. To get an entry point into this complex topic, the history of unmanned aviation was described. Additionally, four aviation key organizations, ICAO, FAA, EASA and also NATO as representative for military aviation, were introduced for the broader context.

History showed that UAS were born in the military aviation world and were always a shadow of manned aviation. While flown in other airspaces than manned aircraft, regulations for unmanned aircraft lacked behind. This was emphasized by the deduction of aviation safety by outlining the two driving concepts *airworthy by design* and *airworthy by operation*. Whereas the first concept is an inevitable part of manned aviation to ensure highest levels of safety to passengers, the second concept is basically one key to enable operations with UAS that do not comply with all airworthiness requirements they are expected to comply with. This was presented and discussed within the chapters that gave an in-depth insight into current UAS regulation activities of the four key organizations mentioned before and supported by the process description about type certification.

It was shown that the need of harmonization and interoperability within military forces led to the first international airworthiness standards for UAS, published by NATO. While large UAS, able to fulfill airworthiness standards, became a permanent asset within air forces worldwide, the civil world focused at first on small UAS. Light UAS are deemed to become part of specific regulations, incorporating the fact that regular operations comparable to manned aviation are not possible at the moment, as it was shown in chapter 4. For those kinds of operations, airworthiness or aviation safety will be achieved only by restrictive and stiff operational limitations. However, it can be said, that this is not airworthiness in the sense of the technical origin. It is more a kind of risk balancing. Such limitations should not be confused with operational safety considerations as the latter are, as implied by the name, options to be considered and not hard limitations. Would it be possible to obtain a type certificate for a light UAS by applying only operational safety considerations? Or is it necessary to apply always strict, non-flexible operational limitations? These ideas and questions led to the hypothesis which stated that operational safety considerations cannot be used as the only proof of airworthiness of a light UAS in an aircraft type inspection process to achieve a type certificate. Driven by the hypothesis, the fundamental research question and three detailed research questions were developed. The introduction outlined them and all are repeated below:

Is it possible to proof the airworthiness of a light UAS with operational safety considerations instead of traditional airworthiness requirements in order to obtain a type certificate?

1. What are relevant operational safety considerations in the context of light UAS operations in Germany?
2. How can these operational safety considerations for light UAS be modelled?
3. How reliable are such operational safety considerations for light UAS?

On the course to achieve answers to the core question and the three detailed questions, an intense review of existing UAS operational risk assessments was performed. This review concluded within several operational safety considerations that are relevant for UAS operations in general and in consequence also for operations above Germany. Furthermore, numerous shortfalls were identified and recommendations to overcome them were developed. Chapter 5 and 6 described this sound analysis of the selected operational risk assessments which is completed by the appendix chapter 11.1 as this chapter contains a standardized scheme for each UAS operational risk assessment approach.

The further course of the research which led to the present thesis and to obtain an answer for detailed research question number two concluded in the development of the O.R.C.U.S. software tool. Based on the recognitions regarding other UAS operation risk assessment, O.R.C.U.S. took into account these findings which led to an encompassing software that enables operators to evaluate the potential ground risk of a UAS operation above any area Germany. Two of the important advantages of O.R.C.U.S. are the ability to apply it without the need to have in-depth knowledge about the UAS, the place and time dependent simulation of population distributions within the operational area and the direct relation to airworthiness quantification means with respect to the cumulative safety number. Other advantages are the open architecture, transparency and the suggested validation method. Furthermore, based on the architecture of O.R.C.U.S. it can be expanded or modified as required. Yet encompassing in its features, the development of O.R.C.U.S. is not seen as finalized. Possible upgrades might include a more detailed differentiation for green areas in order to differentiate better between uninhabited areas and areas of recreational activities. A further improvement to be included would be the ability to apply map images of any zoom level. Another possible improvement could be the inclusion of operational volumes in accordance to SORA or in general more impact area variations. Once available, it is also thinkable to add a database that contains air traffic data of the specific area were the UA is operated and consequently include the risk estimation of mid-air collisions.

With respect to the last detailed research question, a prototype implementation of O.R.C.U.S. was done. The implementation was performed was performed by simulating UAS operations above 14 selected areas in Germany with two different settings each, which led to more than half a million simulated flight hours. To analyze the results, a comparison between the cumulated number of persons hit by UA crashes and the assumed cumulative probability of a catastrophic event was executed in order to show the relative deviation between both. By doing so, it was shown that the results are highly dependent upon the operational area and by modeling of the impact scenarios. For the prototype implementation they were modeled with a trend to be more conservative, e.g. the debris area model needs to be re-considered. Nevertheless, the application of O.R.C.U.S. also showed that an operation with an assumed non-airworthy UAS might not result in an unacceptable high risk for the operational environment if combined with specific operational safety considerations, such as the overflown area and the operational time. Such consideration factors before an operation might surpass the unknown failures within the UAS. However, the results of the simulation series also showed that operational safety considerations can only be a supportive mean to reduce risk and to increase risk awareness but they cannot to be used as a single source to proof that a UAS is airworthy.

As any other UAS operational risk assessment tool, O.R.C.U.S. also depends on the validity of assumptions. Although O.R.C.U.S. relies on official data bases for the population and their movement, it is all theory and it is all a prediction only. Looking for example at SORA and the upcoming annexes of it, the results of this process are similar to airworthiness evidences, yet they are not leading to a type certificate. Furthermore, the application will always be limited to specific operations only, not allowing regular operations although many variables are needed. The more variables needed, the more the application is limited and the more vulnerable the model will be to changes in one of the many variables. In contrast to such approaches, O.R.C.U.S. does not need that much variables and does not aim to produce airworthiness a-like results.

In conclusion, operational safety considerations might be helpful for the pre-estimation of a UAS operation but they are highly dependent on the tools for their generation, the UAS and the operation itself to be conducted. To achieve airworthiness of a UAS, much more is needed and nothing surpasses a well-designed UAS that is compliant to an applicable airworthiness standard. An airworthy UAS will always reduce the risk to the operational environment more than any risk-based authorization. Furthermore, only with airworthy UAS, regular UAS operations will be possible, enhancing the acceptance of UAS in the aviation community as only by this, the unmanned aircraft will be treated as equivalent partner to manned aircraft. Therefore, to the authors best knowledge, the hypothesis of the present thesis has been proven to be correct.

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11 Appendices

11.1 Assessment of UAS Operations Risk Models

Please note that the equations within the different UAS operation risk models were aligned as far as possible to the formula notation of the present thesis. Formula symbols which are not explained in the registers chapter because they are too specific, are explained directly. As the equations are taken directly from the source and are only shown for the sake of completeness, the enumeration for equations is not applied.

In case a part is described as “not considered” or “not assessed”, this means that the model did not provide a qualitative or quantitative description of equation for the specific part.

Model	Weibel and Hansman [36]
P_{FUA}	Assumed as fraction of UA MTBF: $P_{FUA} = \frac{1}{MTBF_{UA}}$; No detailed consideration of root cause or sub-system failures in the UAS.
Operational Area	No specific operational area and details besides population densities applied. Example given for U.S.
S	Shelter based on object penetration probability; $S = P_{Pen}$
$\rho_{Pop_{Ground}}$	Census based regions. Uniform distribution. Static in time.
A_{Impact}	Geographic method. UA planform area for six defined UAS classes. No equation provided. $A_{Impact} = A_{UA_{Ref}}$
P_{Fat}	Includes mitigation possibilities (e.g. design based) $P_{Fat} = (1 - P_{Mit})$
$P_{C_{Ground}}$	$P_{C_{Ground}} = P_{FUA} \cdot A_{Impact} \cdot \rho_{Pop_{Ground}} \cdot S \cdot P_{Fat}$
P_{MAC}	Assumed random location of UA in the airspace by gas model of aircraft. $P_{MAC} = \frac{A_{Front} \cdot d_{travel}}{V \cdot t_{travel}}$; V_{Air} = Airspace volume; d_{travel} = travelled distance; t_{travel} = time travelled
$\rho_{Pop_{Air}}$	Example taken for one day in US NAS, based on FAA data.
$P_{C_{Air}}$	$P_{C_{Air}} = P_{MAC}(P_{Fat_{Col}} - P_{Mit_{Col}})$ $P_{Fat_{Col}}$ = Fatality probability in case of an aircraft collides with a UA $P_{Mit_{Col}}$ = Mitigation measures against collision
P_C	Not assessed as combination of air and ground casualty probability.
Notes	Comprehensive model which involves air and ground risk. Mitigation variables suggested but not applied. Determination of penetration probabilities and impact areas is not given. Model uses given target of safety levels for a backwards calculation to determine acceptable population densities that could be overflown.

Model	Clothier and Walker [37]
P_{FUA}	Assumed as system failure rate: $P_{FUA} = SFR$ No detailed consideration of root cause or sub-system failures in the UAS.
Operational Area	No specific operational area and details besides population densities applied. Applied to Queensland, Australia.
S	Broad assumption that exposed people are not sheltered: $S = 1$
$\rho_{Pop_{Ground}}$	Census based regions. Uniform distribution. Static in time.
A_{Impact}	Geographic method. Defined as lethal area: $A_{Impact} = A_{Lethal} = \pi(\max(\text{diameter})_{UA} + w_P)^2$
P_{Fat}	Assumed that any strike is a fatality: $P_{Fat} = 1$
$P_{C_{Ground}}$	$P_{C_{Ground}} = (P_{FUA} + P_{MAC} + Z) \times A_{Impact} \cdot \rho_{Pop_{Ground}}$ Z= other reasons for the UA to crash, e.g. bird strike or weather
P_{MAC}	P_{MAC} not modelled as equation but taken into account by applying debris as a result of a collision: $P_{MAC} = MC_{Debris}$
$\rho_{Pop_{Air}}$	Not modelled.
$P_{C_{Air}}$	Not modelled.
P_C	$P_C = P_{C_{Ground}}$
Notes	Basic UAS operations risk model. Model uses casualty expectation for a backwards calculation to determine acceptable population densities that could be overflown.

Model	Clothier et. al. [38]
P_{FUA}	Assumed as $P_{FUA} = \lambda = 1 \cdot 10^{-5} [1/Fh]$ No detailed consideration of root cause or sub-system failures in the UAS.
Operational Area	Generic model. No specific operational area and details besides population densities applied. Example given for a UA approach to an Australian Airforce base. The example includes flight path and ground elevation.
S	Not considered.
$\rho_{Pop_{Ground}}$	Noted that spatial census information could be used. Uniform distribution. Static in time.
A_{Impact}	Geographic method. Two forms of impact: Glide and vertical fall. $A_{Impact\mid UA} = \begin{cases} (w_{UA} + 2 \cdot r_P) \times (l_{UA} + d_{GlideGround} + 2 \cdot r_P) \\ \pi \times (0.5 \cdot w_{UA} + r_P)^2 \end{cases}$ $d_{GlideGround} = h_p / \sin(\gamma)$
P_{Fat}	Assumed that any strike is a fatality: $P_{Fat} = 1$
$P_{C_{Ground}}$	$P_{C_{Ground}} = P_{FUA} \cdot P_{Fat} \cdot \rho_{Pop_{Ground}} \cdot A_{Impact}$
P_{MAC}	Not considered.
$\rho_{Pop_{Air}}$	Not considered.
$P_{C_{Air}}$	Not considered.
P_C	$P_C = P_{C_{Ground}}$
Notes	Model calculates the individual casualty risk as bi-variate normal distribution along and across the flight path. Model can be seen as further development of [37]

Model	Dalamagkidis et. al. [39, 46]
P_{FUA}	The model applies a target level of safety approach based to determine an acceptable P_{FUA} which is linked to an acceptable frequency of ground impacts. Initial assumptions: $P_{FUA} = 10^{-6}[1/Fh]$. No detailed consideration of root cause or sub-system failures in the UAS.
Operational Area	Generic model. No specific operational area and details besides population densities applied. Several examples provided.
S	$S = p_s \in (0,1]; \overline{p_s} = 0.5$ Takes into account crash trajectory and by obstacles absorbed kinetic energy.
$\rho_{Pop_{Ground}}$	Three assumed population densities. Uniform distribution. Static in time.
A_{Impact}	Geographic method: $A_{Impact} = w_{UA} \times \left[l_{UA} + h_p/\sin(\gamma)\right]$
P_{Fat}	$P_{Fat} = \frac{1}{1+\sqrt{\alpha/\beta}\cdot[\beta/E_{Imp}]^{1/4p_s}}$ α= Impact energy required for a fatality probability of 50% with $p_s = 0.5$ β= Impact energy threshold required to cause a fatality if $p_s \to 0$ $E_{Imp} = \frac{m^2 g}{\rho_{Air} A_{UA_{Front}} C_d}$
$P_{C_{Ground}}$	$P_{C_{Ground}} = A_{Impact} \cdot \rho_{Pop_{Ground}} \cdot P_{Fat}$
P_{MAC}	$P_{MAC} = \frac{A_{UA_{Front}} \cdot d_{travel}}{V_{Air} \cdot t_{travel}} \cdot P_{Col\|CT}$ $P_{Col\|CT} =$ Probability that one of the conflicting aircraft successfully attempts a collision avoidance maneuver. Elaborates that $\frac{A_{UA_{Front}} \cdot d_{travel}}{V_{Air} \cdot t_{travel}}$ is hard to determine because of the high dynamic of air traffic. Instead a worst-case approach regarding conflicting trajectories is applied, see $\rho_{Pop_{Air}}$.
$\rho_{Pop_{Air}}$	$\rho_{Pop_{Air}} = E(CT) = \frac{A_{UA_{Front}} \cdot d_{travel}}{V_{Air} \cdot t_{travel}} = 10^{-4}[1/Fh]$ $E(CT) =$ Expected conflicting trajectories, based on historical data.
$P_{C_{Air}}$	$P_{C_{Air}} = P_{Col\|CT} = \frac{P_{MAC}}{\rho_{Pop_{Air}}}$
P_C	Not assessed as combination of air and ground casualty probability. P_C is presented as acceptable frequency of ground impacts. $P_C = 1/T_{GI,min}$; $T_{GI} =$ Minimum acceptable time between two ground impacts. $T_{GI,min} = \frac{A_{Impact} \cdot \rho_{Pop_{Ground}} \cdot P_{FUA}}{P_{Fat}}$
Notes	Unusual with respect to P_C presentation. Expands the P_{MAC} of [36]. Function failure conditions with TLS as overall target.
Model	Burke [40]

P_{FUA}	Acceptable P_{FUA} shall be determined via TLS. Initial TLS is set to $10^{-7}[1/Fh]$. No detailed consideration of root cause or sub-system failures in the UAS.
Operational Area	Generic model for sUAS with ca. 0.9 kg $< m_{UA}$ <150 kg. No specific operational area and details besides population densities applied.
S	Defined as hard and soft shelters. No specific value given. Seen as factor of E_{Kin} and therefore m_{UA} is included within the final $P_{C\|UA}$ equation.
$\rho_{Pop_{Ground}}$	Four categories, uniform distribution and static in time: unpopulated, sparsely populated, densely populated, and open-air assembly. Average values for each category based on U.S. census data. The average values are summed up with respect to the mission time above a specific category.
A_{Impact}	Geographic method. Defined as lethal area: $A_{Impact} = A_{Lethal} = \pi \times {w_{UA}}^2$
P_{Fat}	Based on 66 J blunt trauma criterion, m_{UA} range was set. For any UA within the scope of the model $P_{Fat} = 1$ is valid.
$P_{C_{Ground}}$	$P_{C_{Ground}} = P_{FUA} \cdot \rho_{Pop_{Ground}} \cdot A_{Impact} \cdot S \cdot P_{Fat}$
P_{MAC}	Not assessed.
$\rho_{Pop_{Air}}$	Not assessed.
$P_{C_{Air}}$	Not assessed.
P_C	$P_C = P_{C_{Ground}}$; transferred into point-based TLS: $TLS = k \cdot m_{UA} \cdot \left(\log_{10}\left(\rho_{Pop_{Ground}} \cdot A_{Impact}\right)\right)^2$; k = Correction factor The TLS equation is sensitive regarding units. Original units are not SI units. If applied to another units, correction factor k must be amended accordingly.
Notes	Instead of applying target values in terms of events per flight hour, the approach applies a point-based TLS. Foundation of the TLS is the casualty equation of [192]

Model	Waggoner [42]
P_{FUA}	No detailed consideration of root cause or sub-system failures in the UAS. Defined as UAS specific "mid-air" failure $\lambda = P_{FUA}$.
Operational Area	Surface and airspace model. Includes structure density, average height and size.
S	Considered implicitly by P_{Fat} for persons inside buildings.
$\rho_{Pop_{Ground}}$	Based on U.S. census. Outside pedestrian density based on assumptions. Uniform distribution. Static in time.
A_{Impact}	Geographic method. A_{Impact} defined as lethal area for pedestrian (p) and building (b) strikes with respect to horizontal glide and vertical fall impacts: $A_{LV_p}, A_{LH_p}, A_{LV_b}, A_{LH_b}$ $$A_{Impact} = \begin{cases} A_{LV_p} = \pi\left(w_{UA}/2 + r_p\right)^2 \\ A_{LH_p} = \left(w_{UA} + 2r_p\right)\left(l_{UA} + h_p/\tan(\gamma)\right) \\ A_{LV_b} = \pi(w_{UA}/2 + w_b/2)^2 \\ A_{LH_b} = (w_{UA} + w_b)(l_{UA} + h_b/\tan(\gamma)) \end{cases}$$
P_{Fat}	Differentiates between fatality probability inside (b) and outside buildings (p): $$P_{Fat} = \begin{cases} 0 \le P_{Fat_b} \le 1 \\ 0 \le P_{Fat_p} \le 1 \end{cases}$$
$P_{C_{Ground}}$	Differentiates between pedestrian and building strikes. Note that the mid-air collision rate is already included here. $P_{C_{Ground}} = \rho_p \cdot P_{FUA} \cdot A_{LV_p} + P_{MAC} \cdot \rho_{ped} \cdot A_{LV_p}$ $P_{C_{Ground}} = \rho_b \cdot P_{FUA} \cdot A_{LV_b} + P_{MAC} \cdot \rho_b \cdot A_{LV_b}$ ρ_p= Pedestrian density, defined as percentage of $\rho_{Pop_{Ground}}$. ρ_b= Building density.
P_{MAC}	Defined as transient aircraft strikes ($P_{MAC_{trans}}$) and UA fleet strikes ($P_{MAC_{UA_{fleet}}}$), based on a molecular collision model and densities of UA ($\rho_{Pop_{Air_{UA}}}$) and A/C in the air ($\rho_{Pop_{Air_{A/C}}}$). $P_{MAC} = P_{MAC_{trans}} + P_{MAC_{UA_{fleet}}}$ $P_{MAC_{trans}} = \rho_{Pop_{Air_{A/C}}} \cdot A_{col} \cdot v_{rel} \cdot \left(1 - \epsilon_{UA/A/C}\right)\left(1 - \epsilon_{A/C}\right)$ $P_{MAC_{UA_{fleet}}} = 2 \cdot \rho_{Pop_{Air_{UA}}} \cdot A_{UA_{Front}}\sqrt{2} \cdot v_{UA}\left(1 - \epsilon_{UA/UA}\right)$; with $A_{col} = A_{UA_{Front}} + A_{A/C_{Front}} + 2\sqrt{A_{UA_{Front}} A_{A/C_{Front}}}$ $v_{rel} = \sqrt{v_{UA}^2 + v_{A/C}^2}$; ϵ= Collision avoidance of UA or A/C
$\rho_{Pop_{Air}}$	Defined as number of transient A/C and UA in the airspace. Applies a database of air traffic density.
$P_{C_{Air}}$	$P_{C_{Air}} = P_{MAC_{trans}}$; taken into account that UA-UA collisions do not harm other airspace users.
P_C	$P_C = P_{C_{Ground_p}} + P_{C_{Ground_b}} + P_{MAC_{trans}} + P_{MAC_{UA_{fleet}}}$; taken into account that A/C-UA and UA-UA collisions might pose a danger to people on the ground by falling debris.
Notes	Comprehensive model that includes careful considerations. Validation of results via historical aviation data. Rationale for building strike probability might be arbitrary.

Model	Lum and Waggoner [44]
P_{FUA}	No detailed consideration of root cause or sub-system failures in the UAS. Assumed as UAS specific system failure rate $\lambda = P_{FUA}$.
Operational Area	Surface and airspace model. Includes structure density, average height and size.
S	Considered implicitly by P_{Fat} for persons inside buildings.
$\rho_{Pop_{Ground}}$	Based on U.S. census. Outside pedestrian density based on assumptions. Uniform distribution. Static in time.
A_{Impact}	A_{Impact} defined as lethal area for pedestrian (p) and building (b) strikes with respect to horizontal glide and vertical fall impacts: A_{LV_p}, A_{LH_p}, A_{LV_b}, A_{LH_b} $$A_{Impact} = \begin{cases} A_{LV_p} = \pi\left(\max(w_{UA}, l_{UA})/2 + r_p\right)^2 \\ A_{LH_p} = \left(w_{UA} + 2r_p\right)\left(l_{UA} + h_p/\tan(\gamma) + 2r_p\right) \\ A_{LV_b} = \pi(\max(w_{UA}, l_{UA})/2 + w_b/2)^2 \\ A_{LH_b} = (w_{UA} + w_b)(l_{UA} + h_b/\tan(\gamma) + w_b) \end{cases}$$
P_{Fat}	Differentiates between fatality probability inside (b) and outside buildings (p). In case of a building strike, assumptions on the fatality rate are made, e.g. 25 % of the inhabitants will suffer lethal injuries. This would lead to $P_{Fat_b} = 0.25$. $$P_{Fat} = \begin{cases} 0 \le P_{Fat_b} \le 1 \\ 0 \le P_{Fat_p} \le 1 \end{cases}$$
$P_{C_{Ground}}$	$P_{C_{Ground}} = \rho_p \cdot P_{FUA} \cdot A_{LV_p} + P_{MAC} \cdot \rho_{ped} \cdot A_{LV_p}$ $P_{C_{Ground}} = \rho_b \cdot P_{FUA} \cdot A_{LV_b} + P_{MAC} \cdot \rho_b \cdot A_{LV_b}$
P_{MAC}	Defined as transient aircraft strikes and UA fleet strikes, based on a molecular collision model. $P_{MAC} = t_{Miss} \cdot \left(P_{MAC_{trans}} + P_{MAC_{UA_{fleet}}}\right)$; with $P_{MAC_{trans}} = n_{UA} \cdot \rho_{Pop_{Air_{A/C}}} \cdot A_{col} \cdot v_{rel} \cdot \left(1 - \epsilon_{UA/A/C}\right)\left(1 - \epsilon_{A/C}\right)$ $P_{MAC_{UA_{fleet}}} = n_{UA} \cdot \rho_{Pop_{Air_{UA}}} \cdot v_{rel} \cdot \left(4 \cdot A_{UA_{Front}}\right) \cdot \left(1 - \epsilon_{UA/UA}\right)^2$ $A_{col} = A_{UA_{Front}} + A_{A/C_{Front}} + 2\sqrt{A_{UA_{Front}} A_{A/C_{Front}}}$ $v_{rel} = \sqrt{v_{UA}^2 + v_{A/C}^2}$; ϵ= Collision avoidance of UA or A/C; n_{UA}= Number of UA in the airspace
$\rho_{Pop_{Air}}$	Defined as density of transient A/C and UA in the airspace, based on historical data: $\rho_{Pop_{Air_{A/C}}}$; $\rho_{Pop_{Air_{UA}}}$
$P_{C_{Air}}$	$P_{C_{Air}} = P_{MAC_{trans}}$
P_C	$P_C = P_{C_{Ground_p}} + P_{C_{Ground_b}} + P_{MAC_{trans}} + P_{MAC_{UA_{fleet}}}$
Notes	Can be seen as further development of Waggoner's former model [42]. Cf. assessment for further explanation.

Model	Skobir and Magister [187]
P_{FUA}	No detailed consideration of root cause or sub-system failures in the UAS. It is assumed that a failure occurred, $P_{FUA} = 1$. Two scenarios are taken into account UFIT and CFIT.
Operational Area	Generic consideration as populated or unpopulated area.
S	Not assessed.
$\rho_{Pop_{Ground}}$	Considered as populated or unpopulated area but not assessed in detail.
A_{Impact}	Not assessed.
P_{Fat}	Assessed as function of E_{Kin} for both impact scenarios. E_{Kin} is deduced out of available UAS data via regression analysis.
$P_{C_{Ground}}$	Not assessed.
P_{MAC}	Not assessed.
$\rho_{Pop_{Air}}$	Not assessed.
$P_{C_{Air}}$	Not assessed.
P_C	Not assessed.
Notes	The model presents a generic method to determine E_{Kin} of a crashing UA with $m_{UA} \leq 150$ kg in order to show a sufficient level of safety and that UAS classification should go further than just m_{UA} and v_{UA}.

Model	Melnyk [47]
P_{FUA}	No detailed consideration of root cause or sub-system failures in the UAS. Assumed as UAS specific system failure rate $\lambda_{system} = P_{FUA}$.
Operational Area	Detailed consideration regarding infrastructure resistance to UA impact. Population considered by six average groups.
S	Applied results of two studies to determine P_{Pen}. Implicitly $S = 1 - P_{Pen}$. Based on these results, fatality probability of building inhabitants is determined.
$\rho_{Pop_{Ground}}$	Based on U.S. census, six $\rho_{Pop_{Ground_{local}}}$ are defined. UAS operation duration and local dependent distribution considered: $\rho_{Pop_{Ground_{local}}} = \rho_{Pop_{Ground}} \times \frac{t_{Miss}}{A_{Impact}}$
A_{Impact}	Empirical method, weight-based approach: $A_{Impact}[\text{ft}^2] = -2475.466 + 1.001 \times m_{UA}[\text{lbs}]$;
P_{Fat}	Energy and shelter based, for $E_{Kin} > 78$ J and $S = 1$: $P_{Fat} = 1$.
$P_{C_{Ground}}$	$P_{C_{Ground}} = P_{FUA} \times \rho_{Pop_{Ground}} \times A_{Impact} \times S \times P_{Fat}$
P_{MAC}	Not assessed.
$\rho_{Pop_{Air}}$	Not assessed.
$P_{C_{Air}}$	Not assessed.
P_C	$P_C = P_{C_{Ground}}$
Notes	Comprehensive model that takes into account all relevant aspects regarding UA ground impacts. Provides a validation by comparing model results with General Aviation accidents and applying a *t*-test. Based on the results of the paper, a UAS classification scheme is presented.

Model	Ancel et al. [188]
P_{FUA}	Assessed in general terms as undesired events, ranging from improbable up to frequent failures. Ultimate outcome is flight termination.
Operational Area	Divided into N grid cells. Given example is a local limited area. Wind model included.
S	Four defined roof classes are presented, including a vulnerability model.
$\rho_{Pop_{Ground}}$	Uniform distribution. Static in time. Based on building occupancy of assessed operational area.
A_{Impact}	Geographic method. Differentiates between potential impact area and casualty area A_C. $A_{Impact} = A_C = \left(w_{UA} + 2 \cdot r_p\right) \cdot \left(l_{UA} + h_p/\tan(\gamma) + 2 \cdot r_p\right)$
P_{Fat}	Divided into four outcomes which range from non-serious injuries up to fatalities. These outcomes are combined with E_{Kin}, leading to a severity index. A direct correlation in terms of fatalities per flight hour is not given.
$P_{C_{Ground}}$	$P_{C_{Ground_j}} = \sum_{k=1}^{N} P_{I_k} \cdot \rho_{Pop_{Ground_j}} \cdot A_{Impact_j}$, with: $k = k^{th}$ grid cell; $j = j^{th}$ sheltering category; P_{I_k}= Probability of impact in the k^{th} grid cell based on P_{FUA}.
P_{MAC}	Not assessed.
$\rho_{Pop_{Air}}$	Not assessed.
$P_{C_{Air}}$	Not assessed.
P_C	$P_C = P_{C_{Ground}}$
Notes	The model applies a Bayesian Belief Network as well as Monte-Carlo Simulation to predict UAS failures, impacts and outcomes. Applicable to sUAS.

Model	Barr et al. [191]
P_{FUA}	Consideration of root cause and sub-system failures in the UAS. Seven failure sets are assessed with respect to possible effects. Four root causes are considered. Acceptable failure rates are based on manned aviation: $$P_{FUA} = \begin{cases} P_{MIN} < 10^{-3} \\ P_{MAJ} < 10^{-4} \vee 10^{-5} \\ P_{HAZ} < 10^{-5} \vee 10^{-7} \\ P_{CAT} < 10^{-6} \vee 10^{-9} \end{cases} [1/\text{Fh}]$$
Operational Area	Besides $\rho_{Pop_{Ground}}$, $\rho_{Pop_{Air}}$ and S, the model elaborates that obstacles, terrain should be considered. Airspace below 400 ft.
S	Considered as aspect that needs to be taken into account, but not assessed in terms of an equation.
$\rho_{Pop_{Ground}}$	Five classes regarding $\rho_{Pop_{Ground}}$ are defined. Uniform distribution. Static in time.
A_{Impact}	Geographical method. In contrast to other models, the cross section of a person's body or head is defined as lethal area instead of the impact area of a crashing UA. This area is divided into vertical ($A_{P_{Vertical}}$) and glide impact ($A_{P_{Glide}}$). $$A_{Impact} = \begin{cases} A_{P_{Vertical}} = 1.5\ [\text{ft}^2] \\ A_{P_{Glide}} = 11\ [\text{ft}^2] \end{cases}$$
P_{Fat}	P_{Fat} considered as possible effect of P_{HAZ} and P_{CAT}. For these failure cases $P_{Fat} = 1$.
$P_{C_{Ground}}$	$P_{C_{Ground}} = \rho_{Pop_{Ground}} \cdot A_{Impact}$
P_{MAC}	Considered as aspect and possible effect of P_{FUA} that needs to be taken into account, but not assessed in terms of an equation.
$\rho_{Pop_{Air}}$	Considered as aspect that needs to be taken into account, but not assessed in terms of an equation.
$P_{C_{Air}}$	Considered as aspect that needs to be taken into account, but not assessed in terms of an equation.
P_C	$P_{C\|UA} = P_{C_{Ground}} + P_{C_{Air}}$
Notes	Model can be seen as traditional preliminary system safety assessment, which is expanded to a three-dimensional UAS risk assessment and Bayesian Belief Network. Applicable to sUAS. Hazard classification for CAT ("multiple fatalities") seems to be not proportionate with respect to sUAS.

Model	Clothier et al. [49]
P_{FUA}	Qualitative discussion of P_{FUA} as part of UAS reliability in the Barrier Bow Tie Model (BBTM). Four resulting failure scenarios are defined: UDS, LOC, DOJC, CFIT. Not discussed in terms of probabilities.
Operational Area	Considered in terms of risk control regarding terrain awareness, impact location, exposure and entities barriers within the BBTM.
S	Considered in terms of risk control regarding terrain awareness, impact location, exposure and entity response barriers within the BBTM. No equation or number provided.
$\rho_{Pop_{Ground}}$	Considered in qualitative manner as part of risk control within exposure barrier in BBTM.
A_{Impact}	Considered in qualitative manner as part of risk control within impact location and UAS (impact) energy management barrier in BBTM.
P_{Fat}	Considered in qualitative manner in terms of consequence states which result in MIN, MAJ, HAZ or CAT effects.
$P_{C_{Ground}}$	Considered as top event hazard. No probability equation or number provided.
P_{MAC}	Not assessed.
$\rho_{Pop_{Air}}$	Not assessed.
$P_{C_{Air}}$	Not assessed.
P_C	$P_C = P_{C_{Ground}}$
Notes	Pure qualitative BBTM approach. All aspects of the UAS operation including technical details of the UAS must be known very well upfront in order to provide realistic predictions.

Model	Breunig et al. [48]
P_{FUA}	No detailed consideration of root cause or sub-system failures in the UAS. Assumed as UAS class specific system failure rate $P_{FUA} = P_{FUA_{Class_i}}$. Four classes with associated P_{FUA} are defined based on m_{UA}: $$P_{FUA_{Class}} = \begin{cases} P_{FUA_{Micro}}(m_{UA} \leq 0.55\ [\text{lbs}]) = 10^{-2}[1/\text{Fh}] \\ P_{FUA_{Mini}}(0.56\ [\text{lbs}] < m_{UA} \leq 4.4\ [\text{lbs}]) = 10^{-3}[1/\text{Fh}] \\ P_{FUA_{Limited}}(4.5\ [\text{lbs}] < m_{UA} \leq 20.9\ [\text{lbs}]) = 10^{-4}[1/\text{Fh}] \\ P_{FUA_{Mini}}(21\ [\text{lbs}] < m_{UA} \leq 55\ [\text{lbs}]) = 10^{-5}[1/\text{Fh}] \end{cases}$$
Operational Area	Defined by latitude and longitude coordinates. Eight standard mission profiles defined.
S	General assumption that 7.5 % of people in overflown area are outdoor and unsheltered. Therefore, S is related to mission profile.
$\rho_{Pop_{Ground}}$	Three classes differentiated into three categories each. Basis is a 24 h time-based weighted average from a model of the U.S. Department of Energy's Oak Ridge National Laboratory.
A_{Impact}	Geographic method. Defined as circle shaped lethal area dependent on travelled horizontal distance d_{horz} after UA internal failure. $A_{Impact} = A_{Lethal} = \pi d_{horz}^2$ $d_{horz} = h_{Alt} \left\| \frac{F_L}{F_D} \right\| ; F_l = \cos(2\theta)\, ; F_d = \sin\,(2\theta)$ $v_{Impact} = \sqrt{(2 \cdot m_{UA} \cdot g)\ /\ (\rho_{Air} \cdot A_{UA_{Front}} \cdot \sqrt{C_d^2 + C_l^2})};$ Equations only for given example of a multi copter. Might be applied to other UAS via differential equations.
P_{Fat}	$P_{Fat\|UA} = 1/\big(1 + \exp\big(-k(E_{Kin} - E_{Kin0})\big)\ \big)$ $E_{Kin} = 0.5 \cdot m_{UA} \cdot v_{impact}^2$; E_{Kin0}= Kinetic energy required to cause a fatality with a probability of 50 %, for the given example $E_{Kin0} = 110$ [J]; k= Constant shape parameter
$P_{C_{Ground}}$	$P_{C_{Ground}} = P_{FUA} \cdot \rho_{Pop_{Ground}} \cdot A_{Impact} \cdot S \cdot P_{Col} \cdot P_{Fat}$
P_{MAC}	Not assessed.
$\rho_{Pop_{Air}}$	Not assessed.
$P_{C_{Air}}$	Not assessed.
P_C	$P_C = P_{C_{Ground}}$
Notes	Comprehensive model, high input regarding operational area necessary.

Model	Phiesel [189]
P_{FUA}	No detailed consideration of root cause or sub-system failures in the UAS. Assumed as UAS intrinsic failure rate resulting in an out of control scenario f_{ooc}.
Operational Area	Generic, quantitative considerations. No detailed assessment. Seven scenarios are defined in a generic way.
S	$S = 1$, based on the assumption that if a sUAS hits a building, people inside are not endangered.
$\rho_{Pop_{Ground}}$	Based on the operational area, seven $\rho_{Pop_{Ground}}$ are defined. No place dependency. Uniform distribution. Static in time.
A_{Impact}	$A_{Impact} = A_{hit} = \pi \cdot \left(r_p + r_{UA}\right)^2, \quad r_{UA} = \sqrt{A_{UA}/\pi}; \quad A_{UA} = 0.25 \cdot (m_{UA})^{\frac{2}{3}}$ $A_{Impact} = \pi \cdot \left(r_p + \sqrt{\frac{A_{UA}}{\pi}}\right)^2 = \left(r_p + \sqrt{\frac{0.25 \cdot (m_{UA})^{\frac{2}{3}}}{\pi}}\right)^2$ Based on “Square-Root-Cubic Law”, mass-volume-length and area-length proportionality. 0.25 is a correction factor based on an empirical comparison.
P_{Fat}	$P_{Fat} = \tilde{p}_{let\|hit} = \frac{1}{1+e^{-2.6(\log_{10} E_{Kin} - \log_{10} 4928)}}; \, E_{Kin,max} = 155.42 \cdot m_{UA}^{\frac{4}{3}}$
$P_{C_{Ground}}$	Defined as mortality risk n_{mort} based on f_{ooc}, fatality probability in case of hit $p_{fat\|hit}$ and mitigation probability p_{mit}. $P_{C_{Ground}} = n_{mort} = f_{ooc} \cdot n_{hit\|ooc} \cdot p_{fat\|hit} \cdot p_{mit}$; additionally the intrinsic UA risk is defined as $n_{int} = n_{hit\|ooc} \cdot p_{fat\|hit}$ Transferred into safety numbers via application of negative decadic logarithm. $P_{C_{Ground}} = N_{mort} = F_{ooc} + N_{int} + P_{mit}$
P_{MAC}	Determined on the basis of reported near MAC between UA and A/C Seven categories assessed, reduced to two resulting in lethality in case of collision: $P_{MAC} = n_{let\|hit(MAC)} = \begin{cases} 10 \; cat_{a/s} = I, II \\ 0.1 \; all\ other\ cat \end{cases}$
$\rho_{Pop_{Air}}$	Not assessed.
$P_{C_{Air}}$	States that air risk for VLOS ops below 150 m AGL can be neglected entirely if the operation does not take place in close proximity to certain risk areas, e.g. airports. BVLOS ops research states that a BVLOS operation is 20 times riskier than a VLOS operation.
P_C	Provided as combined safety numbers of ground and air risk.
Notes	Applicable to sUAS only. Determination coefficients are lacking for several fundamental equations, e.g. $E_{Kin,max}$.

Model	La Cour-Harbo [50]
P_{FUA}	No overall P_{FUA} assumed. Four failure modes taken into account with $P_{FUA_i} = \{8.0^{-3}, 6.67^{-3}, 1.0^{-2}, 5^{-3}\}[1/Fh]$ No detailed consideration of root cause that leads to the failures.
Operational Area	Denmark as operational area applied. Includes a wind drift model. Area is clustered into cells that identify built up areas or non-built up areas.
S	Shelter factor dependent upon impact scenario. For the given example: $S = \{0.3, 0.6\}$
$\rho_{Pop_{Ground}}$	Based on geographical coordinates (latitude and longitude) and census data. Assumed that 30% are not in buildings. Uniform distribution. Static in time. Defined as matrix $\boldsymbol{D}$.
A_{Impact}	Dependent upon impact scenario and the corresponding time to impact the ground. Formulated as individual probability density functions (PDF).
P_{Fat}	Two methods are discussed: Blunt Trauma Criterion (BC) and Area Weight Kinetic Energy. For the first one, an equation is provided: $P_{Fat} = BC = \ln\left(\frac{E_{Kin}}{m_{UA}^{\frac{1}{3}} TD}\right)$; T=Thickness of body wall, D= Diameter of impacting object.
$P_{C_{Ground}}$	Defined as probability of impact persons $P_{ImpactPerson}$. $P_{C_{Ground}} = P_{ImpactPerson} = S \cdot A_p \cdot \sum_{\substack{lat \\ long}} (PDF \circ \boldsymbol{D})$ $A_p = 1[m^2]$
P_{MAC}	Not assessed.
$\rho_{Pop_{Air}}$	Not assessed.
$P_{C_{Air}}$	Not assessed.
P_C	$P_C = P_{FUA_i} \cdot P_{Fat} \cdot P_{C_{Ground}}$
Notes	Different approach than the mutual casualty expectation with respect to the inclusion of PDF. Inclusion of wind is notably.

Model	Kaya [190]
P_{FUA}	No overall P_{FUA} assumed. Four failure modes with constant occurrence rates are defined $P_{FUA_i} = \{10^{-5}, 10^{-4}, 10^{-3}, 10^{-4}\}[1/Fh]$ No detailed consideration of root cause that leads to the failures.
Operational Area	Based on construction survey data. Augmented by UA sensor data.
S	Not considered.
$\rho_{Pop_{Ground}}$	Based on census data, static in time. Augmented by UA sensor data.
A_{Impact}	Elliptical impact areas related to the four failure modes: $A_{Impact_i} = \{1650, 777, 521, 777\}[\mathrm{m}^2]$. Boundaries based on truncated Gausian distributions assumed to be within a 3σ deviation. Altitude dependent circle-shaped impact areas are also considered.
P_{Fat}	Assumed $P_{Fat} = 1$ in A_{Impact_i}. No equation provided.
$P_{C_{Ground}}$	$P_{C_{Ground}} = p\big(R(x)\big) = \sum_i w^i\, p\big(R^i(x)\big)$ $i = a, b, \ldots$ = Risk sources; w = Risk weighting $w^i \geq 0$; $\sum_i w^i = 1$
P_{MAC}	Assessed in a general, descriptive way. Taken into account within the failure modes.
$\rho_{Pop_{Air}}$	Not assessed.
$P_{C_{Air}}$	Not assessed.
P_C	$P_C = P_{C_{Ground}}$
Notes	The model applies probabilistic risk functions together with rapidly-exploring random trees in order to find a UA flight path posing the least risk to the overflown area. Real UAS sensor data is necessary to apply the model entirely.

Model	JARUS SORA (as part of [24, 166, 167, 169, 170] and with [173])
P_{FUA}	Must be taken into account for determining the probability of a loss of control scenario. Defined as λ_{FUA}. Within [173] explicitly part of the generic FTA for P_{LOC}.
Operational Area	Generic operational area to be considered by the user. Defined as operational volume (cf. Figure 4-5).
S	Considered in qualitative terms within the *Controlled ground area* (cf. Figure 4-5). Furthermore, within [173] applied within the fraction of people exposed to risk by the operation ($F_{Exp} = 1 - S$) and within the obstacle considerations.
$\rho_{Pop_{Ground}}$	Considered in qualitative terms within the *Controlled ground area* (cf. Figure 4-5). Within [173] several methods provided how $\rho_{Pop\|Ground}$ might be modelled by an applicant and recommendations for authorities are provided. General assumptions: Uniform distribution with an area weighting but no method for time dependency. Suggestions include satellite data or movement of people based on mobile phone network data. In general, the TLOS shall be met for every $\rho_{Pop\|Ground}$.
A_{Impact}	Combination of glide and slide on the ground model, including restitution and friction. $A_{Impact} = 2 \cdot r_D \cdot (d_{Glide} + d_{slide,reduced}) + \pi \cdot r_D^2$ with $d_{slide,reduced} = e \cdot v_{horizontal} \cdot t_{safe} - \frac{1}{2} C_g \cdot g \cdot t_{safe}^2$ $t_{safe} = \frac{v_{non-lethal} - e \cdot v_{horizontal}}{-C_g \cdot g}$; $v_{non-lethal} = \sqrt{\frac{2 \cdot K_{non-lethal}}{m}}$ $K_{non-lethal}$ Non-lethal energy; C_g friction coefficient; e restitution coefficient; t_{safe} time that it takes that the speed of the UA becomes non-lethal.
P_{Fat}	Defined as $P(fatality\|collision, LOC)$, which is the probability that a person who got hit after a crash of UA that entered afore a loss of control condition. Generally, it is assumed $P(fatality\|collision, LOC) = 1$
$P_{C_{Ground}}$	Final GRC gives back the risk for people on the ground. GRC ranges from 1 to 8 (cf. Table 4-24 and Table 4-25).
P_{MAC}	Considered in qualitative terms as air risk class ARC. Four classes of ARC are defined a to d (cf. Figure 4-6).
$\rho_{Pop_{Air}}$	Considered in qualitative terms as air risk class ARC. Four classes of ARC are defined a to d (cf. Figure 4-6).
$P_{C_{Air}}$	Considered in qualitative terms as air risk class ARC. Four classes of ARC are defined a to d (cf. Figure 4-6).

P_C	Based on final GRC and ARC, SAIL is defined which is the qualitative description of the cumulative risk for other aircraft and third parties on the ground, imposed by the UAS operation.
Notes	JARUS SORA as part of [24, 166, 167, 169, 170] is set as AMC by EASA, while [173] is still under discussion at JARUS. SORA itself requires for operations with higher risk levels activities which are similar to an aircraft type certification process although the mission is limited to one specific operation. [173] is a very exhaustive and encompassing model to determine GRC, with many variables to be considered.

11.2 O.R.C.U.S. Manual

11.2.1 General Description

O.R.C.U.S. is a set of interacting MATLAB™ functions, which together form a software, that simulates a Unmanned Aircraft System (UAS) operation above populated areas in Germany. After setting up the UAS parameters and mission parameters, the simulation is started. Basically, the software is specified for light fixed wing UAS with a MTOW ≤ 150 kg. Nevertheless, it can also be adapted to other light UAS.

During the simulation, technical failures are introduced randomly into the UAS which might lead to a crash of the Unmanned Aircraft (UA). In case a crash occurs, the current population distribution is calculated in accordance to time and place where the UA operates. Afterwards it is checked if people were present within the impact zone. People who were present in the impact zone are counted as hit person with no regard of the severity of hit. The persons hit are differentiated between unprotected people in the outside (OTW) and protected people in buildings (ATB). The results are presented in the unit per flight hour as it is done for failure conditions in airworthiness codes. Finally, the results are summarized in a .xlsx spread sheet.

Chapter 11.2.7 provides a quick example for the application of O.R.C.U.S.

The present manual summarizes the core steps to apply O.R.C.U.S. and is focused on the default settings of the tool. For advanced settings and information please refer to chapters 11.2.8 and 11.2.9.

11.2.2 Recommended Minimum System Requirements

O.R.C.U.S. was developed and tested in the environment shown in Table 11-1. It might also work on systems that are less powerful, however, this is not ensured.

MATLAB™	R2016B or later including Image Processing Toolbox and Aerospace Toolbox
Operating System	Any that is able to run MATLAB™ in the recommended version
CPU	2.3 GHz Intel Core i5 Dual-Core with 3 MB L3-Cache
RAM	16 GB
HDD	60 MB for O.R.C.U.S. files Ca. 270 kB per simulated flight hour
OTHER	Third party software that is able to read .xlsx files.

Table 11-1 O.R.C.U.S recommended minimum system requirements.

11.2.3 Installation

Unlike other application software, O.R.C.U.S. does not need to be installed on the computer. It is only necessary to copy the files into the directory where the simulation results shall be stored and evaluated. The data package is stored within the directory *O.R.C.U.S._02.01_FinalBuild*. It consists of five file directories, shown in Table 11-2.

Directory	*Content*
O.R.C.U.S._02.00_MapDetection	27 MATLAB™ function files
O.R.C.U.S._02.01_UAFlightPath	One MATLAB™ function file
O.R.C.U.S._02.01_UAFlightSim	54 MATLAB™ function files 3 Microsoft Excel files
O.R.C.U.S._02.01_UAFlightSimEval	Total 14 files including one subfolder. Two MATLAB™ function files within the main directory. Two MATLAB™ function files within the subfolder plus Apache POI library folder.
TrainingExample	One OSM image One Map struct file One O.R.C.U.S. INI file

Table 11-2 O.R.C.U.S._02.01_FinalBuild content.

1) Copy all five file directories at the MATLAB™ working directory.
2) Check each directory if the file numbers are correct.
3) Run MATLAB™.
4) Go to *O.R.C.U.S._02.01_UAFlightSim*.
5) Open the function *UAFlightSimFastEval0204.m* with the editor.
6) In case you are using a macOS or Linux system, go to code line 249 and follow the instruction regarding the POI library.
7) Modify the path directions within code lines 252 to 256 by exchanging `'/Applications/MATLAB_R2020b.app/` the MATLAB™ version that is present on your machine.
8) If a Windows PC is present, it is assumed that MS Excel is installed. In this case no POI addition should be necessary. If this is not the case, or if an error is reported due to missing POI library, please add the POI library to the appropriate path on your Windows PC.
9) Move to code line 271 and update the path in accordance to your directory structure: `YOURPATH/O.R.C.U.S._02.01_FinalBuild/O.R.C.U.S._02.01_UAFlightSim`
10) Save and close the file.
11) Switch to directory *O.R.C.U.S._02.01_UAFlightSimEval* and repeat steps 7) to 10).

GENERAL WARNING

Do not change anything of the uncommented source code as long as not explicitly stated within the present manual or in comment sections of the source code itself.

Notes

It is ok to change the source code, for example to add new modules to your personal O.R.C.U.S., but the user should have sound knowledge about the software.

It is recommended to keep an unamended copy of all source code files in order to undo any changes if the software does not work anymore.

Although the version numbers are higher than the 02.00, the current version of O.R.C.U.S. is designated as version 02.00 which is reflected within the simulation summary xlsx file.

11.2.4 Creating a Map Struct

The structural array *Map Struct* is the centerpiece of every O.R.C.U.S. simulation. It encompasses the operational environment to be simulated, the UAS parameters, the mission parameters and many more. All parameters are stored within specific fields, which are part of the structural array. Every Map Struct begins with the creation of the operational environment, which is a two-dimensional map of the intended area to be simulated. Therefore, to create a *Map Struct*, it is necessary to have an Open Street Map image present.

The OSM must have a zoom level of 15 and the scale level must be known.

The following steps describe the standard map detection sequence. In case a quick example shall be performed, it is recommended to use the training example given in chapter 11.2.7.

1) To download an OSM, visit https://www.openstreetmap.org and search for the area or city of interest. Figure 11-1 provides an example picture of the web site.

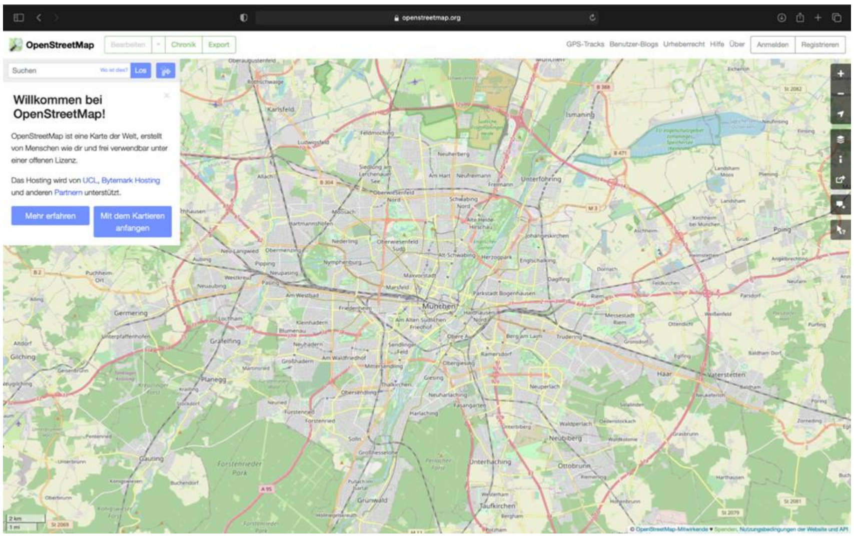


Figure 11-1. Openstreetmap website [199].

2) Zoom to the area of interest and ensure that the zoom level is 15. This can be verified by looking at the address field, which contains the coordinates and the zoom level, for example:

   https://www.openstreetmap.org/#**map=15**/48.1282/11.5765

3) To download the OSM image, click on the share icon. Then download either the entire image or draw a rectangle with the area of interest.
   Note
   Not all browsers support the OSM web page entirely. In seldom cases the share function might not work. Recommended browsers are Mozilla Firefox or Google Chrome.

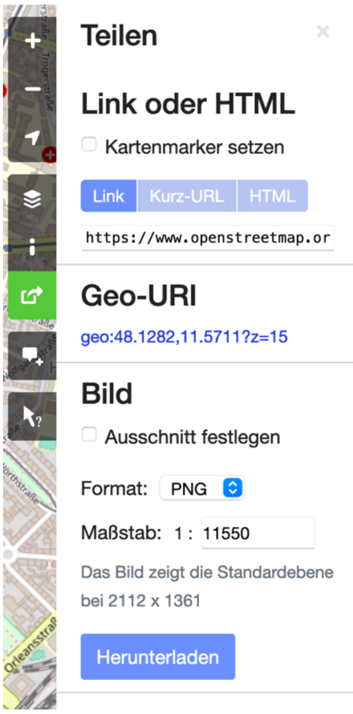


Figure 11-2. Share function of Openstreetmaps [199].

4) Note the scale of the map. The scale is usually a five-digit number.
5) Move the downloaded OSM to the *O.R.C.U.S._02.00_MapDetection* directory.
6) Run MATLAB™ (if not already active).
7) Within MATLAB™, switch within the working directory to the *O.R.C.U.S._02.00_MapDetection* folder.
8) Type the following command line and hit enter:
   `[Map] = MapDetection0200()`
9) A command prompt line will occur, confirming that *MapDetection* is running.
10) After the start of the function, a pop-up window will occur and request the user to select the OSM map image.
11) When the OSM was selected, the function will ask for the DPI number within the command prompt. Enter the value and hit enter.
    Note
    The standard DPI number is 72.

12) Afterwards, the program will ask for the scale within the command prompt. Enter the value and hit enter.
13) After step 12), *MapDetection* will run automatically until the *MapOverlay* subfunction is called. *MapOverlay* might be applied in case the city over which the operation shall take place does not cover the whole OSM. In such a case, the map is divided into the submap polygon (SMP) and the surrounding map (SurM). While in the SMP the census data of the city will be applied by O.R.C.U.S., in the SurM the census data of the county and federal state will be applied during the simulation.
If a sub map polygon shall be included, the user is required to draw the polygon. This is done by marking the first point by a left click within the map image. After the second point is marked a line will be drawn automatically. This shall be continued until the polygon is closed. The polygon should be drawn in a way that it marks the boundary of the small city.

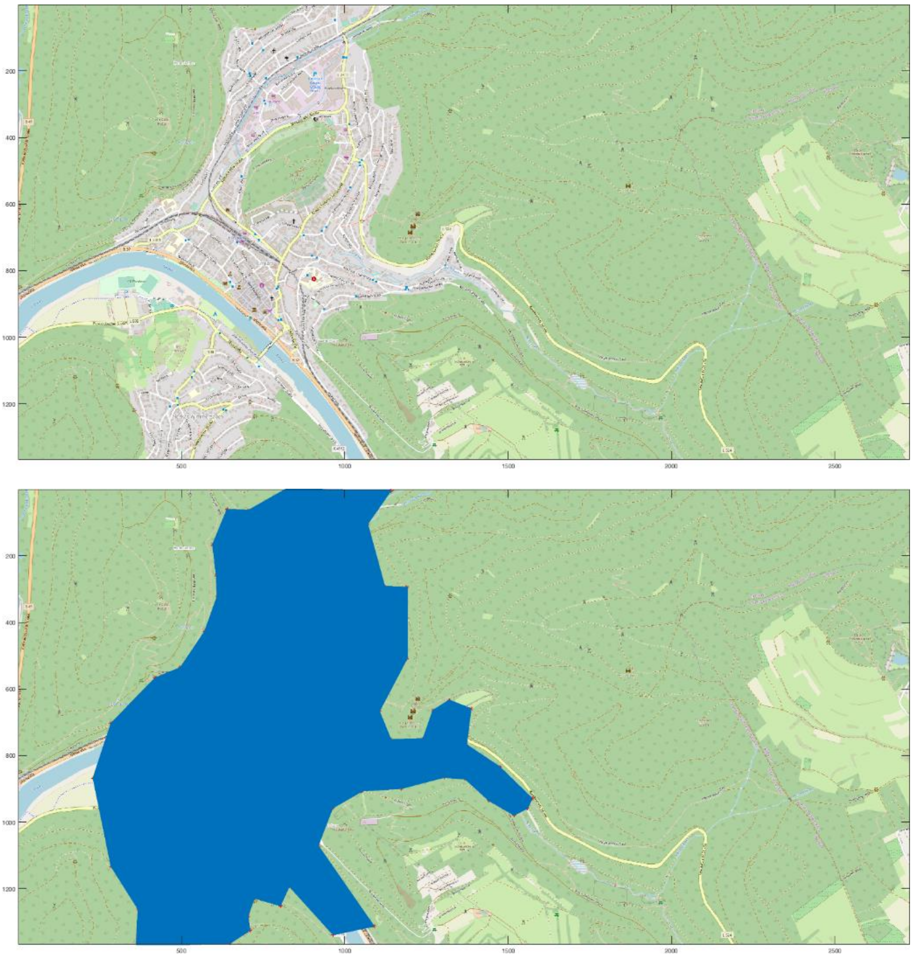


Figure 11-3. Map with SMP (blue) and SurM after MapOverlay.

WARNING

There is no undo function within *MapOverlay*. Once a point is drawn, this point is fixed. To undo, the whole map detection process must be done again.

14) Once all remaining subfunctions are completed all types of sub structs and several other MapDetection results are displayed as figures. Furthermore, a protocol with all details of the MapDetection run is saved.
If not needed, the presented figures can be closed separately or by using the command prompt "`close all`". If needed, they can be saved via the save dialog within the Matlab figure editor.
15) To save the Map Struct on the HDD, write the following line and hit enter:
`save Map -v7.3`

The default internal pixel to meter conversion value within O.R.C.U.S. is defined as one to one. This means, within the resulting Map Struct of MapDetection, one pixel is equal one meter.

Note:

It is not recommended to change this as the current O.R.C.U.S. version is optimized for this conversion value.

However, if needed to change, open the function MapDetection0200 go to line 141. There you find the call for the subfunction NormMap, which is started by the line:

[Map] = NormMap0200(Map,1);

The one within the brackets is the target scale for the pixel metre conversion. For example, if one pixel shall be equal four, exchange the one by four.

11.2.5 Flight Path Generation

11.2.5.1 Pre-Requisites

The Map struct in which the flight path shall be included, must be loaded into the MATLAB™ workspace. If the Map struct file is already present in the workspace, this step can be skipped.

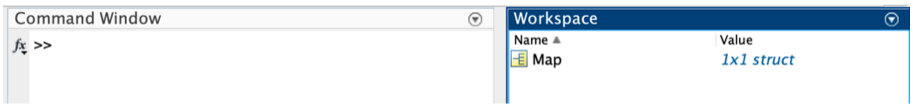


Figure 11-4. Loaded Map struct within MATLAB™ workspace.

Switch within MATLAB™ the current folder to the *O.R.C.U.S._02.01_UAFlightPath* directory.

11.2.5.2 Function Execution

1) Enter the following command into the command prompt and hit enter:
`[Map] = UAFlightPath0201(Map);`
2) A command prompt will occur, confirming that UAFlightPath is running and providing some informations about the Map struct.
3) The function provides two flight path possibilities:
    a. Circle → 1
    b. Ellipse → 2

    You have to choose between one of them by either entering one or two.
    Confirm the selection by hitting enter.

```
--------------------------------------------------------------------------------
--------------------------------------------------------------------------------
-----------------------------------O.R.C.U.S.-----------------------------------
--------------------------------------------------------------------------------
--------------------------------------------------------------------------------
Version 02.00 - Final Build
Oliver Hirling
--------------------------------------------------------------------------------

--------------------------------------------------------------------------------
UAFlightPath
Version 02.00
--------------------------------------------------------------------------------

Map-Length (y-Direction) 5786.97 [m]
Map-Width  (x-Direction) 11552.8 [m]
Map-Area                 6.68555e+07 [m^2]
Possible flightpaths:
1 - Circle
2 - Ellipse
Choose flightpath:
```

Figure 11-5. ORCUS FlightPath selection.

4) In case of a circle, a pop-up window occurs, which requires to draw the centre point within the OSM. After confirmation, the pop-up window will disappear and the map image will occur.
5) The centre point can be marked within the map image by left-clicking on the desired point on the map.
6) After selecting the centre point, another pop-up window will be shown, stating that now a boundary point of the circle shall be marked. By clicking left on a point within the OSM, the boundary point is set and the radius defined.
7) Within the image, the projected flight path will be drawn automatically. If not needed further, the image can be closed.

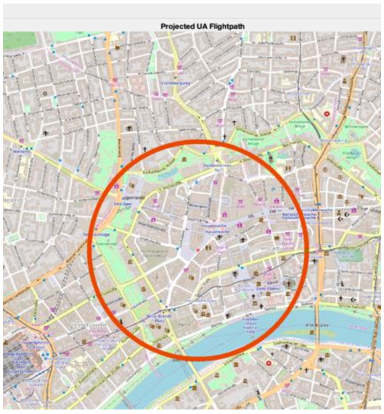


Figure 11-6. O.R.C.U.S. circle flight path projection.

8) In case an ellipse was chosen, a pop-up window will occur, stating that now the first vertex point shall be drawn. After confirming the pop-up window, the point can be set by clicking left within the map image.
9) Afterwards a pop-up window will occur, requiring that now the second vertex point shall be drawn. The procedure is identical to the first vertex point.
10) After setting the second vertex point, the ratio for semi minor to semi major axis must be entered into the command prompt. The ratio must be element of -1 to 1.
11) Enter the ratio and hit enter.
12) Within the image, the projected flight path will be drawn automatically. Additionally, a second figure will pop up, showing the pure ellipse without the underlying map. Note that within the figure without the map image the direction of the y-axis is inverted.
If not needed further, both images can be closed.

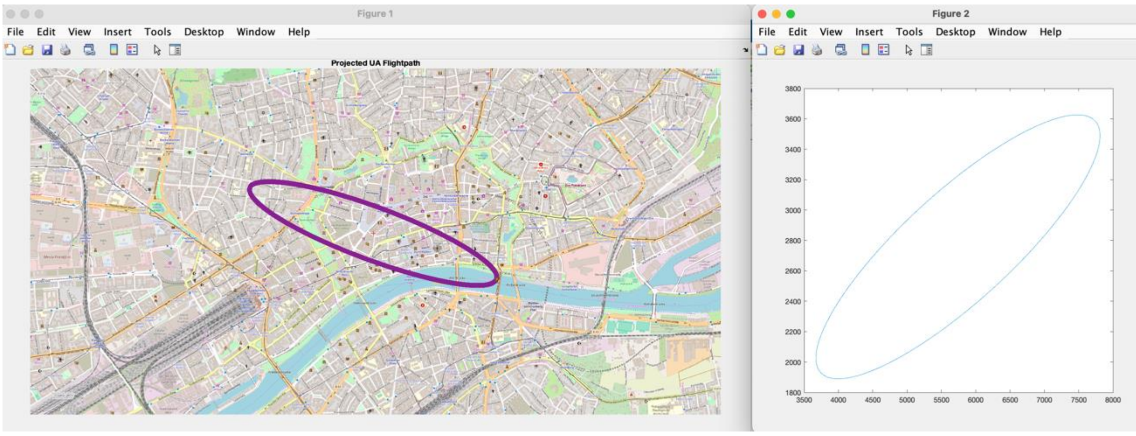


Figure 11-7. ORCUS ellipse flight path projections.

13) O.R.C.U.S. gives a command prompt output that summarizes the specific flight path information.

```
>> [Map] = UAFlightPath0201(Map);
--------------------------------------------------------------------------------
--------------------------------------------------------------------------------
-----------------------------------O.R.C.U.S.-----------------------------------
--------------------------------------------------------------------------------
--------------------------------------------------------------------------------
Version 02.00 - Final Build
Oliver Hirling
--------------------------------------------------------------------------------

--------------------------------------------------------------------------------
UAFlightPath
Version 02.00
--------------------------------------------------------------------------------

Map-Length (y-Direction) 5786.97 [m]
Map-Width  (x-Direction) 11552.8 [m]
Map-Area                 6.68555e+07 [m^2]
Possible flightpaths:
1 - Circle
2 - Ellipse
Choose flightpath:
1
Center Coordinates: (5725 / 2610)

Resulting Radius:   1297 [m]
Circle Area:        5.28482e+06 [m^2]
Flight Path Length  8149.29 [m]
Flight Area / Area: 0.0790484 [/]
```

```
>> [Map] = UAFlightPath0201(Map);
--------------------------------------------------------------------------------
--------------------------------------------------------------------------------
-----------------------------------O.R.C.U.S.-----------------------------------
--------------------------------------------------------------------------------
--------------------------------------------------------------------------------
Version 02.00 - Final Build
Oliver Hirling
--------------------------------------------------------------------------------

--------------------------------------------------------------------------------
UAFlightPath
Version 02.00
--------------------------------------------------------------------------------

Map-Length (y-Direction) 5786.97 [m]
Map-Width  (x-Direction) 11552.8 [m]
Map-Area                 6.68555e+07 [m^2]
Possible flightpaths:
1 - Circle
2 - Ellipse
Choose flightpath:
2
Vertex 1
X 3677.36
Y 1994.16

Vertex 2
X 7804.65
Y 3521.89

Enter the ratio for semi minor to semi major axis:
(The ratio must be element of -1 to 1)
0.2
Resulting Semi Major Axis:   2200.48 [m]
Resulting Semi Minor Axis:   440.096 [m]
Ellipse Area:                3.04239e+06 [m^2]
Flight Path Length           9055.74 [m]
Flight Area / Area:          0.045507 [/]
phi                          0.354516 [rad]
```

Figure 11-8. O.R.C.U.S. flight path summary output.

14) By default, both flight paths have 3,600 waypoints. The x and y coordinates of these waypoints are stored automatically within the struct as variable of the type double and have the name:
`UA_FP_X_imp_norm`
`UA_FP_Y_imp_norm`
Note that the number of waypoints applied within the flight simulation must not be equal the default number.
15) By the automatic storing, the UAFlightPath function ends.

11.2.6 Automatic UAS flight simulation and evaluation

The automatic mode is the default mode for O.R.C.U.S. Hence, it is possible to execute the main functions also manually step by step. Nevertheless, this takes a lot of more interaction of the user during the simulation. Therefore, it is not recommended to execute the O.R.C.U.S. flight simulation manually.

11.2.6.1 Pre-requisites

The Map struct in which the flight path is included, must be loaded into the MATLAB™ workspace.

In order to check if the flight path is entirely included within the Map struct, you can either double click on the *Map* variable within the workspace to open the variable or you enter “Map” into the command prompt. The latter will display all variables which are contained in the Map struct in the command prompt. The flight path is complete if the following variables exist:

a. Circle shaped flight path
```
UA_FP_C_x
UA_FP_C_y
UAFlightPath_ccf_imp_norm
UA_FP_X_imp_norm
UA_FP_Y_imp_norm
```
b. Ellipse shaped flight path
```
UAFlightPath_imp_norm
UA_FP_v1x
UA_FP_v1y
UA_FP_v2x
UA_FP_v2y
UA_FP_C_x
UA_FP_C_y
Ellipse_SemiMajorAxis
Ellipse_SemiMinorAxis
ecc
UAFlightPath_ccf_imp_norm
Ellipse_phi
UA_FP_X_imp_norm
UA_FP_Y_imp_norm
```

Switch within MATLAB™ from the current folder to the *O.R.C.U.S._02.01_UAFlightSim* directory.

11.2.6.2 Initialization Function Preparation and Execution

To initiate an O.R.C.U.S. flight simulation, it is necessary to prepare the O.R.C.U.S. initialization function.

The initialization file can be found within the *O.R.C.U.S._02.01_UAFlightSim* directory. It has the name “`ORCUS_INI0202.m`”.

1) Double click on the `ORCUS_INI0202.m` file. The MATLAB™ function editor opens.
2) Go to **`Step 01 – UA Physical Parameters`**
3) Modify the UA physical parameters as required, but do not modify variable names.

Parameter	*Unit*	*Description*
`Map.wUA`	[m]	Wingspan of the UA
`Map.lUA`	[m]	Length of the UA
`Map.mUA`	[kg]	MTOW of the UA
`Map.LtDUA`	[/]	Lift to drag ratio

Table 11-3 O.R.C.U.S. Initialization function: UA physical parameters

4) Go to **`Step 02.01 – Cumulative Probability of a Catastrophic Event`**
5) Enter the cumulative probability of a catastrophic event of the UA to be simulated. If this number is unknown, enter an assumed one. The format can be a decimal (for example 0.001) or exponential (for example 1E-3).
6) Go to **`Step 02.02 – Percentage of equipment failure`**
7) Enter the percentage number per main sub systems, but do not modify the variable names.

Parameter	*Unit*	*Range*	*Description*
`Map.FPer_EngineUA_sets`	[/]	0 to 1	Percentage failure of the engine.
`Map.FPer_ESysUA_sets`	[/]	0 to 1	Percentage failure of the electrical system.
`Map.FPer_FCSUA_sets`	[/]	0 to 1	Percentage failure of the flight control system.
`Map.FPer_NavSysUA_sets`	[/]	0 to 1	Percentage failure of the navigation system.
`Map.FPer_StructureUA_sets`	[/]	0 to 1	Percentage failure of the structure.

Table 11-4 O.R.C.U.S. Initialization function: Percentage of main sub systems failure.

The default values are for each main sub system 0.2.

8) Go to **`Step 03.01 – UA Mission Parameters`**

9) Modify the UA mission parameters as required before the semicolon, but do not modify variable names.

Parameter	*Unit*	*Description*
`Map.vUA`	[m/s]	Velocity of the UA
`Map.AltUA`	[m]	Altitude at which the UA operates

Table 11-5 O.R.C.U.S. Initialization function: UA mission parameters.

10) Go to **`Step 03.02 – Area Mission Parameters`**
In this section, all relevant data for the simulated mission are entered.

11) Modify the area mission parameters as required before the semicolon, but do not modify variable names.

Parameter	*Description*
`Step 03.02.01 – Overflown area`	
`Map.city_name`	Name of the city which is stored within the Map struct. Note: The name must be precise and in accordance to the city database. If you are not sure what the exact name is, open the file *pplCitiesCountiesFS.xlsx*. Switch to sheet *2_MATLAB_PPL_EXPORT* and search for the precise name of the city which is intended to serve as simulation area. Afterwards, close the file. **WARNING** **Do not modify the *pplCitiesCountiesFS.xlsx*! In case Excel asks you if you want to save changes, decline it.**
`Step 03.02.02 – Number of probes`	
`Map.nProbes0`	Defines the initial number of probes that is used to calculate the final number of probes dependent on the mission scheme. Recommended number of probes is 100.

Table 11-6 O.R.C.U.S. Initialization function: Overflown area and number of probes.

12) There are two possibilities to define the mission itself and the resulting total number of probes to be conducted. Go to `Step 03.02.03 Days of UA flight and mission definition`.

There are two options for the mission definition. One must be chosen.

`Option 1 - UAS operation on a random day during the week`

In case the exact day of the UAS operation is not further specified, this option should be activated by uncommenting the following lines. To uncomment, delete the percent sign:

```
% UA_days0 = [1 2 3 4 5 6 7];
% Map.UA_days0 = UA_days0;
% Map.UA_days = repmat(UA_days0,1,nProbes0);
% Map.nProbes_eval = length(Map.UA_days);
```

Each number within **`UA_days0`** identifies one day as follows:

1 – Monday
2 – Tuesday
3 – Wednesday
4 – Thursday
5 – Friday
6 – Saturday
7 – Sunday

The resulting number of probes will be equal the initial number of probes multiplied with seven and therefore equal the length of **`UA_days`**. **`UA_days`** is the variable within the Map struct that identifies and stores all simulated days within the simulation run.

`Option 2 - UAS operation on a specific day or days`

In case the UAS operation shall take on a specific day or days, option 2 should be activated by uncommenting the following lines and by deleting the days that shall not be simulated. To uncomment, delete the percent sign:

```
% UA_days0 = [1 2 3 4 5 6 7];
% Map.UA_days0 = UA_days0;
% Map.UA_days = repmat(UA_days0,1,nProbes0);
% Map.nProbes_eval = nProbes0;
```

The resulting number of relevant probes will be equal the initial number of probes and not equal the length of UA_days. Because one mission is equal one or more days, one probe is equal those days. In case a mission which shall take place every day in one week, one probe would be equal seven days (Monday to Sunday).

`nProbes_eval` is the resulting number of probes for calculating the t value, necessary to check if the simulation run is valid or not.

Note

Only one option for the mission definition shall be activated by uncommenting the specific lines. The other option must be deactivated by commenting the specific lines with the percentage sign.

13) Go to **Step 03.02.04 - Start and Landing time** to enter the time when the UAS operation is planned to start and to land each day. Modify the numbers within the brackets, but do not modify the name of the variable.
The **UA_start_land** variable must look as follows:
UA_start_land = [s l];
With **s** = start time and **l** = landing time.
s must be lower than **l**.
s and **l** must be integers which have a range from zero to 24.

Note
These times cannot vary between the days to be simulated. In the beginning, it was thought that it might be useful to include several start and landing times. However, this was omitted due to validation reasons. Therefore, wherever start and landing time sets occur, this number is equal one.

14) Go to **Step 04.01 – Basic population density determination**
In case the population density shall be entered *manually*, the struct variable **Map.dv0** must be set to one: **Map.dv0 = 1;**
Additionally, the struct variables **Map.ppldens_km2** and **Map.city_ppl** must be uncommented and filled. The first is the population density per square kilometre and the second one the number of inhabitants of the city to be overflown within the simulation. Examples:
Map.ppldens_km2 = 1500;
Map.city_ppl = 10000;
In case of manual input be aware that this may result in too much people for the map. If this happens the O.R.C.U.S. will be re-initiated during the simulation.

In case the population density shall be entered *automatically* by a search within the O.R.C.U.S. database, the struct variable **Map.dv0** must be set to two: **Map.dv0 = 2;**
If this is activated, nothing more must be done in this part of the INI function.

15) Go to **Step 04.02 – Tourist allocation**
In case tourists shall be added to the basic population number, set the struct variable **Map.dv2** to one: **Map.dv2 = 1**. If no tourists shall be added, set **Map.dv2 = 0**.
The default setting is **Map.dv2 = 0**

Note
Not for every city stored within the O.R.C.U.S. city database tourist numbers are available. If a city is selected without related tourist numbers, the tourist numbers of the county is applied. If also no tourist data about the county is available, the tourist data from the federal state is applied. This is done automatically by O.R.C.U.S.

16) Go to `Step 04.03 – OTW/ATB modification`

In case the user wishes to modify the people distribution of people in the outside (OTW) and at building sites (ATB), set `Map.ac = 1`. In general, using the activating this will result in following modification:

$$PPL_{TD_{OTW}} = PPL_{TD_{OTW_{original}}} + PPL_{TD_{ATB}} \cdot modppl$$

$$PPL_{TD_{ATB}} = PPL_{TD_{ATB_{original}}} - PPL_{TD_{ATB}} \cdot modppl$$

If `Map.ac = 1` the variable `Map.modppl` must be set to a value within the range between 0 and 1 as decimal, for example: `Map.modppl = 0.5;`

By default, `Map.ac` is set to zero: `Map.ac=0;` In this case, `Map.modppl` becomes “NA”.

Note

The OTW/ATB modification should only be applied in specific cases only as it neglects the time and place dependent population distribution algorithm. A specific case could be for example a segregated ground area where a huge assembly of people shall be overflown.

17) Go to `Step 05.01 – Cycle number`

During an O.R.C.U.S. simulation series, after launch, the UA will continuously follow the flight path until landing time is reached. One completed flight path is called *cycle*.

The control variable for the cycle number is `Map.d_cyc`.

The default setting of O.R.C.U.S. is to maintain the automated cycle number. In this case the `Map.d_cyc` is set to one: `Map.d_cyc = 1;`
If you wish to apply the default setting, you can skip this step and go to step 0.

In case the cycle number is very high, the user could desire to lower this number. High cycle numbers might occur in case of a short flight path and an increased velocity. If the cycle number shall be lowered, the variable `Map.d_cyc` must be set to zero: `Map.d_cyc = 0;`
In this case, the cycle number variable `Map.cyc` must be uncommented by deleting the percent sign and an integer number must be assigned, for example:
`Map.cyc = 20;`

18) Go to **Step 05.02 – Waypoint number**
O.R.C.U.S. calculates automatically the number of waypoints within a flight path. Due to the current possibilities for a flight path, circle or ellipse, the default value is 3600 two waypoints are separated by 0.1 ° seen from the theoretical centre point of the flight path.

The control variable for the cycle number is **Map.wp_num0**.

The default setting of O.R.C.U.S. is to maintain the automated waypoint number. In this case the **Map.wp_num0** is set to one: **Map.wp_num0 = 1;**
If you wish to apply the default setting, you can skip this step and go to step 19).

In case you wish to lower the waypoint number, the variable **Map.wp_num0** must be set to zero: **Map.wp_num0 = 0;**
In this case, the waypoint number variable **Map.wp_num** must be uncommented by deleting the percent sign and an integer number must be assigned, for example:
Map.wp_num = 100;

19) Save the file by and close the INI file.
20) Execute the INI file by writing the following line into the command prompt:
[Map] = ORCUS_INI0202(Map);
Press **enter**.
After the execution was successful, you get the following command prompt output:

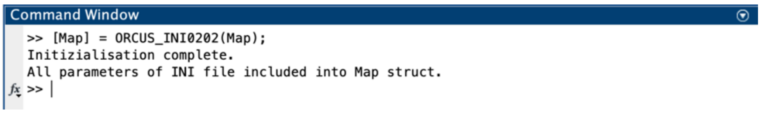

Command Window
```
>> [Map] = ORCUS_INI0202(Map);
Initizialisation complete.
All parameters of INI file included into Map struct.
>>
```

Figure 11-9. O.R.C.U.S. INI summary output.

11.2.6.3 Execution of the Automatic UAS Flight Simulation and Evaluation

After preparation in accordance to 11.2.6.1 and 11.2.6.2 is complete, O.R.C.U.S. is ready to run the simulation with the loaded Map struct.

1) Go to directory *O.R.C.U.S._02.01_UAFlightSim*.
2) Execute the O.R.C.U.S. by writing the following line into the command prompt:
[Map] = ORCUS_RUN0205(Map);
Press **enter**.
After the execution was successful, you will see progression outputs within the command prompt. The progression parameter is **k_day**.

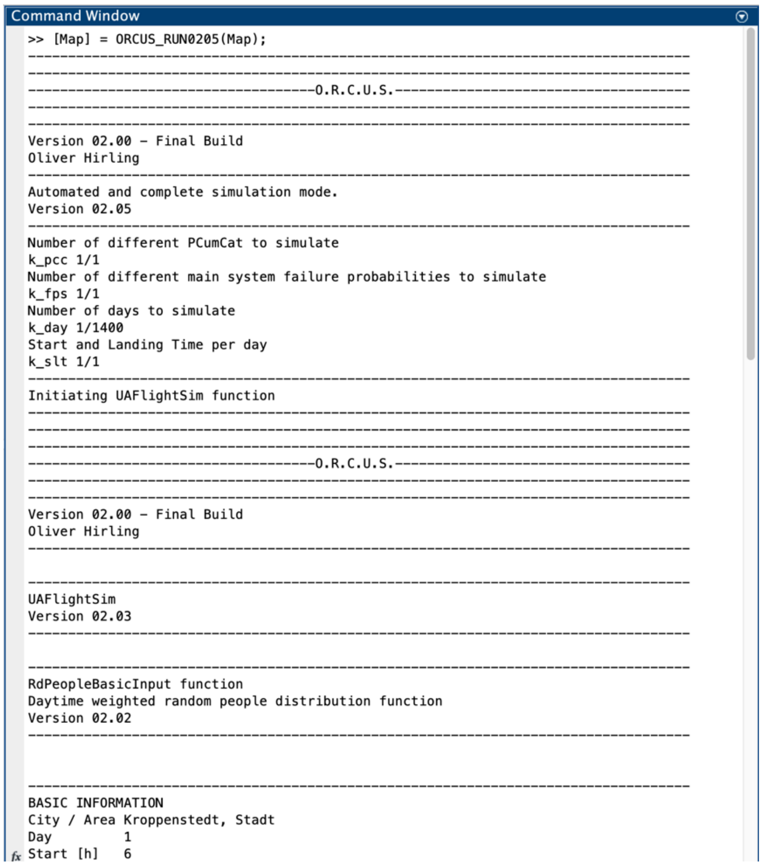


Figure 11-10. Running O.R.C.U.S. simulation output.

Based on the inputs transferred into the Map struct, O.R.C.U.S. will search the database for area information. In case it is successful, the following output will be shown.

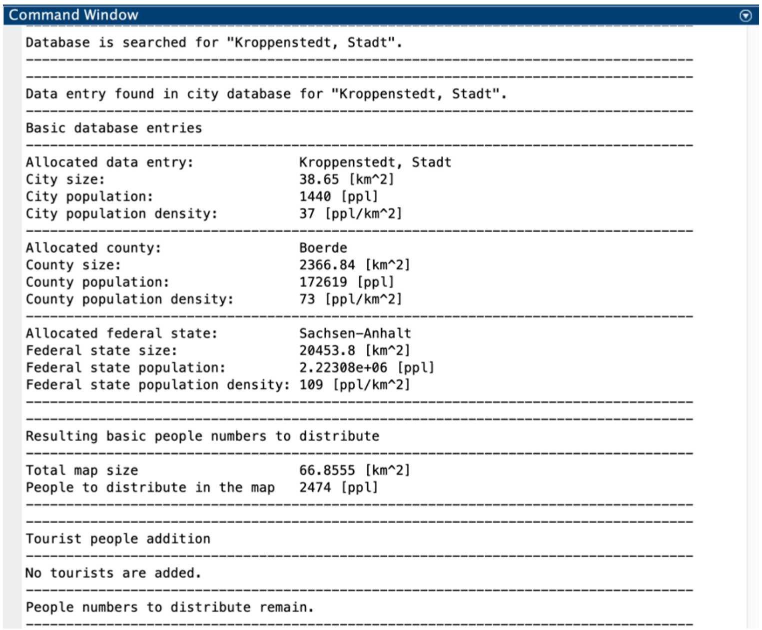


Figure 11-11. Successful database search during a simulation.

For every simulated mission day, O.R.C.U.S. generates text file that contains a protocol and stored in the directory.
In case an initiating failure occurs within the simulated UAS, six evaluation struct files will be generated and stored in the directory.

3) Once all mission days are simulated, *ORCUS_RUN* will call the evaluation function *UAFlightSimFastEval0204*.

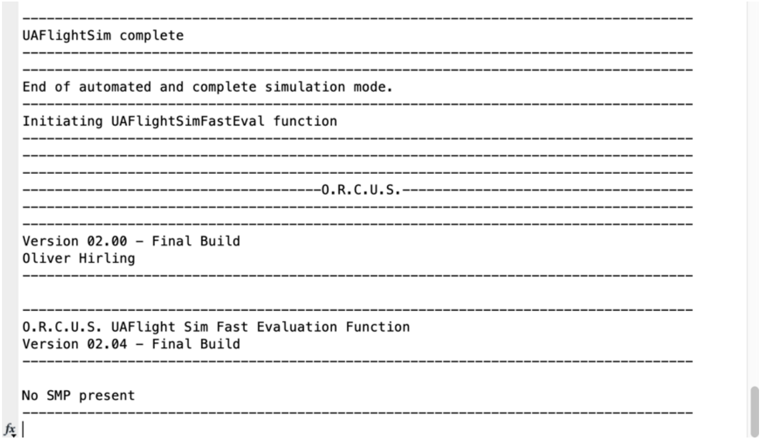


Figure 11-12. O.R.C.U.S. automated evaluation function launch.

4) The evaluation function reads all evaluation files, extracts the relevant data creates a Microsoft Excel xlsx table, that contains all necessary data about the entire simulation run including the cumulated events per flight hour and cumulated hits per flight hour.
5) The evaluation function gives back a progression status in the command prompt. After all events were analyzed, the function gives back a termination output and *ORCUS_RUN* is complete.

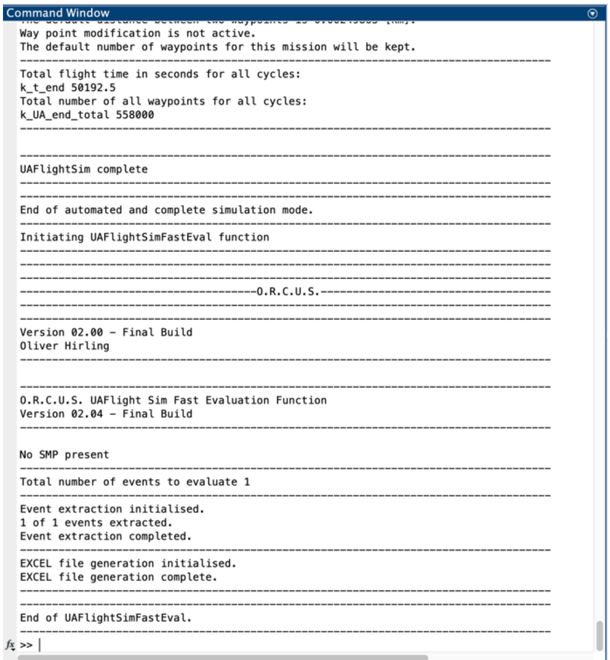


Figure 11-13. O.R.C.U.S. completed evaluation function.

6) In case no events occurred during the whole simulation run, the evaluation function will give a back an error message within the command prompt as the array to fill the Excel sheet is empty. The Excel file will be generated anyway and *ORCUS_Run* is terminated afterwards.

11.2.6.4 Evaluation File

The xlsx evaluation file consists of two sheets. The *Summary* sheet contains all information of the simulation results and the *tTest* sheet contains the results of the t-Test. For the latter, only the resulting t-Values are of importance. They can be found in the left part of the spread sheet for ATB, OTW and for the total simulation run. For a significance level $\alpha = 0.01$ the t-Values shown in Table 11-7 shall be passed in order that the simulation run can be counted as valid.

Number of probes	$t_{Crit} = t_{df;99.5}$
$df = n = 30$	2.750
$df = n = 120$	2.617
$df = n \to \infty$	2.576

Table 11-7 t-Values to be passed.

While in the left part of the summary sheet the information about the results of the particular simulation is presented, the details about every event during the simulation are presented in the columns *G* to *AI*. Table 11-8 provides a description about every column entry within the summary sheet.

O.R.C.U.S. 02.00 - Simulation Summary					
UA Parameters					
MTOW [kg]	Wingspan [r	Length [m]	L/D		
90	5	4	8		
v [km/h]	Alt [m]	CCF [m]			
100	100	9927.607			
P_CumCat [	Engine [%]	ESys [%]	FCS [%]	NavSys [%]	Struct [%]
0.01	20	20	20	20	20
General map parameters					
	Name	Area [km2]	PPL	PPL/km2	
City	Koeln	405.01	1080394	2668	
County	Koeln, Stadt	405.01	1080394	2668	
FS	NW	34112.45	17912134	525	
Mission specific map parameters					
	Area [km2]	PPL	Tourists	Total PPL	
City	66.855476	178371	0	178371	
Map total	66.855476	178371	0	178371	
PPL MOD	NA				
Sim FH [Fh]	19600	Ev/Fh [1/Fh]	0.0113776		
Events total	223				
Hits due to UA impacts		Hits/Fh [1/Fh]			
City ATB	1791	0.0913776			
City OTW	356	0.0181633			
Total	2147	0.1095408			

Figure 11-14. Evaluation file: Example simulation information and results summary.

Designation	*Description*
Prot	Number of simulation protocol file
cyc	Cycle within simulation when
k_UA	Current position of UA on flight path
Day	Simulated day
Start [hh]	Starting time of mission
Land [hh]	Landing time of mission
Time of impact	Time in simulation when impact happened
UA X Pos	UA impact coordinate x-axis
UA Y Pos	UA impact coordinate y-axis
Travelled Distance [km]	Total travelled distance of UA on flight path
pcc [1/Fh]	Probabitlity of the initiating failure
FP Eng [%]	Failure percentage of the different main sub systems engine, electrical system, flight control system, navigation system and structure.
FP ESys [%]	
FP FCS [%]	
FP NAV [%]	
FP STR [%]	
PPL_TD_CITY_ATB	Number of people to distribute at buildings within the simulated city.
PPL_CITY_ATB_COUNT	Number of distributed people at buildings within the simulated city.
HIT_CITY_ATB_COUNT	Number of people at buildings that got hit by the impact.
MAX_HIT_CITY_ATB	Maximum hit value that occurred at buildings.
PPL_TD_CITY_OTW	Number of people to distribute outside within the simulated city.
PPL_CITY_OTW_COUNT	Number of distributed people outside within the simulated city.
HIT_CITY_OTW_COUNT	Number of people outside that got hit by the impact.
MAX_HIT_CITY_OTW	Maximum hit value that occurred outside.
PPL_TD_SURM_ATB	Number of people to distribute at buildings in the surrounding map. *Only active in case SMP/SurM is present.*
PPL_SURM_ATB_COUNT	Number of distributed people at buildings in the surrounding map. *Only active in case SMP/SurM is present.*
HIT_SURM_ATB_COUNT	Number of people at buildings in the surrounding map that got hit by the impact. *Only active in case SMP/SurM is present.*
MAX_HIT_SURM_ATB	Maximum hit value that occurred at buildings in the surrounding map. *Only active in case SMP/SurM is present.*
PPL_TD_SURM_OTW	Number of people to distribute at buildings in the outside. *Only active in case SMP/SurM is present.*
PPL_SURM_OTW_COUNT	Number of distributed people at buildings in the outside. *Only active in case SMP/SurM is present.*

HIT_SURM_OTW_COUNT	Number of people at buildings in the outside that got hit by the impact. *Only active in case SMP/SurM is present.*
MAX_HIT_SURM_OTW	Maximum hit value that occurred at buildings in the outside. *Only active in case SMP/SurM is present.*
PPL_ALL_ATB_COUNT	Cumulated number distributed people at buildings.
PPL_ALL_OTW_COUNT	Cumulated number distributed people outside.
E	Event chain vector number.
Case	Description of failure case.
Outcome	Outcome of failure case.

Table 11-8 Evaluation file columns description.

11.2.6.5 Remarks on the Simulation Duration

The simulation duration is dependent upon many factors such as size of the map, flight duration per day, number of days to be simulated, the probability of an initiating failure F_0 or the initial number of probes $n0$ and the combination of all these factors. Furthermore, the computer hardware has a significant influence. Therefore, a precise prediction is hardly feasible.

For example, Figure 11-15 shows the duration of 28 simulation runs on a map with 5787 × 11553 pixels and with $F_0 = 0.01$ 1/Fh. The mission duration was 14 h and $n0$ was set to 200. Both options for the mission definitions were applied and the total number of mission days to be simulated was 1,400. The used hardware was an Apple MacBook Pro with a 2.6 GHz 6-Core Intel Core i7 and 32 GB RAM. As can be seen by Figure 11-15, the duration between the simulation runs varies greatly. The linear trend function is shown in equation (11-1). As the determination coefficient is very low, it can be said that there is no clear trend.

$$y = 0{,}0058x + 1{,}362$$
$$R^2 = 0.0304 \qquad \textbf{(11-1)}$$

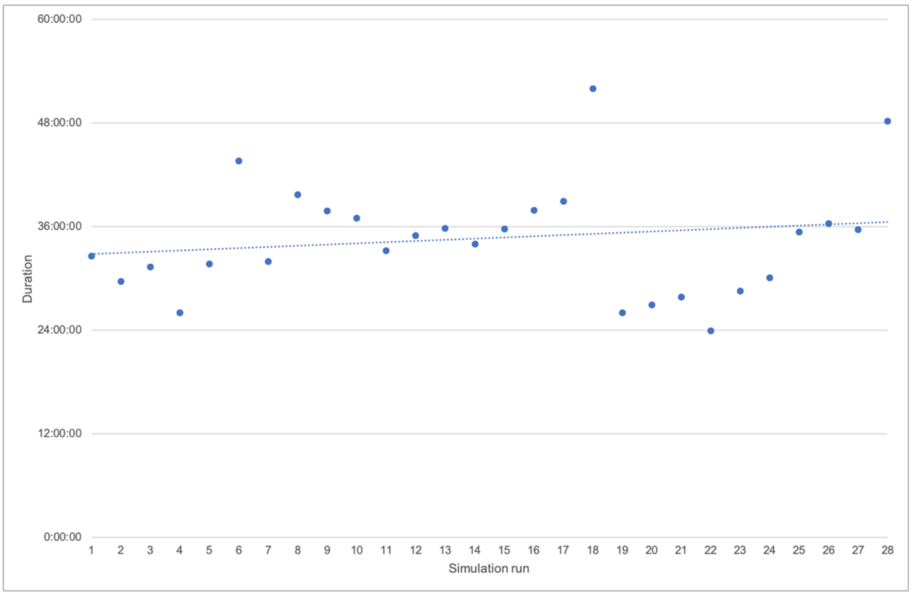


Figure 11-15. Example of O.R.C.U.S. simulation runs duration.

11.2.7 Training Example

Within the data package, a training example is included. The purpose is to familiarize with O.R.C.U.S. and to check if all files are correctly transferred The example includes an OSM image of the city “Garching bei München, a Map struct including flight path and the prepared INI file.

There are two possibilities to train yourself:

a) Quick training
   i. Copy the Map struct and the INI file into your O.R.C.U.S._02.01_UAFlightSim directory.
   ii. Load the Map struct into you MATLAB™ workspace by double clicking on the file in the current folder within MATLAB™.
   iii. Execute the INI file by [Map] = ORCUS_INI0202(Map); and press enter.
   iv. Execute the simulation run by [Map] = ORCUS_RUN0205(Map);

   Note:
   The INI file has been aligned to the training purpose. This means, the UAS has a very high initial failure rate ($0.1\ [1/Fh]$) in order to see how O.R.C.U.S. works. Furthermore, the number of probes is very low in order to reduce the simulation time for the training. Consequently, the results will probably be not valid.

b) More intense training
   i. Copy the OSM image into your O.R.C.U.S._02.00_MapDetection.
   ii. Follow the process as described in chapter 11.2.4 to 11.2.6.

The evaluation files will be stored within the directory of *O.R.C.U.S._02.01_UAFlightSim*. To see the results summary, open the xlsx file which will be generated automatically.

11.2.8 Advanced Settings

The underlying principle of O.R.C.U.S. for the randomized failure simulation is an event tree that contains probability values. These values are in terms of percent for the detection or success of certain events. The total event chain consists of 17 layers, beginning with layer zero, which marks the initiating failure during the simulation and ends with layer 17, which marks the final consequence. An excerpt of the event tree, showing layer 0 to layer 7, is presented in Figure 11-16.

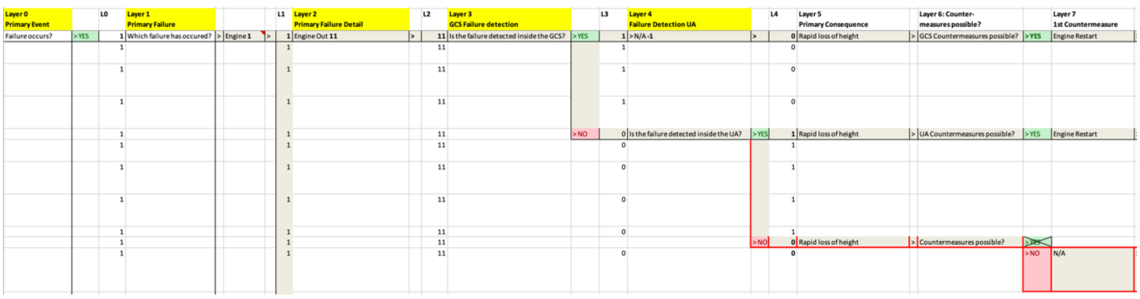


Figure 11-16. Event tree excerpt, L0-L7.

During a simulation, whenever a decision is required, e.g., failure detected or not, countermeasure successful or not, the decision is deduced on random basis with values stored in the event tree.

A complete event chain results in a so-called event vector. This vector represents the different layers with defined values in order to trace the complete chain of events. The event vector does not contain all layers, as some of them are only descriptive elements within the event tree. Table 11-9 outlines the layers, their definitions, the values and the specific designation. The last row shows if the layer is part of the event vector or not.

Layer	*Definition*	*Values*	*Designation*	*Event vector element*
L0	Primary event	0	There is no initiating failure.	Yes
		1	There is an initiating failure.	
L1	Primary failure	1	Engine	Yes
		2	Electrical system	
		3	Flight control system	
		4	Navigation system	
		5	Structure	
L2	Primary failure detail	11-13	Detailed failure cases of engine.	Yes
		21-23	Detailed failure cases of ELS.	
		31-34	Detailed failure cases of FCS.	
		41-42	Detailed failure cases of NavSys.	
		51	Detailed failure of structure.	
L3	Failure Detection by GCS	0	Failure Not Detected	Yes
		1	Failure Detected	
L4	Failure Detection by UA	0	Failure Not Detected or L3 == 1	Yes
		1	Failure Detected	
L5	Primary consequence	/	Qualitative description of primary failure	No
L6	Countermeasures possible?	/	Qualitative description if CMs are possible. CMs are only possible if L3 or L4 == 1.	No
L7	CM, by default the 1st CM	/	Qualitative description of CM.	No

L8	Success parameter of L7	0	Fail	Yes
		1	Success	
		-1	If this CM is not available or if another CM before was successful	
L9	Consequence parameter of L8	0	If L8 == 0	Yes
		1	If L8 == 1	
		-1	If L8 == -1	
L10	CM, by default the 2nd CM	/	Qualitative description of CM.	No
L11	Success parameter of L10	0	Fail	Yes
		1	Success	
		-1	If this CM is not available or if another CM before was successful	
L12	Consequence parameter of L11	0	If L11 == 0	Yes
		1	If L11 == 1	
		-1	If L11 == -1	
L13	CM, by default the 3rd CM	/	Qualitative description of CM.	No
L14	Success parameter of L13	0	Fail	Yes
		1	Success	
		-1	If this CM is not available or if another CM before was successful	
L15	Consequence parameter of L14	0	If L14 == 0	Yes
		1	If L14 == 1	
		-1	If L14 == -1	
L16	Final Consequence	0	If no CM is available or no CM was successful	Yes
		1	If one CM was available	

Table 11-9 Layer logic.

The probability for L0 is assigned within the INI file by setting up the probability of an initiating failure. For the remaining elements that are part of the event vector, an individual probability can be set up within the event tree file. This file consists of various spread sheets, including the complete event tree and the necessary export data for MATLAB™, as well as an editor which can be used to easily modify the probability values in terms of percent for the different elements.

L1	L2	L3 GCS Detection	L4 UA Detection			L8 - Success probability 1. Countermeasure	L11 - Success probability 2. Countermeasure	L14 - Success probability 3. Countermeasure
Engine	Engine Out	50	50	L7 - 1. Countermeasure	GCS_Restart	50	-1	-1
Engine	Engine Out				UA_Restart	50	-1	-1
Engine	Engine Out			L10 - 2. Countermeasure	GCS_CFIT / Emergency Landing	-1	50	-1
Engine	Engine Out				UA_CFIT / Emergency Landing	-1	50	-1
Engine	Engine Out			L13 - 3. Countermeasure	GCS_ITF	-1	-1	50
Engine	Engine Out				UA_ITF	-1	-1	50
Engine	Engine Anomaly	50	50	L7 - 1. Countermeasure	GCS_CFIT / Emergency Landing	50	-1	-1
Engine	Engine Anomaly				UA_CFIT / Emergency Landing	50	-1	-1
Engine	Engine Anomaly			L10 - 2. Countermeasure	GCS_ITF	-1	50	-1
Engine	Engine Anomaly				UA_ITF	-1	50	-1
Engine	Engine Anomaly			L13 - 3. Countermeasure	N/A	-1	-1	-1
Engine	Engine Anomaly				N/A	-1	-1	-1
Engine	Engine Fire	50	50	L7 - 1. Countermeasure	GCS_ITF	50	-1	-1
Engine	Engine Fire				UA_ITF	50	-1	-1
Engine	Engine Fire			L10 - 2. Countermeasure	N/A	-1	-1	-1
Engine	Engine Fire				N/A	-1	-1	-1
Engine	Engine Fire			L13 - 3. Countermeasure	N/A	-1	-1	-1
Engine	Engine Fire				N/A	-1	-1	-1
Electrical System	Generator Failure	50	50	L7 - 1. Countermeasure	GCS_CFIT / Emergency Landing	50	-1	-1
Electrical System	Generator Failure				UA_CFIT / Emergency Landing	50	-1	-1
Electrical System	Generator Failure			L10 - 2. Countermeasure	GCS_ITF	-1	50	-1
Electrical System	Generator Failure				UA_ITF	-1	50	-1
Electrical System	Generator Failure			L13 - 3. Countermeasure	N/A	-1	-1	-1
Electrical System	Generator Failure				N/A	-1	-1	-1
Electrical System	Connection Failure	50	50	L7 - 1. Countermeasure	GCS_CFIT / Emergency Landing	50	-1	-1
Electrical System	Connection Failure				UA_CFIT / Emergency Landing	50	-1	-1
Electrical System	Connection Failure			L10 - 2. Countermeasure	GCS_ITF	-1	50	-1
Electrical System	Connection Failure				UA_ITF	-1	50	-1
Electrical System	Connection Failure			L13 - 3. Countermeasure	N/A	-1	-1	-1
Electrical System	Connection Failure				N/A	-1	-1	-1

Figure 11-17. Part of the editor to modify the event tree values.

WARNING

Within the event tree file, only the green fields in the EDITOR spread sheet shall be modified. Otherwise, it cannot be guaranteed that O.R.C.U.S. will work as intended.

In the current version, O.R.C.U.S. is limited to the defined default LUAS, the associated main sub systems, failure modes and countermeasures. The addition of sub systems is possible but requires at first to expand the event tree in order to define the associated failure modes. Furthermore, the necessary MATLAB™ functions must be programmed and included into O.R.C.U.S. in accordance to the architecture of the software. This encompasses new failure mode functions, the assignation of an appropriate impact function and the expansion of the command prompt output functions. Figure 11-18shows the complete map of the interacting functions necessary for a complete O.R.C.U.S. simulation and for the sake of completeness Figure 11-19 shows O.R.C.U.S._02.00_MapDetection.

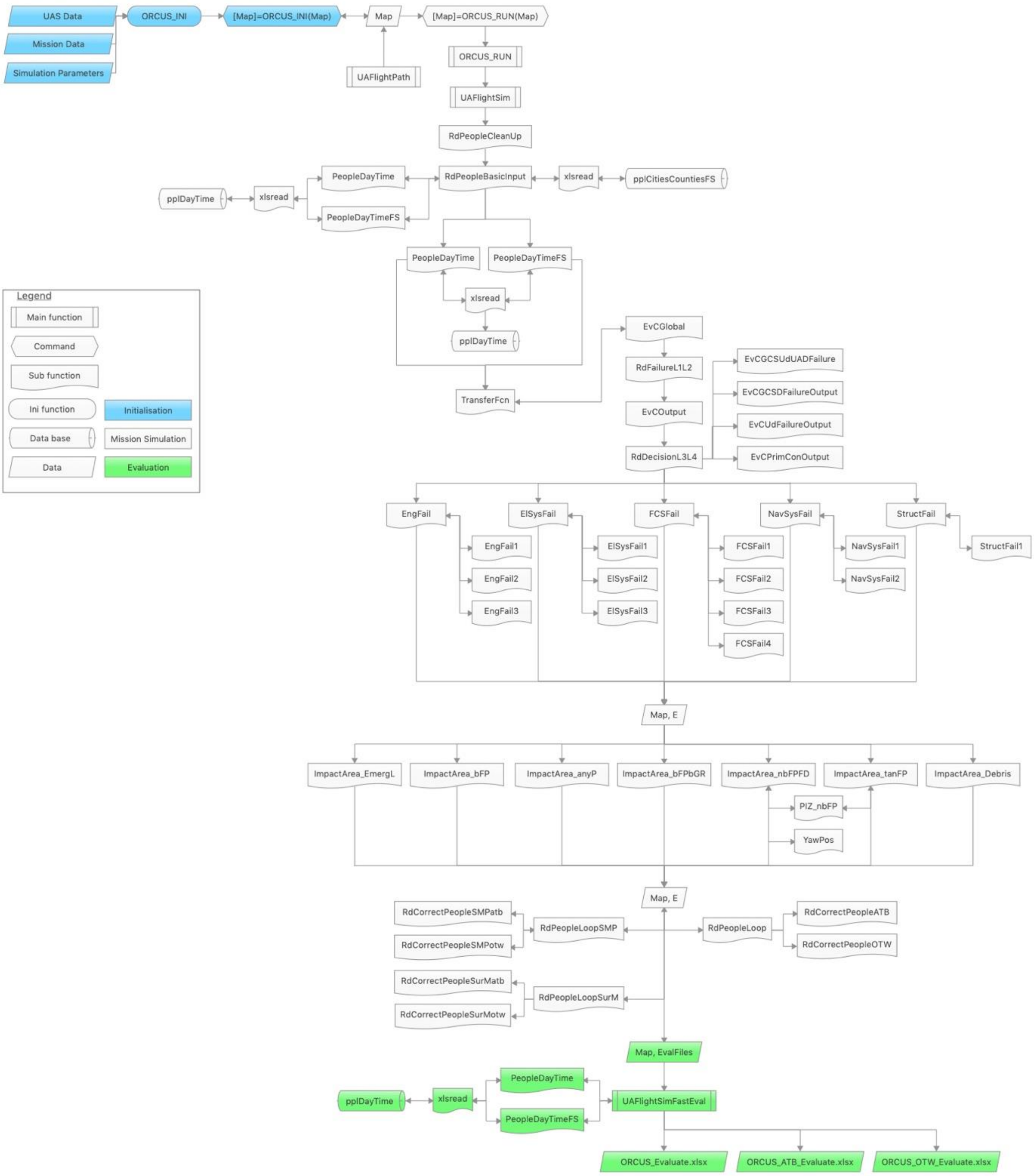


Figure 11-18. Function interaction of O.R.C.U.S. flight simulation.

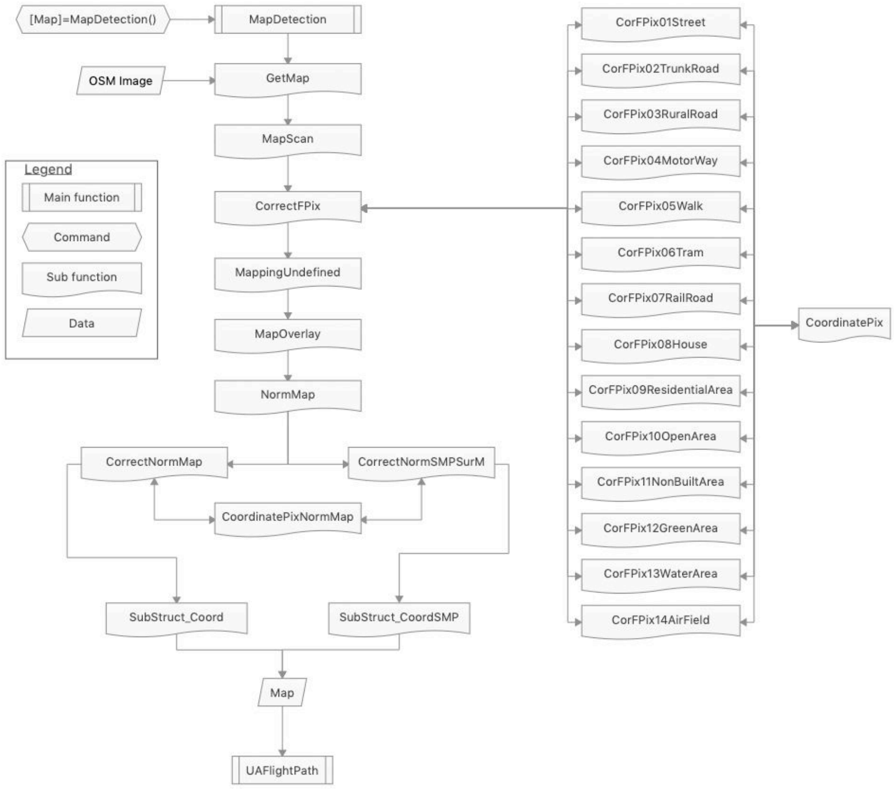


Figure 11-19. Function interaction of O.R.C.U.S. map detection.

11.2.9 Function Glossary

11.2.9.1 CoordinatePix

Description	The function calculates the surrounding pixels to the input pixel in relation to the position of the input pixel on the input map. Up to 24 neighbour pixels might be calculated. After calculation, the surrounding pixels are given back to the parent function as vectors.
Type	Sub function
Current Version	02.00
Parent function(s)	CorrectFPix1Street CorrectFPix2TrunkRoad CorrectFPix3RuralRoad CorrectFPix4MotorWay CorrectFPix5Walk CorrectFPix6Tram CorrectFPix7RailRoad CorrectFPix8House CorrectFPix9ResidentialArea CorrectFPix10OpenArea CorrectFPix11NonBuiltArea CorrectFPix12GreenArea CorrectFPix13WaterArea CorrectFPix14Airfield MappingUndefined
Child function(s)	None
Group	Operational Environment Generation
Command	`[Y,X] = CoordinatePix0200(y,x,mMax,nMax)`
Input variables	y and x coordinate of input pixel, maximum pixel numbers in y and x direction. $y = m_{Max}; x = n_{Max}$
Output variables	Surrounding pixels to the input pixel

11.2.9.2 CoordinatePixNormMap

Description	The function calculates the surrounding pixels to the input pixel in relation to the position of the input pixel on the input map. Input map is the improved and scaled map. Up to 9 neighbour pixels might be calculated. After calculation, the surrounding pixels are given back to the parent function as vectors.
Type	Sub function
Current Version	02.00
Parent function(s)	NormMap
Child function(s)	None
Group	Operational Environment Generation
Command	`[Y,X] = CoordinatePixNormMap0200(y,x,Map)`
Input variables	Scaled improved Map struct including sub-structs; y and x coordinate of input pixel
Output variables	Surrounding pixels to the input pixel

11.2.9.3 CorrectFPix

Description	The CorrectFPix function takes the map struct including the sub-structs from MapScan and deletes "wrong" allocated pixels. In this case "wrong" means for example a house pixel within a street or similar. These errors occur due to the RGB vagueness and the map labelling. The correction is done by the 14 child functions and the defined correction factors. The correction factors may be changed.
Type	Sub function
Current Version	02.00
Parent function(s)	MapDetection
Child function(s)	CorrectFPix1Street CorrectFPix2TrunkRoad CorrectFPix3RuralRoad CorrectFPix4MotorWay CorrectFPix5Walk CorrectFPix6Tram CorrectFPix7RailRoad CorrectFPix8House CorrectFPix9ResidentialArea

	CorrectFPix10OpenArea CorrectFPix11NonBuiltArea CorrectFPix12GreenArea CorrectFPix13WaterArea CorrectFPix14Airfield
Group	Operational Environment Generation
Command	`[Map] = CorrectFPix0200(Map);`
Input variables	Map struct including sub-structs
Output variables	Corrected Map struct including sub-structs

11.2.9.4 CorrectFPix01Street

Description	The function checks the street sub-struct of the map struct for wrong allocated street pixels. A wrong street pixel is identified if the surrounding pixels are less than the number defined by the handed over correction factor. The surrounding pixels are calculated by the CoordinatePix sub function. If a wrong allocated street pixel is detected, it is replaced with the correct sub-struct pixel by majority weighting. The correction is done by an outer and an inner loop. The outer loop is defined by the number of all original street pixels. The inner loop is defined by the number of surrounding pixels of every original street pixel. By this process every street pixel is checked.
Type	Sub function
Current Version	02.00
Parent function(s)	CorrectFPix
Child function(s)	CoordinatePix
Group	Operational Environment Generation
Command	`[Map] = CorrectFPix01Street0200(Map,SCor)`
Input variables	Map struct including sub-structs, street sub-struct correction factor
Output variables	Map struct including corrected street sub-struct

11.2.9.5 CorrectFPix02TrunkRoad

Description	The function checks the trunk road sub-struct of the map struct for wrong allocated street pixels. A wrong trunk road pixel is identified if the surrounding pixels are less than the number defined by the handed over correction factor. The surrounding pixels are calculated by the CoordinatePix sub function. If a wrong allocated trunk road pixel is detected, it is replaced with the correct sub-struct pixel by majority weighting. The correction is done by an outer and an inner loop. The outer loop is defined by the number of all original trunk road pixels. The inner loop is defined by the number of surrounding pixels of every original trunk road pixel. By this process every trunk road pixel is checked.
Type	Sub function
Current Version	02.00
Parent function(s)	CorrectFPix
Child function(s)	CoordinatePix
Group	Operational Environment Generation
Command	`[Map] = CorrectFPix02TrunkRoad0200(Map,TRCor)`
Input variables	Map struct including sub-structs; trunk road correction factor
Output variables	Map struct including corrected trunk road sub-struct

11.2.9.6 CorrectFPix03RuralRoad

Description	The function checks the rural road sub-struct of the map struct for wrong allocated street pixels. A wrong rural road pixel is identified if the surrounding pixels are less than the number defined by the handed over correction factor. The surrounding pixels are calculated by the CoordinatePix sub function. If a wrong allocated trunk road pixel is detected, it is replaced with the correct sub-struct pixel by majority weighting. The correction is done by an outer and an inner loop. The outer loop is defined by the number of all original rural road pixels. The inner loop is defined by the number of surrounding pixels of every original rural road pixel. By this process every rural road pixel is checked.
Type	Sub function
Current Version	02.00

Parent function(s)	CorrectFPix
Child function(s)	CoordinatePix
Group	Operational Environment Generation
Command	`[Map] = CorrectFPix03RuralRoad0200(Map,RRCor)`
Input variables	Map struct including sub-structs; rural road correction factor
Output variables	Map struct including corrected rural road sub-struct

11.2.9.7 CorrectFPix04MotorWay

Description	The function checks the motorway sub-struct of the map struct for wrong allocated street pixels. A wrong motorway pixel is identified if the surrounding pixels are less than the number defined by the handed over correction factor. The surrounding pixels are calculated by the CoordinatePix sub function. If a wrong allocated motor way pixel is detected, it is replaced with the correct sub-struct pixel by majority weighting. The correction is done by an outer and an inner loop. The outer loop is defined by the number of all original motor way pixels. The inner loop is defined by the number of surrounding pixels of every original rural road pixel. By this process every motor way pixel is checked.
Type	Sub function
Current Version	02.00
Parent function(s)	CorrectFPix
Child function(s)	CoordinatePix
Group	Operational Environment Generation
Command	`[Map] = CorrectFPix04MotorWay0200(Map,MWCor)`
Input variables	Map struct including sub-structs; motor way correction factor
Output variables	Map struct including corrected motor way sub-struct

11.2.9.8 CorrectFPix05Walk

Description	The function checks the walk sub-struct of the map struct for wrong allocated walk pixels. A wrong walk pixel is identified if the surrounding pixels are less than the number defined by the handed

	over correction factor. The surrounding pixels are calculated by the CoordinatePix sub function. If a wrong allocated walk pixel is detected, it is replaced with the correct sub-struct pixel by majority weighting. The correction is done by an outer and an inner loop. The outer loop is defined by the number of all original walk pixels. The inner loop is defined by the number of surrounding pixels of every original walk pixel. By this process every walk pixel is checked.
Type	Sub function
Current Version	02.00
Parent function(s)	CorrectFPix
Child function(s)	CoordinatePix
Group	Operational Environment Generation
Command	`[Map] = CorrectFPix05Walk0200(Map,WCor)`
Input variables	Map struct including sub-structs; walk correction factor
Output variables	Map struct including corrected walk sub-struct

11.2.9.9 CorrectFPix06Tram

Description	The function checks the tram sub-struct of the map struct for wrong allocated walk pixels. A wrong tram pixel is identified if the surrounding pixels are less than the number defined by the handed over correction factor. The surrounding pixels are calculated by the CoordinatePix sub function. If a wrong allocated tram pixel is detected, it is replaced with the correct sub-struct pixel by majority weighting. The correction is done by an outer and an inner loop. The outer loop is defined by the number of all original walk pixels. The inner loop is defined by the number of surrounding pixels of every original tram pixel. By this process every tram pixel is checked.
Type	Sub function
Current Version	02.00
Parent function(s)	CorrectFPix
Child function(s)	CoordinatePix

Group	Operational Environment Generation
Command	`[Map] = CorrectFPix06Tram0200(Map,TCor)`
Input variables	Map struct including sub-structs; tram correction factor
Output variables	Map struct including corrected tram sub-struct

11.2.9.10 CorrectFPix07RailRoad

Description	The function checks the railroad sub-struct of the map struct for wrong allocated railroad pixels. A wrong railroad pixel is identified if the surrounding pixels are less than the number defined by the handed over correction factor. The surrounding pixels are calculated by the CoordinatePix sub function. If a wrong allocated railroad pixel is detected, it is replaced with the correct sub-struct pixel by majority weighting. The correction is done by an outer and an inner loop. The outer loop is defined by the number of all original railroad pixels. The inner loop is defined by the number of surrounding pixels of every original railroad pixel. By this process every railroad pixel is checked.
Type	Sub function
Current Version	02.00
Parent function(s)	CorrectFPix
Child function(s)	CoordinatePix
Group	Operational Environment Generation
Command	`[Map] = CorrectFPix07RailRoad0200(Map,RCor)`
Input variables	Map struct including sub-structs; railroad correction factor
Output variables	Map struct including corrected railroad sub-struct

11.2.9.11 CorrectFPix08House

Description	The function checks the house sub-struct of the map struct for wrong allocated house pixels. A wrong house pixel is identified if the surrounding pixels are less than the number defined by the handed over correction factor. The surrounding pixels are calculated by the CoordinatePix sub function.

	If a wrong allocated house pixel is detected, it is replaced with the correct sub-struct pixel by majority weighting. The correction is done by an outer and an inner loop. The outer loop is defined by the number of all original house pixels. The inner loop is defined by the number of surrounding pixels of every original house pixel. By this process every house pixel is checked.
Type	Sub function
Current Version	02.00
Parent function(s)	CorrectFPix
Child function(s)	CoordinatePix
Group	Operational Environment Generation
Command	`[Map] = CorrectFPix08House0200(Map,HCor)`
Input variables	Map struct including sub-structs; house correction factor
Output variables	Map struct including corrected house sub-struct

11.2.9.12 CorrectFPix09ResidentialArea

Description	The function checks the residential area sub-struct of the map struct for wrong allocated residential area pixels. A wrong residential area pixel is identified if the surrounding pixels are less than the number defined by the handed over correction factor. The surrounding pixels are calculated by the CoordinatePix sub function. If a wrong allocated residential area pixel is detected, it is replaced with the correct sub-struct pixel by majority weighting. The correction is done by an outer and an inner loop. The outer loop is defined by the number of all original residential area pixels. The inner loop is defined by the number of surrounding pixels of every original residential area pixel. By this process every residential area pixel is checked.
Type	Sub function
Current Version	02.00
Parent function(s)	CorrectFPix
Child function(s)	CoordinatePix
Group	Operational Environment Generation

Command	`[Map] = CorrectFPix09ResidentialArea0200(Map,RACor)`
Input variables	Map struct including sub-structs; residential area correction factor
Output variables	Map struct including corrected residential area sub-struct

11.2.9.13 CorrectFPix10OpenArea

Description	The function checks the open area sub-struct of the map struct for wrong allocated open area pixels. A wrong open area pixel is identified if the surrounding pixels are less than the number defined by the handed over correction factor. The surrounding pixels are calculated by the CoordinatePix sub function. If a wrong allocated open area pixel is detected, it is replaced with the correct sub-struct pixel by majority weighting. The correction is done by an outer and an inner loop. The outer loop is defined by the number of all original residential area pixels. The inner loop is defined by the number of surrounding pixels of every original open area pixel. By this process every open area pixel is checked.
Type	Sub function
Current Version	02.00
Parent function(s)	CorrectFPix
Child function(s)	CoordinatePix
Group	Operational Environment Generation
Command	`[Map] = CorrectFPix10OpenArea0200(Map,OACor)`
Input variables	Map struct including sub-structs; open area correction factor
Output variables	Map struct including corrected open area sub-struct

11.2.9.14 CorrectFPix11NonBuiltArea

Description	The function checks the non-built area sub-struct of the map struct for wrong allocated non-built area pixels. A wrong non-built area pixel is identified if the surrounding pixels are less than the number defined by the handed over correction factor. The surrounding pixels are calculated by the CoordinatePix sub function. If a wrong allocated open area pixel is detected, it is replaced with the correct sub-struct pixel by majority weighting. The correction is done by an outer and an inner loop. The outer loop is defined by the

	number of all original non-built area pixels. The inner loop is defined by the number of surrounding pixels of every original non-built area pixel. By this process every non-built area pixel is checked.
Type	Sub function
Current Version	02.00
Parent function(s)	CorrectFPix
Child function(s)	CoordinatePix
Group	Operational Environment Generation
Command	`[Map] = CorrectFPix11NonBuiltArea0200(Map,Ncor)`
Input variables	Map struct including sub-structs; non-built area correction factor
Output variables	Map struct including corrected non-built area sub-struct

11.2.9.15 CorrectFPix12GreenArea

Description	The function checks the green area sub-struct of the map struct for wrong allocated green area pixels. A wrong green area pixel is identified if the surrounding pixels are less than the number defined by the handed over correction factor. The surrounding pixels are calculated by the CoordinatePix sub function. If a wrong allocated open area pixel is detected, it is replaced with the correct sub-struct pixel by majority weighting. The correction is done by an outer and an inner loop. The outer loop is defined by the number of all original green area pixels. The inner loop is defined by the number of surrounding pixels of every original green area pixel. By this process every green area pixel is checked.
Type	Sub function
Current Version	02.00
Parent function(s)	CorrectFPix
Child function(s)	CoordinatePix
Group	Operational Environment Generation
Command	`[Map] = CorrectFPix12GreenArea0200(Map,GACor)`
Input variables	Map struct including sub-structs; green area correction factor
Output variables	Map struct including corrected green area sub-struct

11.2.9.16 CorrectFPix13WaterArea

Description	The function checks the water area sub-struct of the map struct for wrong allocated water area pixels. A wrong water area pixel is identified if the surrounding pixels are less than the number defined by the handed over correction factor. The surrounding pixels are calculated by the CoordinatePix sub function. If a wrong allocated water area pixel is detected, it is replaced with the correct sub-struct pixel by majority weighting. The correction is done by an outer and an inner loop. The outer loop is defined by the number of all original water area pixels. The inner loop is defined by the number of surrounding pixels of every original water area pixel. By this process every water area pixel is checked.
Type	Sub function
Current Version	02.00
Parent function(s)	CorrectFPix
Child function(s)	CoordinatePix
Group	Operational Environment Generation
Command	`[Map] = CorrectFPix13WaterArea0200(Map,WACor)`
Input variables	Map struct including sub-structs; water area correction factor
Output variables	Map struct including corrected water area sub-struct

11.2.9.17 CorrectFPix14Airfield

Description	The function checks the airfield sub-struct of the map struct for wrong allocated airfield pixels. A wrong airfield pixel is identified if the surrounding pixels are less than the number defined by the handed over correction factor. The surrounding pixels are calculated by the CoordinatePix sub function. If a wrong allocated airfield pixel is detected, it is replaced with the correct sub-struct pixel by majority weighting. The correction is done by an outer and an inner loop. The outer loop is defined by the number of all original water area pixels. The inner loop is defined by the number of surrounding pixels of every original airfield pixel. By this process every airfield pixel is checked.

Type	Sub function
Current Version	02.00
Parent function(s)	CorrectFPix
Child function(s)	CoordinatePix
Group	Operational Environment Generation
Command	`[Map] = CorrectFPix14Airfield0200(Map,AFCor)`
Input variables	Map struct including sub-structs; airfield correction factor
Output variables	Map struct including corrected airfield sub-struct

11.2.9.18 CorrectNormMap

Description	Within the scaling process of the NormMap sub function, it may happen that several pixels are allocated with two or three sub-structs. CorrectNormMap determines these pixels and allocates them to a sole sub-struct. It is only activated if it's needed. The function works similar to the MappingUndefined sub function. However, in contrast to MappingUndefined only five loops are used.
Type	Sub function
Current Version	02.00
Parent function(s)	MapDetection
Child function(s)	CoordinatePixNormMap
Group	Operational Environment Generation
Command	`[Map] = CorrectNormMap0200(Map)`
Input variables	Scaled improved Map struct including sub-structs
Output variables	Corrected scaled improved Map struct including sub-structs

11.2.9.19 CorrectNormSMPSurM

Description	Within the scaling process of the NormMap sub function, it may happen that several pixels are allocated with two or three sub-structs.

	CorrectNormSMPSurM determines these pixels and allocates them to a sole sub-struct. It is only activated if it's needed and only in case an overlay has been drawn. The function works similar to the MappingUndefined sub function. However, in contrast to MappingUndefined only five loops are used.
Type	Sub function
Current Version	02.00
Parent function(s)	MapDetection
Child function(s)	CoordinatePixNormMap
Group	Operational Environment Generation
Command	`[Map] = CorrectNormMap0200(Map)`
Input variables	Scaled improved Map struct including sub-structs
Output variables	Corrected scaled improved Map struct including SurM, SMP and sub-structs

11.2.9.20 ElsSysFail

Description	The function summarizes the different failure mode functions for the UA Electrical System, calls them and hands the results back to the *EvCGlobal* function.
Type	Sub function
Current Version	02.00
Parent function(s)	EvCGlobal
Child function(s)	ElSysFail221 ElSysFail222 ElSysFail223
Group	UA Flight Simulation
Command	`[L8,L9,L11,L12,L14,L15,L16] = ElSysFail0200(Map,L1,L2,L3,L4)`
Input variables	O.R.C.U.S. Map struct including all relevant UAS parameters and mission variables. Layer parameters L1, L2, L3, and L4. See Table 11-9 for description.

Output variables	Layer parameters L8, L9, L11, L12, L14, L15 and L16. See Table 11-9 for description.

11.2.9.21 ElSysFail221

Description	Function for determining the event chain in case of the electrical system failure condition "Generator Failure". Event Chain is based on *Eventtree_6.xlsx*.
Type	Sub function
Current Version	02.00
Parent function(s)	ElSysFail
Child function(s)	None
Group	UA Flight Simulation
Command	`[L8,L9,L11,L12,L14,L15,L16] = ElSysFail221_0200(Map,L2,L3,L4)`
Input variables	O.R.C.U.S. Map struct including all relevant UAS parameters and mission variables. Layer parameters L2, L3, and L4. See Table 11-9 for description.
Output variables	Layer parameters L8, L9, L11, L12, L14, L15 and L16. See Table 11-9 for description.

11.2.9.22 ElSysFail222

Description	Function for determining the event chain in case of the electrical system failure condition "Connection Failure". Event Chain is based on *Eventtree_6.xlsx*.
Type	Sub function
Current Version	02.00
Parent function(s)	ElSysFail
Child function(s)	None
Group	UA Flight Simulation

Command	`[L8,L9,L11,L12,L14,L15,L16] = ElSysFail222_0200(Map,L2,L3,L4)`
Input variables	O.R.C.U.S. Map struct including all relevant UAS parameters and mission variables. Layer parameters L2, L3, and L4. See Table 11-9 for description.
Output variables	Layer parameters L8, L9, L11, L12, L14, L15 and L16. See Table 11-9 for description.

11.2.9.23 ElSysFail223

Description	Function for determining the event chain in case of the electrical system failure condition "Short Circuit / Overload". Event Chain is based on *Eventtree_6.xlsx*.
Type	Sub function
Current Version	02.00
Parent function(s)	ElSysFail
Child function(s)	None
Group	UA Flight Simulation
Command	`[L8,L9,L11,L12,L14,L15,L16] = ElSysFail223_0200(Map,L2,L3,L4)`
Input variables	O.R.C.U.S. Map struct including all relevant UAS parameters and mission variables. Layer parameters L2, L3, and L4. See Table 11-9 for description.
Output variables	Layer parameters L8, L9, L11, L12, L14, L15 and L16. See Table 11-9 for description.

11.2.9.24 EngFail

Description	The function summarizes the different failure mode functions for the UA engine, calls them and hands the results back to the *EvCGlobal* function.
Type	Sub function

Current Version	02.00
Parent function(s)	EvCGlobal
Child function(s)	EngFail111 EngFail112 EngFail113
Group	UA Flight Simulation
Command	`[L8,L9,L11,L12,L14,L15,L16] = EngFail0200(Map,L1,L2,L3,L4)`
Input variables	O.R.C.U.S. Map struct including all relevant UAS parameters and mission variables. Layer parameters L1, L2, L3, and L4. See Table 11-9 for description.
Output variables	Layer parameters L8, L9, L11, L12, L14, L15 and L16. See Table 11-9 for description.

11.2.9.25 EngFail111

Description	Function for determining the event chain in case of the electrical system failure condition "Engine Out". Event Chain is based on *Eventtree_6.xlsx*.
Type	Sub function
Current Version	02.00
Parent function(s)	EngFail
Child function(s)	None
Group	UA Flight Simulation
Command	`[L8,L9,L11,L12,L14,L15,L16] = EngFail111_0200(Map,L2,L3,L4)`
Input variables	O.R.C.U.S. Map struct including all relevant UAS parameters and mission variables. Layer parameters L2, L3, and L4. See Table 11-9 for description.
Output variables	Layer parameters L8, L9, L11, L12, L14, L15 and L16.

	See Table 11-9 for description.

11.2.9.26 EngFail112

Description	Function for determining the event chain in case of the electrical system failure condition "Engine Anomaly". Event Chain is based on *Eventtree_6.xlsx*.
Type	Sub function
Current Version	02.00
Parent function(s)	EngFail
Child function(s)	None
Group	UA Flight Simulation
Command	`[L8,L9,L11,L12,L14,L15,L16] = EngFail112_0200(Map,L2,L3,L4)`
Input variables	O.R.C.U.S. Map struct including all relevant UAS parameters and mission variables. Layer parameters L2, L3, and L4. See Table 11-9 for description.
Output variables	Layer parameters L8, L9, L11, L12, L14, L15 and L16. See Table 11-9 for description.

11.2.9.27 EngFail113

Description	Function for determining the event chain in case of the electrical system failure condition "Engine Fire". Event Chain is based on *Eventtree_6.xlsx*.
Type	Sub function
Current Version	02.00
Parent function(s)	EngFail
Child function(s)	None
Group	UA Flight Simulation
Command	`[L8,L9,L11,L12,L14,L15,L16] = EngFail113_0200(Map,L2,L3,L4)`

Input variables	O.R.C.U.S. Map struct including all relevant UAS parameters and mission variables. Layer parameters L2, L3, and L4. See Table 11-9 for description.
Output variables	Layer parameters L8, L9, L11, L12, L14, L15 and L16. See Table 11-9 for description.

11.2.9.28 EvCGlobal

Description	Function that calculates the failure process in the airborne UA, based on *Eventree_6.xlsx*. The function flow is based on the layers and values stored within the event tree file.
Type	Sub function
Current Version	02.00
Parent function(s)	TransferFcn
Child function(s)	PrimEvFail RdFailureL1L2 EvCOutput RdDecisionL3L4 EvCCGCFailureOutput EvCGCSUdUADFailureOutput EvCUdFailureOutput EngFail ElSysFail FCSFail NavSysFail StructFail
Group	UA Flight Simulation
Command	`[L1,L2,L3,L4,L8,L9,L11,L12,L14,L15,L16] = EvCGlobal0200(Map)`
Input variables	O.R.C.U.S. Map struct including all relevant UAS parameters and mission variables.
Output variables	Layer parameters L8, L9, L11, L12, L14, L15 and L16. See Table 11-9 for description.

11.2.9.29 *EvCGCSDFailureOutput*

Description	Function which provides a command prompt output that the GCS detected a failure within the airborne UA.
Type	Sub function
Current Version	02.00
Parent function(s)	EvCGlobal
Child function(s)	None
Group	UA Flight Simulation
Command	`[] = EvCGCSDFailureOutput0200(L2)`
Input variables	Layer parameter L2; see Table 11-9 for description.
Output variables	None except command line output.

11.2.9.30 *EvCGCSUdUADFailureOutput*

Description	Function which returns a command prompt output that the UA detected a failure within the airborne UA, which was not detected in the GCS.
Type	Sub function
Current Version	02.00
Parent function(s)	EvCGlobal
Child function(s)	None
Group	UA Flight Simulation
Command	`[] = EvCGCSUdUADFailureOutput0200(L2)`
Input variables	Layer parameter L2; see Table 11-9 for description.
Output variables	None except command line output.

11.2.9.31 *EvCOutput*

Description	Function that returns the results of the *RdFailureL1L2* function within the command prompt.
Type	Sub function
Current Version	02.00

Parent function(s)	EvCGlobal
Child function(s)	None
Group	UA Flight Simulation
Command	`[] = EvCOutput0200(L1,L2)`
Input variables	Layer parameter L1 and L2; see Table 11-9 for description.
Output variables	None except command line output.

11.2.9.32 EvCPrimConOutput

Description	Function that returns a command prompt output of the primary consequence in case a failure occurred within the airborne UA.
Type	Sub function
Current Version	02.00
Parent function(s)	EvCGlobal
Child function(s)	None
Group	UA Flight Simulation
Command	`[] = EvCPrimConOutput0200(L2)`
Input variables	Layer parameter L2; see Table 11-9 for description.
Output variables	None except command line output.

11.2.9.33 EvCUdFailureOutput

Description	Function which returns a command prompt output that a failure within the airborne UA was not detected neither in the GCS nor in the UA.
Type	Sub function
Current Version	02.00
Parent function(s)	EvCGlobal
Child function(s)	None
Group	UA Flight Simulation
Command	`[] = EvCUdFailureOutput0200(L2)`
Input variables	Layer parameter L2; see Table 11-9 for description.

Output variables	None except command line output.

11.2.9.34 Eventtree_6.xlsx

Description	The event tree file contains all probability values defined by the UAS and by the O.R.C.U.S. user regarding possible events which might occur by random during an O.R.C.U.S. simulation. See also chapter 11.2.8.
Type	xlsx table
Current Version	6
Parent function(s)	None
Child function(s)	None
Group	UA Flight Simulation
Command	`None`
Input variables	Probability values for failure modes, failure detection and countermeasures in accordance to UAS and user definition.
Output variables	Probability values for failure modes, failure detection and countermeasures in accordance to UAS and user definition.

11.2.9.35 FCSFail

Description	The function summarizes the different failure mode functions for the UA FCS, calls them and hands the results back to the *EvCGlobal* function.
Type	Sub function
Current Version	02.00
Parent function(s)	EvCGlobal
Child function(s)	FCSFail331 FCSFail332 FCSFail333 FCSFail334
Group	UA Flight Simulation
Command	`[L8,L9,L11,L12,L14,L15,L16] =` `FCSFail0200(Map,L1,L2,L3,L4)`

Input variables	O.R.C.U.S. Map struct including all relevant UAS parameters and mission variables. Layer parameters L1, L2, L3, and L4. See Table 11-9 for description.
Output variables	Layer parameters L8, L9, L11, L12, L14, L15 and L16. See Table 11-9 for description.

11.2.9.36 FCSFail331

Description	Function for determining the event chain in case of the electrical system failure condition "Partial Lock of flight control surfaces". Event Chain is based on *Eventtree_6.xlsx*.
Type	Sub function
Current Version	02.00
Parent function(s)	FCSFail
Child function(s)	None
Group	UA Flight Simulation
Command	`[L8,L9,L11,L12,L14,L15,L16] = FCSFail331_0200(Map,L2,L3,L4)`
Input variables	O.R.C.U.S. Map struct including all relevant UAS parameters and mission variables. Layer parameters L2, L3, and L4. See Table 11-9 for description.
Output variables	Layer parameters L8, L9, L11, L12, L14, L15 and L16. See Table 11-9 for description.

11.2.9.37 FCSFail332

Description	Function for determining the event chain in case of the electrical system failure condition "Wrong commands to the flight control surfaces, resulting in oscillations". Event Chain is based on *Eventtree_6.xlsx*.
Type	Sub function

Current Version	02.00
Parent function(s)	FCSFail
Child function(s)	None
Group	UA Flight Simulation
Command	`[L8,L9,L11,L12,L14,L15,L16] = FCSFail332_0200(Map,L2,L3,L4)`
Input variables	O.R.C.U.S. Map struct including all relevant UAS parameters and mission variables. Layer parameters L2, L3, and L4. See Table 11-9 for description.
Output variables	Layer parameters L8, L9, L11, L12, L14, L15 and L16. See Table 11-9 for description.

11.2.9.38 FCSFail333

Description	Function for determining the event chain in case of the electrical system failure condition "Wrong commands to the flight control surfaces / override of GCS commands". Event Chain is based on *Eventtree_6.xlsx*.
Type	Sub function
Current Version	02.00
Parent function(s)	FCSFail
Child function(s)	None
Group	UA Flight Simulation
Command	`[L8,L9,L11,L12,L14,L15,L16] = FCSFail333_0200(Map,L2,L3,L4)`
Input variables	O.R.C.U.S. Map struct including all relevant UAS parameters and mission variables. Layer parameters L2, L3, and L4. See Table 11-9 for description.
Output variables	Layer parameters L8, L9, L11, L12, L14, L15 and L16. See Table 11-9 for description.

11.2.9.39 FCSFail334

Description	Function for determining the event chain in case of the electrical system failure condition "Wrong commands to the flight control surfaces and/or the engine resulting in movements beyond the limitations of the UA (V_{NE} is exceeded)". Event Chain is based on *Eventtree_6.xlsx*.
Type	Sub function
Current Version	02.00
Parent function(s)	FCSFail
Child function(s)	None
Group	UA Flight Simulation
Command	`[L8,L9,L11,L12,L14,L15,L16] = FCSFail334_0200(Map,L2,L3,L4)`

Input variables	O.R.C.U.S. Map struct including all relevant UAS parameters and mission variables. Layer parameters L2, L3, and L4. See Table 11-9 for description.
Output variables	Layer parameters L8, L9, L11, L12, L14, L15 and L16. See Table 11-9 for description.

11.2.9.40 ImpactArea_anyP

Description	The function determines the circle-shaped impact area after a UA ground impact that happened at a random point on the overflown map. This impact scenario occurs after event chains E56, E58, E59, E67, E70 and E71. The impact area is calculated as follows: $r_{CoreImpact} = \lceil 0.5 \cdot \max(w_{UA}, l_{UA}) \rceil$ (11-2) $r_{Impact} = 2 \cdot r_{CoreImpact}$ (11-3) $A_{Impact} = \pi \cdot r_{Impact}^2$ (11-4)
Type	Sub function
Current Version	02.00
Parent function(s)	TransferFcn
Child function(s)	None
Group	UA Flight Simulation
Command	`[Map] = ImpactArea_anyP0200(Map,k_cyc,k_UA)`
Input variables	O.R.C.U.S. Map struct including all relevant UAS parameters and mission variables. Current position of UA on flight path k_UA and current cycle number k_cyc. Handed over automatically by parent function.
Output variables	Impact area on the map which is stored directly in map struct. If activated, plot of impact zone.

11.2.9.41 *ImpactArea_bFP*

Description	The function determines the circle-shaped impact area after a UA ground impact directly below the flight path on the overflown map. This impact scenario occurs after event chains E3, E7, E11, E14, E17, E19, E23, E26, E30, E33, E36, E37, E38, E39, E40, E42, E45, E49, E50, E52, E53, E54, E55, E57, E60, E62, E66, E69, E73, E74, E76, E77, E78, E79 and E81. The calculation of the impact areas is identical to the function *ImpactArea_anyP*.
Type	Sub function
Current Version	02.00
Parent function(s)	TransferFcn
Child function(s)	None
Group	UA Flight Simulation
Command	`[Map] = ImpactArea_bFP0200(Map,k_cyc,k_UA)`
Input variables	O.R.C.U.S. Map struct including all relevant UAS parameters and mission variables. Current position of UA on flight path k_UA and current cycle number k_cyc. Handed over automatically by parent function.
Output variables	Impact area on the map which is stored directly in map struct. If activated, plot of impact zone.

11.2.9.42 *ImpactArea_bFPbGR*

Description	The function determines the rectangular-shaped impact area after the UA has followed the flight path at best-glide ratio until it touched the ground. This impact scenario occurs after event chains E4, E12, E15 and E16. The impact area is calculated as follows: $d_{Glide} = L/D \cdot h_{Alt}$ [m] (11-5) $d_{Glide\|h_P} = L/D \cdot h_P$ [m] (11-6) $d_{Swath} = 2 \cdot \max(w_{UA}, l_{UA}) + d_{Glide\|h_P}$ [m] (11-7) $A_{GlideImpact} = 2 \cdot \max(w_{UA}, l_{UA}) \cdot d_{Swath}$ [m] (11-8)
Type	Sub function
Current Version	02.01

Parent function(s)	TransferFcn
Child function(s)	PIZ_nbFP
Group	UA Flight Simulation
Command	`[Map] = ImpactArea_bFPbGR0201(Map,k_cyc,k_UA)`
Input variables	O.R.C.U.S. Map struct including all relevant UAS parameters and mission variables. Current position of UA on flight path k_UA and current cycle number k_cyc. Handed over automatically by parent function.
Output variables	Impact area on the map which is stored directly in map struct. If activated, plot of impact zone.

11.2.9.43 ImpactArea_Debris

Description	The function determines the impact area in case the UA disintegrates in the air and debris occurs. This impact scenario occurs after event chains E18, E20, E21, E61, E63, E64, E80, E82 and E83. The impact area is calculated as follows: $t_{Impact} = \sqrt{\frac{2 \cdot h_{Alt}}{g}}\ [\mathrm{sec}]$ (11-9) $d_{Debris} = v_{UA} \cdot t_{Impact}\ [\mathrm{m}]$ (11-10) $r_{Impact} = \max(w_{UA}, l_{UA}, 0.5 \cdot d_{Debris})$ (11-11) $A_{Debris} = \pi \cdot r_{Impact}\ [\mathrm{m}^2]$ (11-12)
Type	Sub function
Current Version	02.00
Parent function(s)	TransferFcn
Child function(s)	None
Group	UA Flight Simulation
Command	`[Map] = ImpactArea_Debris0200(Map,k_cyc,k_UA)`
Input variables	O.R.C.U.S. Map struct including all relevant UAS parameters and mission variables. Current position of UA on flight path k_UA and current cycle number k_cyc. Handed over automatically by parent function.

Output variables	Impact area on the map which is stored directly in map struct. If activated, plot of impact zone.

11.2.9.44 ImpactArea_EmergL

Description	The function determines the emergency landing field in case an emergency landing is possible due to a countermeasure. This applies to all event chains not linked to another impact scenario. The quadratic-shaped emergency landing area is calculated as follows: $$A_{ELF} = r_{Impact}^2 = \lceil \max(w_{UA}, l_{UA}) \rceil^2 \quad (11\text{-}13)$$
Type	Sub function
Current Version	02.00
Parent function(s)	TransferFcn
Child function(s)	None
Group	UA Flight Simulation
Command	`[Map] = ImpactArea_EmergL0200(Map,k_cyc,k_UA)`
Input variables	O.R.C.U.S. Map struct including all relevant UAS parameters and mission variables. Current position of UA on flight path k_UA and current cycle number k_cyc. Handed over automatically by parent function.
Output variables	Impact area on the map which is stored directly in map struct. If activated, plot of impact zone.

11.2.9.45 ImpactArea_nbFPFD

Description	The function calculates an impact zone close to the flight path in flight direction. The UA deviates from the flight path by a normal distributed random pitch angle and a yaw angle. In any case, it is assumed, that the last phase before the impact is comparable to a deep dive. The impact scenario occurs after event chains E43, E46 and E47. The calculation of the impact areas is identical to the function *ImpactArea_anyP*.
Type	Sub function
Current Version	02.00
Parent function(s)	TransferFcn

Child function(s)	PIZ_nbFP YawPos
Group	UA Flight Simulation
Command	`[Map] = ImpactArea_nbFPFD0200(Map,k_cyc,k_UA)`
Input variables	O.R.C.U.S. Map struct including all relevant UAS parameters and mission variables. Current position of UA on flight path k_UA and current cycle number k_cyc. Handed over automatically by parent function.
Output variables	Impact area on the map which is stored directly in map struct. If activated, plot of impact zone.

11.2.9.46 ImpactArea_tanFP

Description	The function calculates an impact zone after the UA has deviated tangentially from the flight path and loses altitude at best glide ratio until it touches the ground. The impact scenario occurs after event chains E8, E9, E24, E27, E28, E31, E34 and E35. The calculation of the impact areas is identical to the function *ImpactArea_bFPbGR*.
Type	Sub function
Current Version	02.01
Parent function(s)	TransferFcn
Child function(s)	PIZ_nbFP
Group	UA Flight Simulation
Command	`[Map] = ImpactArea_tanFP0201(Map,k_cyc,k_UA)`
Input variables	O.R.C.U.S. Map struct including all relevant UAS parameters and mission variables. Current position of UA on flight path k_UA and current cycle number k_cyc. Handed over automatically by parent function.
Output variables	Impact area on the map which is stored directly in map struct. If activated, plot of impact zone.

11.2.9.47 GetMap

Description	The function loads an OSM image into the MATLAB workspace.
Type	Sub function
Current Version	02.00
Parent function(s)	MapDetection
Child function(s)	None
Group	Operational Environment Generation
Command	`[Map] = GetMap0200()`
Input variables	OSM png map image, scale, resolution
Output variables	Map struct

11.2.9.48 MapDetection

Description	The function calls all sub functions necessary to import and render an OSM image, categorize it and transfer it into a MATLAB struct.
Type	Main function
Current Version	02.00
Parent function(s)	None
Child function(s)	CorrectFPix CorrectNormMap CorrectNormSMP GenerateSurM GetMap MapOverlay MappingUndefined MapScan NormMap SubStruct_Coord
Group	Operational Environment Generation
Command	`[Map] = MapDetection0200()`
Input variables	OSM png map image
Output variables	O.R.C.U.S. Map struct

11.2.9.49 MapOverlay

Description	This function allows the user to draw a polygon shaped overlay, if required. With this polygon the "small city/big map" is solved. "Small city/big map" issue: In general, O.R.C.U.S. uses the population data stored in pplCities and pplDayTime databases to distribute people in a city on the map image. In case the city covers the whole map image, this is applicable without any limitations. However, if the city doesn't cover the whole map image, this would also be applied to areas on the map even if there's no city. By using the overlay function a sub map is generated for the city area. In this sub map the original data and algorithms are used. For the remaining area the data from the advanced database "pplCitiesCountiesFS" is used. This database encompasses an update of population data for all cities plus population data from each county and federal state. In addition, a "PeopleDayTimeFS" algorithm was generated for this area.
Type	Sub function
Current Version	02.00
Parent function(s)	MapDetection
Child function(s)	None
Group	Operational Environment Generation
Command	`[Map] = MapOverlay0200(Map)`
Input variables	Improved corrected Map struct including sub-structs
Output variables	Improved corrected Map struct including SurM, SMP and sub-structs

11.2.9.50 MapScan

Description	The function compares an imported OSM image from GetMap() with the included RGB database and allocates House, Street, etc. The resulting elements are stored in sub-structs within the main struct.
Type	Sub function
Current Version	02.00
Parent function(s)	MapDetection
Child function(s)	None
Group	Operational Environment Generation
Command	`[Map] = MapScan0200(Map)`
Input variables	Map struct
Output variables	Map struct including sub-structs

11.2.9.51 MappingUndefined

Description	The sub function determines undefined pixels after the MapScan sub function was completed. Pixels which were not identified have a value of zero. Those pixels are determined by the present function and stored into a y and x vector. The vectors are handed over to the CoordinatePix function which calculates the surrogating pixels of each undefined pixel (maximum of 24 pixels). In the next step, the function counts the pixel number of each sub-struct in the surrounding area. Afterwards, the undefined pixel is replaced by the sub-struct pixel with the most pixels in the surrounding area. This process is repeated 20 times.
Type	Sub function
Current Version	02.00
Parent function(s)	MapDetection
Child function(s)	CoordinatePix
Group	Operational Environment Generation
Command	`[Map] = MappingUndefined0200(Map)`
Input variables	Corrected Map struct including sub-structs

Output variables	Improved corrected Map struct including sub-structs

11.2.9.52 NavSysFail

Description	The function summarizes the different failure mode functions for the UA navigation system, calls them and hands the results back to the *EvCGlobal* function.
Type	Sub function
Current Version	02.00
Parent function(s)	EvCGlobal
Child function(s)	NavSysFail441 NavSysFail442
Group	UA Flight Simulation
Command	`[L8,L9,L11,L12,L14,L15,L16] = NavSysFail0200(Map,L1,L2,L3,L4)`
Input variables	O.R.C.U.S. Map struct including all relevant UAS parameters and mission variables. Layer parameters L1, L2, L3, and L4. See Table 11-9 for description.
Output variables	Layer parameters L8, L9, L11, L12, L14, L15 and L16. See Table 11-9 for description.

11.2.9.53 NavSysFail441

Description	Function for determining the event chain in case of the electrical system failure condition "Degradation of lateral and horizontal navigation data accuracy". Event Chain is based on *Eventtree_6.xlsx*.
Type	Sub function
Current Version	02.00
Parent function(s)	NavSysFail
Child function(s)	None
Group	UA Flight Simulation

Command	`[L8,L9,L11,L12,L14,L15,L16] = NavSysFail441_0200(Map,L2,L3,L4)`
Input variables	O.R.C.U.S. Map struct including all relevant UAS parameters and mission variables. Layer parameters L2, L3, and L4. See Table 11-9 for description.
Output variables	Layer parameters L8, L9, L11, L12, L14, L15 and L16. See Table 11-9 for description.

11.2.9.54 NavSysFail442

Description	Function for determining the event chain in case of the electrical system failure condition "Degradation of altitude data". Event Chain is based on *Eventtree_6.xlsx*.
Type	Sub function
Current Version	02.00
Parent function(s)	NavSysFail
Child function(s)	None
Group	UA Flight Simulation
Command	`[L8,L9,L11,L12,L14,L15,L16] = NavSysFail442_0200(Map,L2,L3,L4)`
Input variables	O.R.C.U.S. Map struct including all relevant UAS parameters and mission variables. Layer parameters L2, L3, and L4. See Table 11-9 for description.
Output variables	Layer parameters L8, L9, L11, L12, L14, L15 and L16. See Table 11-9 for description.

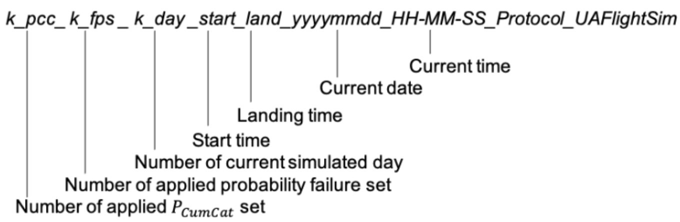
11.2.9.55 NormMap

Description	The function scales the loaded map struct to a given to a variable pixel to metre ratio target scale by using imresize. The target scale can be either handed over by the function directly or it may be entered during the function flow. Default setting is the direct hand over. The target scale is defined in the INI function.
Type	Sub function
Current Version	02.00
Parent function(s)	MapDetection
Child function(s)	None
Group	Operational Environment Generation
Command	`[Map] = NormMap0200(Map,target_scale)`
Input variables	Improved corrected *Map struct* including sub-structs; target scale *Protocol file*. The filename of a protocol is composed as follows: *yyyymmdd_Protocol_UAFlightSim* Current date
Output variables	Scaled improved Map struct including sub-structs

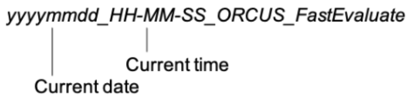
11.2.9.56 ORCUS_INI

Description	The function stores all relevant UAS parameters and mission variables in the map struct. UAS parameters and mission variables have to be entered into the function file itself first.
Type	INI function
Current Version	02.02
Parent function(s)	None
Child function(s)	None
Group	Initialisation
Command	`[Map] = ORCUS_INI0202(Map)`
Input variables	O.R.C.U.S. Map struct
Output variables	O.R.C.U.S. Map struct including all relevant UAS parameters and mission variables

11.2.9.57 ORCUS_RUN

Description	The function executes automatically O.R.C.U.S. simulations and evaluates the results. Basis are the inputs stored within the map struct in accordance to the ORCUS_INI function. A xlsx evaluation table is generated after completion. For further development a possibility is included to execute several runs with different failure cumulative failure probabilities, main sub system failure probability sets. In the current state of O.R.C.U.S., this is experimental only.
Type	Main function
Current Version	02.05
Parent function(s)	None
Child function(s)	UAFlightSim UAFlightSimFastEval
Group	UA Flight Simulation
Command	`[Map] = ORCUS_RUN0205(Map)`
Input variables	O.R.C.U.S. Map struct including all relevant UAS parameters and mission variables.
Output variables	*Protocol files* For every execution of UAFlightSim, a protocol file is created and stored on the hard disk. UAFlightSim is executed that often as defined within the INI file (cf. manual chapter 11.2.6.2). The filename of a protocol is composed as follows:  *xlsx evaluation table* A xlsx evaluation table is created after a successful completion of O.R.C.U.S._RUN. It summarizes all information about the simulated mission and all occurred events during the simulation. Furthermore, the cumulated events per flight hour and cumulated hits per flight hour are included.

The filename of a xlsx evaluation table is composed as follows:



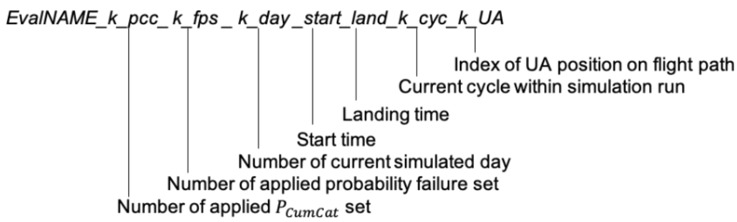
Struct array files for evaluation

Whenever a UAS failure occurred within a simulation run, six evaluation structs will be generated and stored on the hard drive.

In case the evaluation struct is a $m \times n$ matrix, the size is equal to the map given *MapDetection*.

In order to get a complete data set, each file is generated without regard of the actual occurrence result. For example, in case of a debris impact, also the ELF file will be generated, but will only contain zeros.

Each filename is expanded by the following identification code.



The user can already see by the filename in which cycle and at which position the simulated UAS failure occurred.

The output data described hereafter is stored in accordance to run, cycle and UA position of the UA: Eval*NAME*.cyc.(*cycle*).k_UA(*position index*).

Example: A failure occurred in the 17th cycle, on position 5. In this case all evaluation data is stored as follows:

Eval*NAME*.cyc(17).k_UA(5)

Name	Size	Description
EvalDebris	$m \times n$	Matrix with debris impact area. Where a debris part is present, the cell value is equal 0.2 by default.
EvalE	1×12	Event vector. Contains the event sequence within the UAS.

	EvalELF	$m \times n$	Matrix with emergency landing area. Each cell of the emergency landing area has a value of 5.
	EvalIZPL_Quad	$m \times n$	Matrix with the impact area defined by the specific impact scenario. Each impact cell has a value defined by the fatality probability equation stored within the specific impact scenario function.
	EvalPos	1×2	Contains the x and y coordinates of the UA on the map where the failure occurred.
	EvalPPL	$m \times n$	Contains the people distribution in the moment of the UA failure. Each cell which contains a person has the value one.

11.2.9.58 PeopleDayTime

Description	This function determines how many people have to be distributed in the outside and inside buildings within a city on a Map in accordance to the entered day and time. The percentage is based upon "Mobilitaet in Deutschland 2008" and the follow up study "Mobilitaet in Deutschland 2017" and the related RegioStaR 7 classification of the German Federal Ministry of Transport and Digital Infrastructure.
Type	Sub function
Current Version	02.02
Parent function(s)	RdPeopleBasicInput
Child function(s)	None
Group	UA Flight Simulation
Command	`[ppl_td_otw,ppl_td_atb] = PeopleDayTime0202(R7,ppl_td,day,hour)`
Input variables	All input variables are handed over automatically. R7 RegioStaR 7 classification of overflown city ppl_td Basic number of people to be distributed on the map day Current simulated day hour current simulated daytime

Output variables	ppl_td_atb Number of people to be distributed at buildings. ppl_td_otw Number of people to be distributed in the outside.

11.2.9.59 PeopleDayTimeFS

Description	This function determines how many people have to be distributed in the outside and at buildings around a city on a Map in accordance to entered day, time and the Federal State surrounding the overflown city. The function relies on the *pplDayTime.xlsx* database.
Type	Sub function
Current Version	02.02
Parent function(s)	RdPeopleBasicInput
Child function(s)	None
Group	UA Flight Simulation
Command	`[ppl_td_otw,ppl_td_atb] = PeopleDayTimeFS0202(FS,ppl_td,day,hour)`
Input variables	All input variables are handed over automatically. FS Federal State code ppl_td Basic number of people to be distributed on the surrounding map day Current simulated day hour current simulated daytime
Output variables	ppl_td_atb Number of people to be distributed at buildings. ppl_td_otw Number of people to be distributed in the outside.

11.2.9.60 PIZ_nbFP

Description	The function calculates all possible central impact coordinates after a failure occurred within the airborne UA leading to the impact scenarios *ImpactArea_nbFPFD* or *ImpactArea_tanFP*. Note: The final central impact point is determined within the parent function.
Type	Sub function
Current Version	02.00

Parent function(s)	ImpactArea_nbFPFD or ImpactArea_tanFP
Child function(s)	None
Group	UA Flight Simulation
Command	`[Map,UA_mov_y,UA_mov_x,y1,x1,psi] = PIZ_nbFP0200(Map,k_UA,x_FOC,y_FOC)`
Input variables	O.R.C.U.S. Map struct including all relevant UAS parameters and mission variables. Current position of UA on flight path k_UA and current cycle number k_cyc. Failure occurrence point coordinates: x_FOC, y_FOC. All input variables are handed over automatically.
Output variables	Potential central impact coordinates on the map which is are directly in map struct. If activated, plot of impact zone. Approximated UA move vector: UA_mov_x, UA_mov_y. Supporting variables, necessary for further calculations in parent functions: x1, y1: Coordinates to avoid that the limitations of the map are exceeded. Psi: Angle between x-axis and UA move vector.

11.2.9.61 pplCitiesCountiesFS.xlsx

Description	The pplCitiesCountiesFS is a xlsx file which represents the population database applied in O.R.C.U.S. It contains population data of more than 3,300 cities in Germany, as well as the population data of all counties and all Federal States in Germany. Furthermore, for each city, the RegioStaR 7 classification is included. Additionally, data of tourists for selected cities, counties and all Federal States are included. The database is founded on official census data obtained from Statistisches Bundesamt (Destatis).
Type	xlsx table
Current Version	2019-06
Parent function(s)	None
Child function(s)	None
Group	UA Flight Simulation
Command	`None`

Input variables	Census data obtained from Statistisches Bundesamt (Destatis)
Output variables	Population data in terms of inhabitant numbers and population densities.

11.2.9.62 pplDayTime.xlsx

Description	The pplDayTime is a xlsx file which represents a database that contains the percentage numbers of people who are in movement in accordance to RegioStaR 7 classification as well as in accordance to several time frames during a weekday. The percentage values are based upon "Mobilitaet in Deutschland 2017" of the German Federal Ministry of Transport and Digital Infrastructure.
Type	xlsx table
Current Version	2019-01
Parent function(s)	None
Child function(s)	None
Group	UA Flight Simulation
Command	`None`
Input variables	Data obtained from "Mobilitaet in Deutschland 2017" of the German Federal Ministry of Transport and Digital Infrastructure.
Output variables	Percentage values of people in movement in accordance to day, time and city type.

11.2.9.63 RdDecisionL3L4

Description	The function determines if a failure is detected within the UA or GCS in relation to event tree file. The underlying detection probabilities are stored within the *Eventtree_6.xlsx* file.
Type	Sub function
Current Version	02.00
Parent function(s)	TransferFcn
Child function(s)	None
Group	UA Flight Simulation
Command	`[L3,L4] = RdDecisionL3L4_0200(Map,L1,L2)`

Input variables	O.R.C.U.S. Map struct including all relevant UAS parameters and mission variables. Layer parameters L1 and L2. See Table 11-9 for description.
Output variables	Layer parameters L3 and L4. See Table 11-9 for description.

11.2.9.64 RdFailureL1L2

Description	The function determines the random failed main sub system (L1) and the random detailed failure mode (L2) based on the probabilities stored within the *Eventtree_6.xlsx* file.
Type	Sub function
Current Version	02.00
Parent function(s)	TransferFcn
Child function(s)	None
Group	UA Flight Simulation
Command	`[rd_failure,rd_failure1] = RdFailureL1L2_0200(Map)`
Input variables	O.R.C.U.S. Map struct including all relevant UAS parameters and mission variables.
Output variables	Layer parameters L1 = rd_failure and L2 = rd_failure1. See Table 11-9 for description. Note: The renaming is done within the parent function.

11.2.9.65 RdPeopleBasicInput

Description	The function returns all basic information regarding population density to the parent function which are necessary for the current run of the O.R.C.U.S. simulation. Therefore, it searches the *pplCitiesCountiesFS.xlsx* database for an entry in accordance to the city name and extracts all information provided there for further calculation. In case no entry is found, the user has to provide all information manually. The function is called every time the parent function progresses one simulation day (k_day).

Type	Sub function
Current Version	02.02
Parent function(s)	UAFlightSim
Child function(s)	PeopleDayTime PeopleDayTimeFS
Group	UA Flight Simulation
Command	`[Map,day,start,land,city_ppl,R7,FS,terminate] = RdPeopleBasicInput0202(Map)`
Input variables	O.R.C.U.S. Map struct including all relevant UAS parameters and mission variables.
Output variables	All input variables are handed over automatically. Map — By present function modified O.R.C.U.S. Map struct day — Current simulated day start — Starting time of UA mission land — Landing time of UA mission city_ppl — Number of inhabitants of overflown city R7 — RegioStaR 7 classification of overflown city FS — Federal State code terminate — Termination signal. If equal one, current simulation is terminated. Only activated in case inputs are out of range for Map struct.

11.2.9.66 RdPeopleCleanUp

Description	The function cleans up the Map struct with respect to people distribution related fields and variables to ensure a clean initiation of the *RdPeople* functions and to avoid errors due to overwrite of such variables.
Type	Sub function
Current Version	02.00
Parent function(s)	UAFlightSim
Child function(s)	None

Group	UA Flight Simulation
Command	`[Map] = RdPeopleCleanUp0200(Map)`
Input variables	O.R.C.U.S. Map struct including all relevant UAS parameters and mission variables.
Output variables	By present function modified O.R.C.U.S. Map struct.

11.2.9.67 RdPeopleCorrectATB

Description	It might happen that not enough or too much people are distributed at building sites (ATB) within the Map because of approximation errors during map generation. The function counts the number of people distributed amongst the sub structs and increases or decrease them.
Type	Sub function
Current Version	02.00
Parent function(s)	RdPeopleLoop
Child function(s)	None
Group	UA Flight Simulation
Command	`[Map] = RdPeopleCorrectATB0200(Map,A_atb,csum_atb)`
Input variables	All input variables are handed over automatically. Map — O.R.C.U.S. Map struct including all relevant UAS parameters and mission variables. A_atb — Number of all distributed people at building sites. Csum_atb — Sum of all people distributed at building sites within the sub structs.
Output variables	By present function modified O.R.C.U.S. Map struct.

11.2.9.68 RdPeopleCorrectOTW

Description	It might happen that not enough or too much people are distributed in the outside (OTW) within the Map because of approximation errors during map generation. The function counts the number of people distributed amongst the sub structs and increases or decrease them.
Type	Sub function

Current Version	02.00	
Parent function(s)	RdPeopleLoop	
Child function(s)	None	
Group	UA Flight Simulation	
Command	`[Map] = RdPeopleCorrectOTW0200(Map,A_otw,csum_otw)`	
Input variables	All input variables are handed over automatically.	
	Map	O.R.C.U.S. Map struct including all relevant UAS parameters and mission variables.
	A_otw	Number of all distributed people in the outside.
	Csum_otw	Sum of all people distributed in the outside within the sub structs.
Output variables	By present function modified O.R.C.U.S. Map struct.	

11.2.9.69 RdPeopleCorrectSMPatb

Description	It might happen that not enough or too much people are distributed at building sites (ATB) within the submap polygon map (SMP) because of approximation errors during map generation. The function counts the number of people distributed amongst the sub structs and increases or decrease them.	
Type	Sub function	
Current Version	02.00	
Parent function(s)	RdPeopleLoop	
Child function(s)	None	
Group	UA Flight Simulation	
Command	`[Map] = RdPeopleCorrectSMPatb0200(Map,A_SMP_atb,csum_atb)`	
Input variables	All input variables are handed over automatically.	
	Map	O.R.C.U.S. Map struct including all relevant UAS parameters and mission variables.
	A_SMP_atb	Number of all distributed people at building sites in the SMP.

	Csum_atb	Sum of all people distributed at building sites within the sub structs of the SMP.
Output variables	By present function modified O.R.C.U.S. Map struct.	

11.2.9.70 RdPeopleCorrectSMPotw

Description	It might happen that not enough or too much people are distributed in the outside (OTW) within the submap polygon (SMP) because of approximation errors during map generation. The function counts the number of people distributed amongst the sub structs and increases or decrease them.
Type	Sub function
Current Version	02.00
Parent function(s)	RdPeopleLoop
Child function(s)	None
Group	UA Flight Simulation
Command	`[Map] = RdPeopleCorrectSMPotw0200(Map,A_SMP_otw,csum_otw)`
Input variables	All input variables are handed over automatically. Map: O.R.C.U.S. Map struct including all relevant UAS parameters and mission variables. A_SMP_otw: Number of all distributed people in the outside within the SMP. Csum_otw: Sum of all people distributed in the outside within the sub structs of the SMP.
Output variables	By present function modified O.R.C.U.S. Map struct.

11.2.9.71 RdPeopleCorrectSurMatb

Description	It might happen that not enough or too much people are distributed at building sites (ATB) within the SMP surrounding Map (SurM) because of approximation errors during map generation. The function counts the number of people distributed amongst the sub structs and increases or decrease them.
Type	Sub function
Current Version	02.00

Parent function(s)	RdPeopleLoop
Child function(s)	None
Group	UA Flight Simulation
Command	`[Map] = RdPeopleCorrectSurMatb0200(Map,A_SurM_atb,csum_atb)`
Input variables	All input variables are handed over automatically. Map — O.R.C.U.S. Map struct including all relevant UAS parameters and mission variables. A_SurM_atb — Number of all distributed people at building sites in the SurM. Csum_atb — Sum of all people distributed at building sites within the sub structs of the SMP.
Output variables	By present function modified O.R.C.U.S. Map struct.

11.2.9.72 RdPeopleCorrectSurMotw

Description	It might happen that not enough or too much people are distributed in the outside (OTW) within the SMP surrounding Map (SurM) because of approximation errors during map generation. The function counts the number of people distributed amongst the sub structs and increases or decrease them.
Type	Sub function
Current Version	02.00
Parent function(s)	RdPeopleLoop
Child function(s)	None
Group	UA Flight Simulation
Command	`[Map] = RdPeopleCorrectSurMotw0200(Map,A_SurM_otw,csum_otw)`
Input variables	All input variables are handed over automatically. Map — O.R.C.U.S. Map struct including all relevant UAS parameters and mission variables. A_SurM_otw — Number of all distributed people in the outside within the SurM.

	Csum_otw	Sum of all people distributed in the outside within the sub structs of the SurM.
Output variables	By present function modified O.R.C.U.S. Map struct.	

11.2.9.73 RdPeopleLoop

Description	The function distributes people randomly on the different applicable pixels in the map within the simulation. The numbers of people to be distributed within the map are in accordance to the current time within the simulation. These numbers are defined by the *PeopleDayTime* function. The function is only activated in case no SMP and SurM fields are present within the Map struct.
Type	Sub function
Current Version	02.00
Parent function(s)	UAFlightSim
Child function(s)	RdPeopleCorrectATB RdPeopleCorrectOTW
Group	UA Flight Simulation
Command	`[Map] = RdPeopleLoop0200(Map, ppl_td_city, ppl_td_city_otw, ppl_td_city_atb, ppl_otw_y0, ppl_otw_x0, ppl_atb_y0, ppl_atb_x0)`
Input variables	All input variables are handed over automatically. Map — O.R.C.U.S. Map struct including all relevant UAS parameters and mission variables. ppl_td_city — Total number of people to be distributed in the city. ppl_td_city_otw — Number of people to be distributed in the outside (OTW) within the city area. ppl_td_city_atb — Number of people to be distributed at buildings (ATB) within the city area. ppl_otw_y0 — Y-coordinates of the map where people could be in the outside. ppl_otw_x0 — X-coordinates of the map where people could be in the outside.

	ppl_atb_y0	Y-coordinates of the map where people could be at buildings.
	ppl_atb_x0	X-coordinates of the map where people could be at buildings.
Output variables	By present function modified O.R.C.U.S. Map struct.	

11.2.9.74 RdPeopleLoopSMP

Description	The function distributes people randomly on the different applicable pixels in the SMP within the simulation. The numbers of people to be distributed within the SMP are in accordance to the current time within the simulation. These numbers are defined by the *PeopleDayTime* function. The function is only activated in case SMP and SurM fields are present within the Map struct.
Type	Sub function
Current Version	02.00
Parent function(s)	UAFlightSim
Child function(s)	CorrectRdPeopleSMPatb CorrectRdPeopleSMPotw
Group	UA Flight Sim
Command	`[Map] = RdPeopleLoopSMP0200(Map, ppl_td_city, ppl_td_city_otw, ppl_td_city_atb, pplSMP_otw_y0, pplSMP_otw_x0, pplSMP_atb_y0, pplSMP_atb_x0)`
Input variables	All input variables are handed over automatically. Map: O.R.C.U.S. Map struct including all relevant UAS parameters and mission variables. ppl_td_city: Total number of people to be distributed in the city. ppl_td_city_otw: Number of people to be distributed in the outside (OTW) within the SMP. ppl_td_city_atb: Number of people to be distributed at buildings (ATB) within the SMP. pplSMP_otw_y0: Y-coordinates of the SMP where people could be in the outside.

	pplSMP_otw_x0 X-coordinates of the SMP where people could be in the outside. pplSMP_atb_y0 Y-coordinates of the map where people could be at buildings. pplSMP_atb_x0 X-coordinates of the map where people could be at buildings.
Output variables	By present function modified O.R.C.U.S. Map struct.

11.2.9.75 RdPeopleLoopSurM

Description	The function distributes people randomly on the different applicable pixels in the SurM within the simulation. The numbers of people to be distributed within the SurM are in accordance to the current time within the simulation. These numbers are defined by the *PeopleDayTimeFS* function. The function is only activated in case SMP and SurM fields are present within the Map struct.
Type	Sub function
Current Version	02.00
Parent function(s)	UAFlightSim
Child function(s)	CorrectRdPeopleSurMatb CorrectRdPeopleSurMotw
Group	UA Flight Sim
Command	`[Map] = RdPeopleLoopSurM0200(Map, ppl_td_SurM, ppl_td_SurM_otw, ppl_td_SurM_atb, pplSurM_otw_y0, pplSurM_otw_x0, pplSurM_atb_y0, pplSurM_atb_x0)`
Input variables	All input variables are handed over automatically. Map O.R.C.U.S. Map struct including all relevant UAS parameters and mission variables. ppl_td_SurM Total number of people to be distributed in the SurM. ppl_td_SurM_otw Number of people to be distributed in the outside (OTW) within the SurM. ppl_td_city_atb Number of people to be distributed at buildings (ATB) within the SurM.

	pplSurM_otw_y0	Y-coordinates of the SurM where people could be in the outside.
	pplSurM_otw_x0	X-coordinates of the SurM where people could be in the outside.
	pplSurM_atb_y0	Y-coordinates of the SurM where people could be at buildings.
	pplSurM_atb_x0	X-coordinates of the SurM where people could be at buildings.
Output variables	By present function modified O.R.C.U.S. Map struct.	

11.2.9.76 StructFail

Description	The function summarizes the different failure mode functions for the UA struxture, calls them and hands the results back to the *EvCGlobal* function.
Type	Sub function
Current Version	02.00
Parent function(s)	EvCGlobal
Child function(s)	StructFail551
Group	UA Flight Simulation
Command	`[L8,L9,L11,L12,L14,L15,L16] = StructFail0200(Map,L1,L2,L3,L4)`
Input variables	O.R.C.U.S. Map struct including all relevant UAS parameters and mission variables. Layer parameters L1, L2, L3, and L4. See Table 11-9 for description.
Output variables	Layer parameters L8, L9, L11, L12, L14, L15 and L16. See Table 11-9 for description.

11.2.9.77 StructFail551

Description	Function for determining the event chain in case of the electrical system failure condition "Separation of essential UA parts". Event Chain is based on *Eventtree_6.xlsx*.

Type	Sub function
Current Version	02.00
Parent function(s)	StructFail
Child function(s)	None
Group	UA Flight Simulation
Command	`[L8,L9,L11,L12,L14,L15,L16] = StructFail551_0200(Map,L2,L3,L4)`
Input variables	O.R.C.U.S. Map struct including all relevant UAS parameters and mission variables. Layer parameters L2, L3, and L4. See Table 11-9 for description.
Output variables	Layer parameters L8, L9, L11, L12, L14, L15 and L16. See Table 11-9 for description.

11.2.9.78 SubStruct_Coord

Description	The sub function stores all sub-struct pixels from the three basic phases of MapDetection (MapScan, MappingUndefined and NormMap) in order to have a complete and traceable data package of the operational environment. In addition to this, figures are provided to show the efficiency of the MapDetection.
Type	Sub function
Current Version	02.00
Parent function(s)	MapDetection
Child function(s)	None
Group	Operational Environment Generation
Command	`[Map] = SubStruct_Coord0200(Map)`
Input variables	Corrected scaled improved Map struct including sub-structs
Output variables	Corrected scaled improved Map struct including sub-structs, efficiency figures

11.2.9.79 SubStruct_CoordSMP

Description	The sub function stores all sub-struct pixels from the three basic phases of MapDetection (MapScan, MappingUndefined and NormMap) in order to have a complete and traceable data package of the operational environment. This is done for SMP as well as SurM. In addition to this, figures are provided to show the efficiency of the MapDetection.
Type	Sub function
Current Version	02.00
Parent function(s)	MapDetection
Child function(s)	None
Group	Operational Environment Generation
Command	`[Map] = SubStruct_CoordSMP0200(Map)`
Input variables	Corrected scaled improved Map struct including sub-structs
Output variables	Corrected scaled improved Map struct including sub-structs, efficiency figures

11.2.9.80 TransferFcn

Description	In case a random failure occurs within the airborne UA during a simulation, *TransferFcn* is activated. Purpose of *TransferFcn* is to call the *EvCGlobal* function with the subsequent sub functions. Afterwards, *TransferFcn* transfers the results into command line outputs, activates the assigned impact functions and hands the Event Vector back to *UAFlightSim* function.
Type	Sub function
Current Version	02.01
Parent function(s)	UAFlightSim
Child function(s)	EvCGlobal EmergencyLanding ImpactArea_bFP ImpactArea_anyP ImpactArea_bFPbGR ImpactArea_nbFPFD ImpactArea_tanFP

	ImpactArea_Debris	
Group	UA Flight Sim	
Command	`[Map, E] = TransferFcn0201(Map, L0, y_FP, x_FP, k_pcc, k_fps, k_day, k_slt, k_cyc, k_UA)`	
Input variables	All input variables are handed over automatically.	
	Map	O.R.C.U.S. Map struct including all relevant UAS parameters and mission variables.
	L0	Layer parameter L0, defines if a failure has occurred in the airborne UA or not. See Table 11-9 for further description.
	y_FP	Y-Coordinates of the projected UA flight path.
	x_FP	X-Coordinates of the projected UA flight path.
	k_pcc	Number of applied P_{CumCat} set
	k_fps	Number of applied probability failure set
	k_day	Number of current simulated day
	k_slt	Number of current simulated start and landing time (always equal one)
	k_cyc	Number of current cycle.
	k_UA	Position index of UA on flight path.
Output variables	By present function modified O.R.C.U.S. Map struct and event vector E.	

11.2.9.81 UAFlightPath

Description	With this function, the user can define the flight path for the mission that shall be simulated by O.R.C.U.S. Two flight paths are possible: 1) Circle 2) Ellipse In case 1), the user must set the centre point and one boundary point which will mark the radius. For case 2), the user must set the centre point and the two vertices. Additionally, the ratio for semi minor to semi major axis must be entered after the three points have been set. For setting up the points, an image of the simulation map is provided and the input is done via the mouse cursor. O.R.C.U.S. composes the flight path automatically by distributing 3,600 points on the circle or the ellipse. All flight path coordinates are stored within the map struct as x and y coordinates.
Type	Main function
Current Version	02.01
Parent function(s)	None
Child function(s)	None
Group	Operational Environment Generation
Command	`[Map] = UAFlightPath0201(Map)`
Input variables	O.R.C.U.S. Map struct
Output variables	O.R.C.U.S. Map struct including flight path coordinates

11.2.9.82 UAFlightSim

Description	This function simulates the flight of a UA as a projected two-dimensional trajectory above a city. Via the function *TransferFcn* a random failure generator is activated, which may initiate a failure within the UA. In case a failure occurs, the simulation program uses the event tree and assigned probabilities of detection and success for countermeasures. Either the failure is covered or an emergency procedure is sufficient or the UA crashes. In case of a crash, people in accordance to city and time are distributed. After this, data is provided for evaluation.
Type	Main function

<table>
<tr><td>Current Version</td><td colspan="2">02.03</td></tr>
<tr><td>Parent function(s)</td><td colspan="2">ORCUS_RUN</td></tr>
<tr><td>Child function(s)</td><td colspan="2">PeopleDayTime
PeopleDayTimeFS
RdPeopleCleanUp
RdPeopleBasicInput
RdPeopleLoop
RdPeopleLoopSMP
RdPeopleLoopSurM
TransferFcn</td></tr>
<tr><td>Group</td><td colspan="2">UA Flight Simulation</td></tr>
<tr><td>Command</td><td colspan="2"><code>[Map,terminate] = UAFlightSim0203(Map,k_pcc,k_fps,k_day,k_slt)</code></td></tr>
<tr><td rowspan="5">Input variables</td><td colspan="2">O.R.C.U.S. Map struct including all relevant UAS parameters and mission variables.</td></tr>
<tr><td>k_pcc</td><td>Number of applied P_{CumCat} set</td></tr>
<tr><td>k_fps</td><td>Number of applied probability failure set</td></tr>
<tr><td>k_day</td><td>Number of current simulated day</td></tr>
<tr><td>k_slt</td><td>Number of current simulated start and landing time (always equal one)</td></tr>
<tr><td>Output variables</td><td colspan="2">Struct array files for evaluation

See ORCUS_RUN for description.

In automated mode, these files are directly handed over to ORCUS_RUN for the execution of UAFlightSimFastEval.</td></tr>
</table>

11.2.9.83 *UAFlightSimFastEval*

Description	The function generates a xlsx file, which contains all necessary information for evaluation of the O.R.C.U.S. simulation run. Mission information - Overflown City/Area incl. size, people density etc. - UAS Data (failure probabilities, size etc.) - Start/land time Simulation results - Cumulated simulated flight hours - Resulting event probabilities - Resulting hit probabilities of people (outside/inside buildings) - Failure event analysis - Event cases and outcomes - Number of people to distribute - Number of people distributed - Number of people hit - Protocol identity - UA position on map - t-Test values
Type	Main function
Current Version	02.04
Parent function(s)	ORCUS_RUN
Child function(s)	PeopleDayTime PeopleDayTimeFS xlwrite (Copyright 2012-2021, by Alec de Zegher)
Group	Evaluation
Command	`UAFlightSimFastEval0204(Map)`
Input variables	O.R.C.U.S. Map struct including all relevant UAS parameters and mission variables. Struct array files for evaluation – must be stored in the directory where *UAFlightSimFastEval* is executed.
Output variables	xlsx evaluation table

11.2.9.84 *xlwrite*

Description	Alec de Zegher (2021). xlwrite: Generate XLS(X) files without Excel on Mac/Linux/Win (https://www.mathworks.com/matlabcentral/fileexchange/38591-xlwrite-generate-xls-x-files-without-excel-on-mac-linux-win), MATLAB Central File Exchange.	
Type	External function	
Current Version	20130227 (Version applied in O.R.C.U.S.)	
Parent function(s)	UAFlightSimFastEval	
Child function(s)	None	
Group	External	
Command	`xlwrite(filename, A, sheet, range)`	
Input variables	filename	Name of xls(x) to be generated.
	A	MATLAB data to be written into the xls(x) file.
	sheet	Spread sheet within the xls(x) to be written onto.
	range	Range of the spread sheet where the MATLAB™ data shall written.
Output variables	xls(x) file	

11.2.9.85 *yawPos*

Description	The function is a sub function of the *ImpactArea_nbFPFD* function. It calculates the central impact point of the impact area by determining a deviating yaw angle eta and aligning it to the afore calculated potential impact points.
Type	Sub function
Current Version	02.00
Parent function(s)	ImpactArea_nbFPFD
Child function(s)	None
Group	UA Flight Simulation
Command	`[x_CIP,y_CIP,eta] = YawPos0200(UA_mov_x, UA_mov_y, y_pCIP1, x_pCIP1)`

Input variables	Approximated UA move vector: UA_mov_x, UA_mov_y. Possible central impact coordinates: x_pCIP1, y_pCIP1. Handed over automatically by parent function.
Output variables	X- and Y-coordinate of the central impact point, to the flight path deviating yaw angle eta.

11.3 Example Mission Areas

11.3.1 Cologne – R71

$N_{PPL_{City}}$	1,080,394	[/]
A_{City}	405.01	[km^2]
ρ_{PPL}	2,668	[PPL/km^2]
$A_{Mission}$	66.8555	[km^2]
$N_{PPL_{Map}}$	178,371	[/]

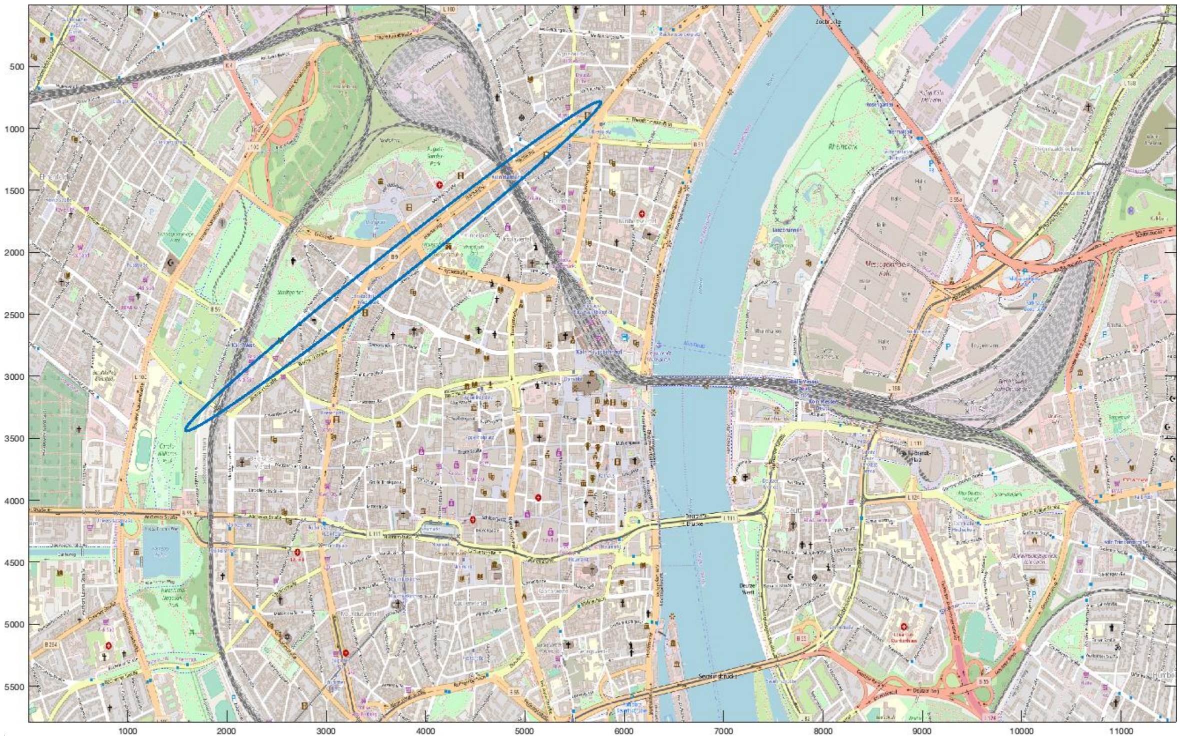


Figure 11-20. Example city R71 with flight path.

11.3.2 Saarbrücken – R72

$N_{PPL_{City}}$	180,966	[/]
A_{City}	167.52	[km^2]
ρ_{PPL}	1,080	[PPL/km^2]
$A_{Mission}$	65.2964	[km^2]
$N_{PPL_{Map}}$	70,521	[/]

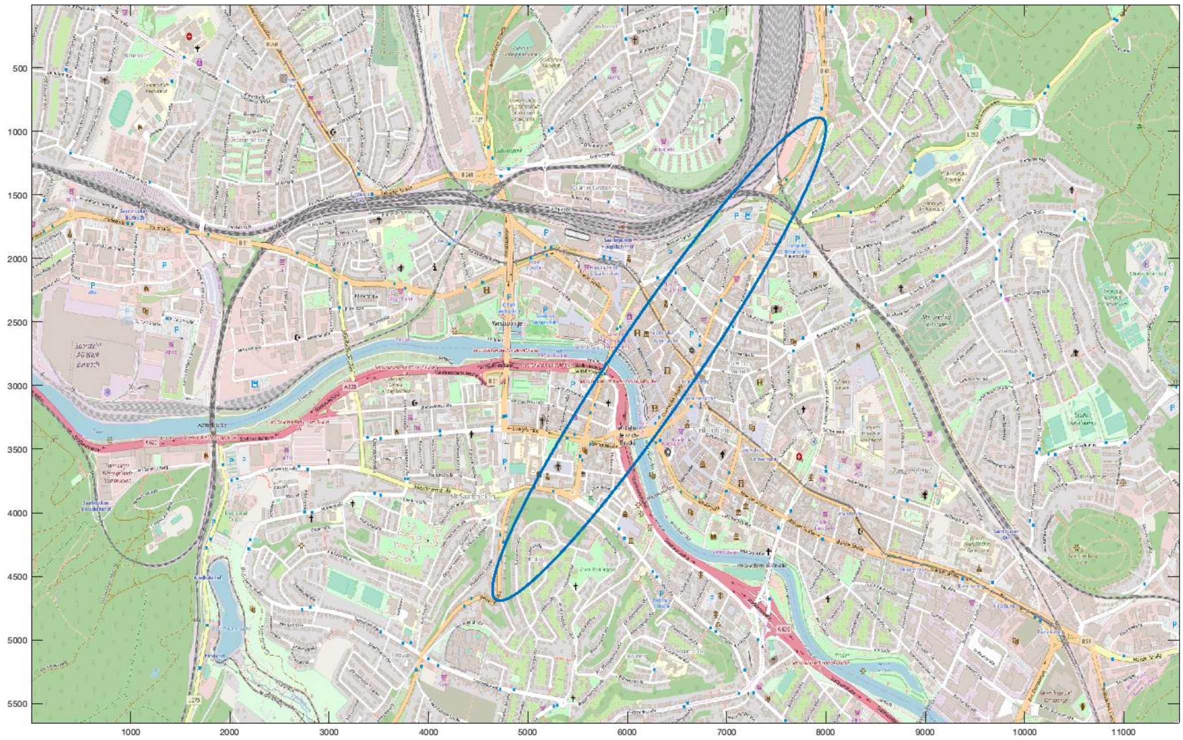


Figure 11-21. Example city R72 with flight path.

11.3.3 Gröbenzell – R73

$N_{PPL\|City/Area}$	19,835	[/]
$A_{City/Area}$	112.1	[km^2]
$\rho_{PPL/City}$	3119	[PPL/km^2]
$\rho_{PPL/SurM}$	501	[PPL/km^2]
$A_{SMP/Area}$	20,7327	[km^2]
$A_{SurM/Area}$	46,1228	[km^2]
$A_{Mission}$	66,8555	[km^2]
$N_{PPL\|Mission}$	42,943	[/]

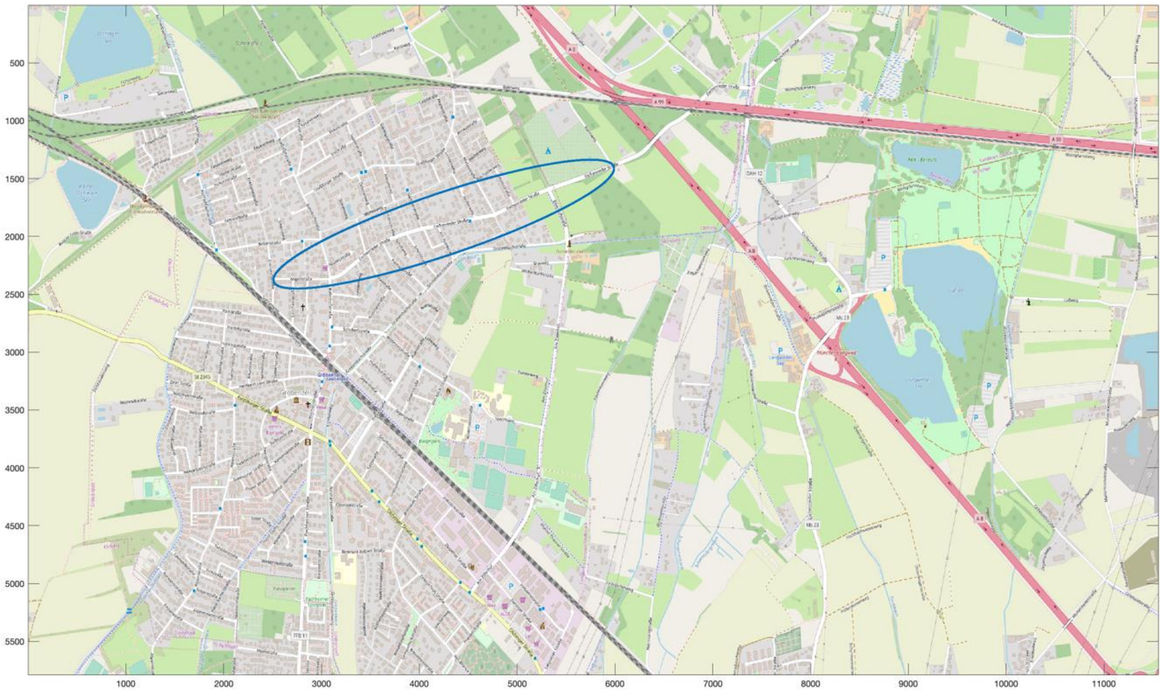


Figure 11-22. Example city R73 with flight path.

11.3.4 Arnstein – R74

$N_{PPL\|City/Area}$	8,168	[/]
$A_{City/Area}$	112.1	[km^2]
$\rho_{PPL/City}$	73	[PPL/km^2]
$\rho_{PPL/SurM}$	96	[PPL/km^2]
$A_{SMP/Area}$	10,7276	[km^2]
$A_{SurM/Area}$	56.1279	[km^2]
$A_{Mission}$	66.8555	[km^2]
$N_{PPL\|Mission}$	13,557	[/]

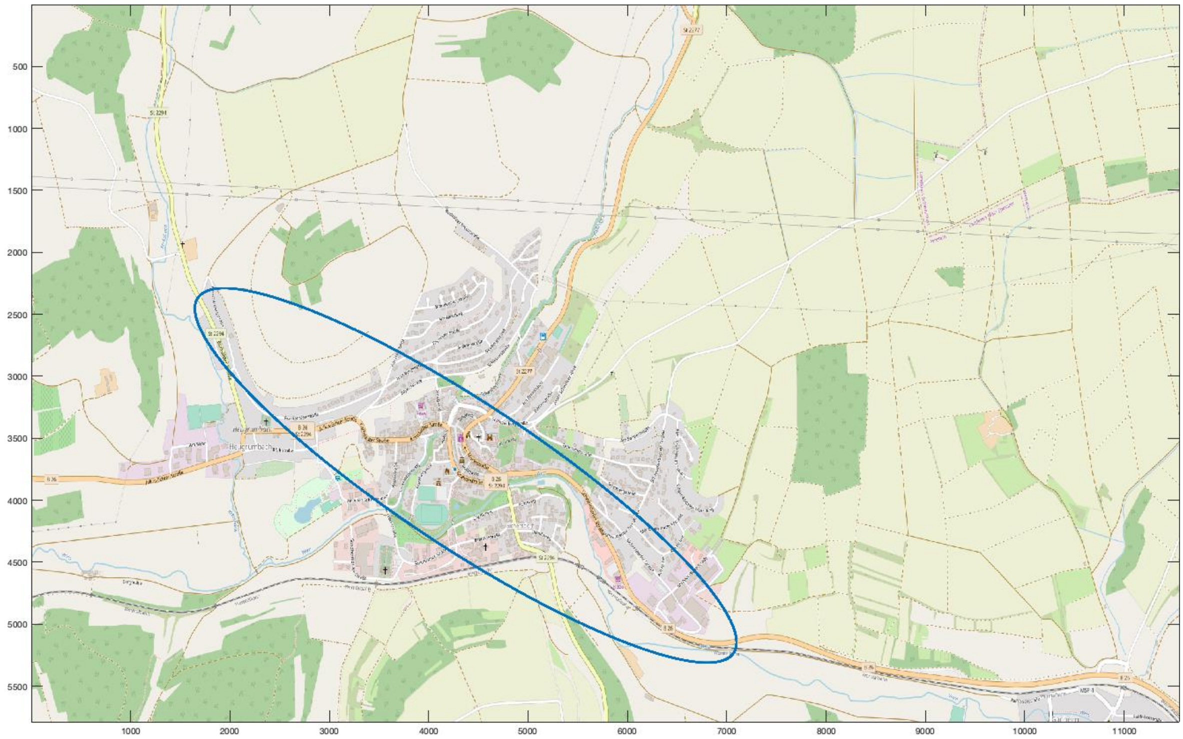


Figure 11-23. Example city R74 with flight path.

11.3.5 Ibbenbüren – R75

$N_{PPL\|City/Area}$	52,037	[/]
$A_{City/Area}$	108.87	[km^2]
ρ_{PPL}	478	[PPL/km^2]
$A_{Mission}$	66.8555	[km^2]
$N_{PPL\|Mission}$	31,957	[/]

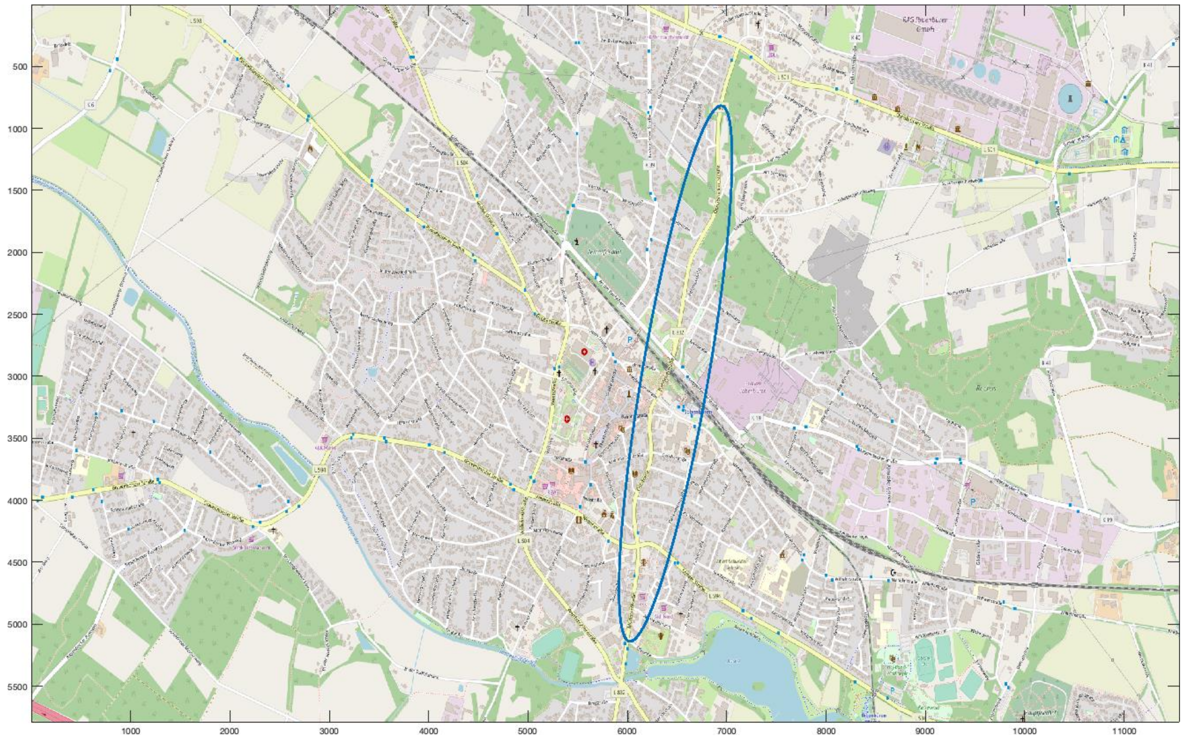


Figure 11-24. Example city R75 with flight path.

11.3.6 Eberbach – R76

$N_{PPL\|City/Area}$	14,578	[/]
$A_{City/Area}$	81.15	[km^2]
$\rho_{PPL/City}$	180	[PPL/km^2]
$\rho_{PPL/SurM}$	515	[PPL/km^2]
$A_{SMP/Area}$	16.8002	[km^2]
$A_{SurM/Area}$	50.0553	[km^2]
$A_{Mission}$	66.8555	[km^2]
$N_{PPL\|Mission}$	40,357	[/]

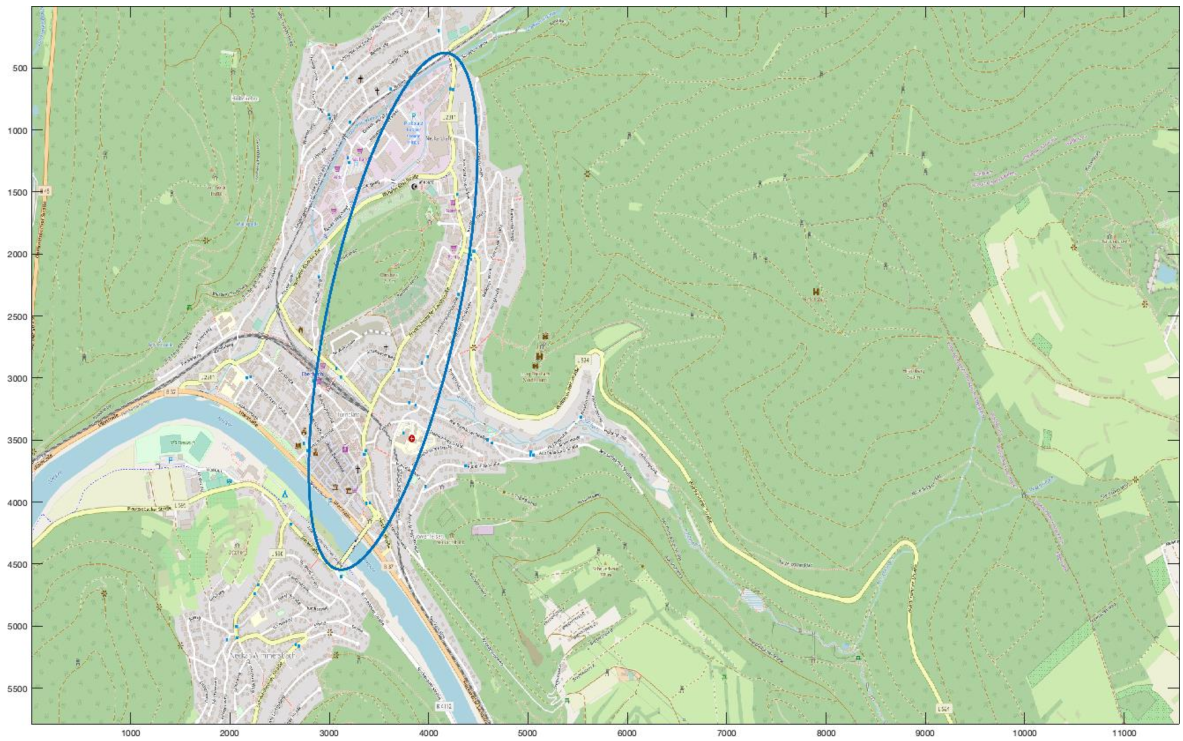


Figure 11-25. Example city R76 with flight path.

11.3.7 Georgensgmuend – R77

$N_{PPL\|City/Area}$	6,680	[/]
$A_{City/Area}$	46.89	[km^2]
$\rho_{PPL/City}$	142	[PPL/km^2]
$\rho_{PPL/SurM}$	141	[PPL/km^2]
$A_{SMP/Area}$	12.9739	[km^2]
$A_{SurM/Area}$	53.8816	[km^2]
$A_{Mission}$	66.8555	[km^2]
$N_{PPL\|Mission}$	14,278	[/]

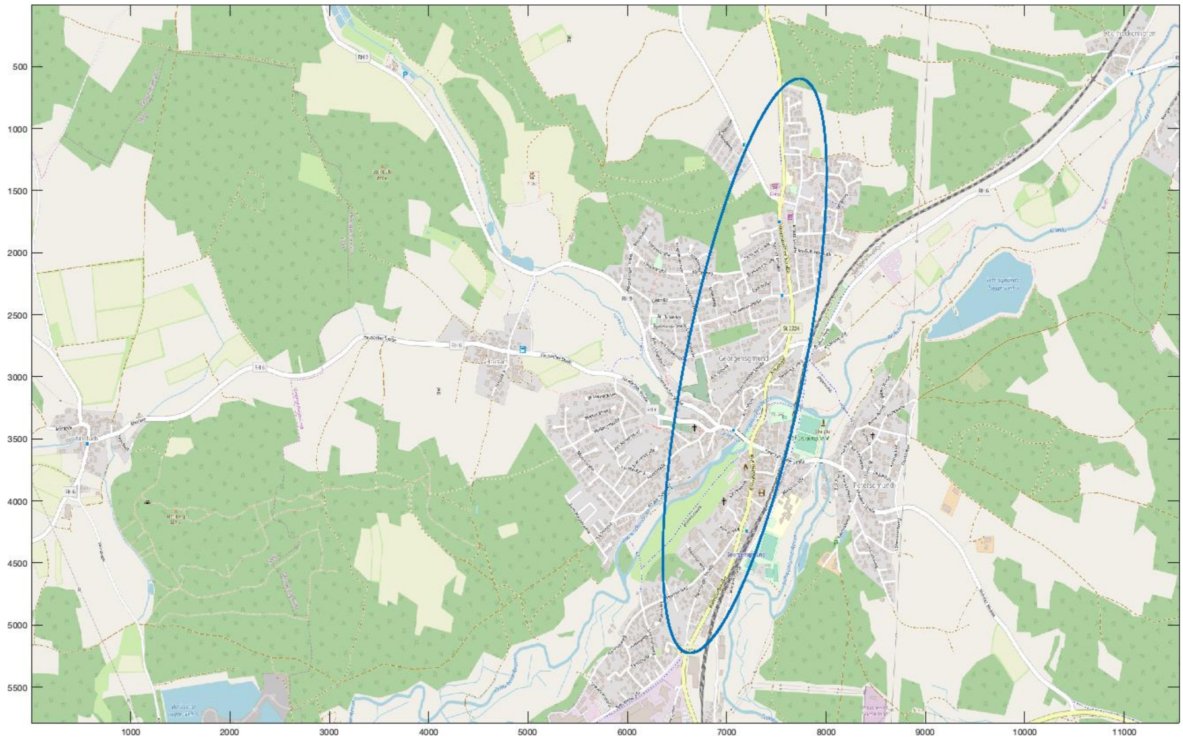


Figure 11-26. Example city R77 with flight path.

11.3.8 Frankfurt am Main – C1

$N_{PPL\|City/Area}$	746,878	[/]
$A_{City/Area}$	248.31	[km^2]
ρ_{PPL}	3,008	[PPL/km^2]
$A_{Mission}$	66.8555	[km^2]
$N_{PPL\|Mission}$	201,102	[/]

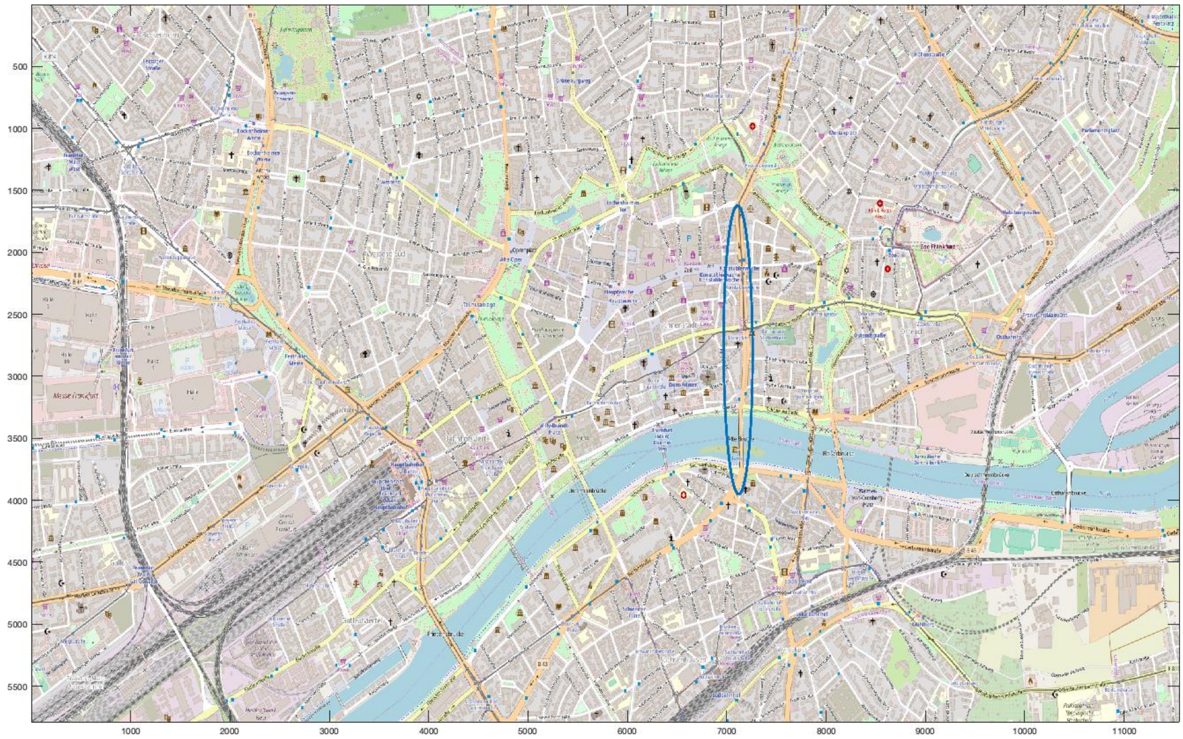


Figure 11-27. Example city C1 with flight path.

11.3.9 Hagen – C2

$N_{PPL\|City/Area}$	187,730	[/]
$A_{City/Area}$	160.45	[km^2]
ρ_{PPL}	1,170	[PPL/km^2]
$A_{Mission}$	66.8555	[km^2]
$N_{PPL\|Mission}$	78,221	[/]

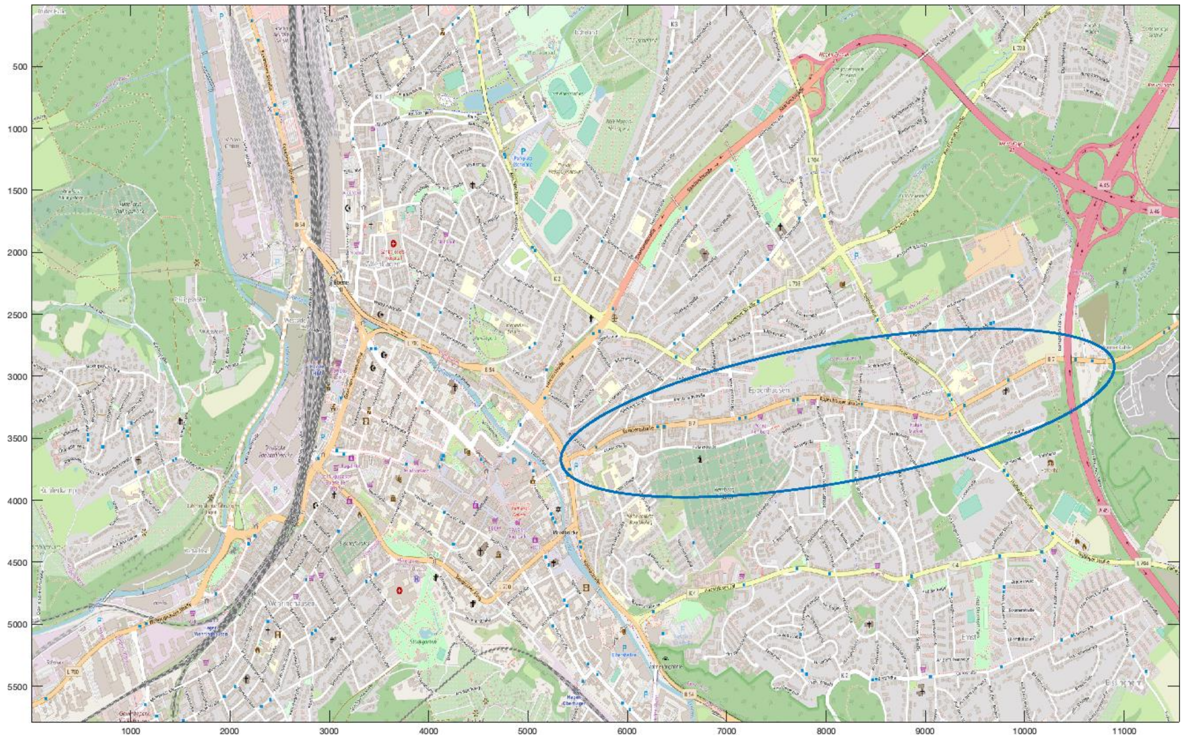


Figure 11-28. Example city C2 with flight path.

11.3.10 Aalen – C3

$N_{PPL\|City/Area}$	67,849	[/]
$A_{City/Area}$	146,58	[km^2]
ρ_{PPL}	463	[PPL/km^2]
$A_{Mission}$	66.8555	[km^2]
$N_{PPL\|Mission}$	30,955	[/]

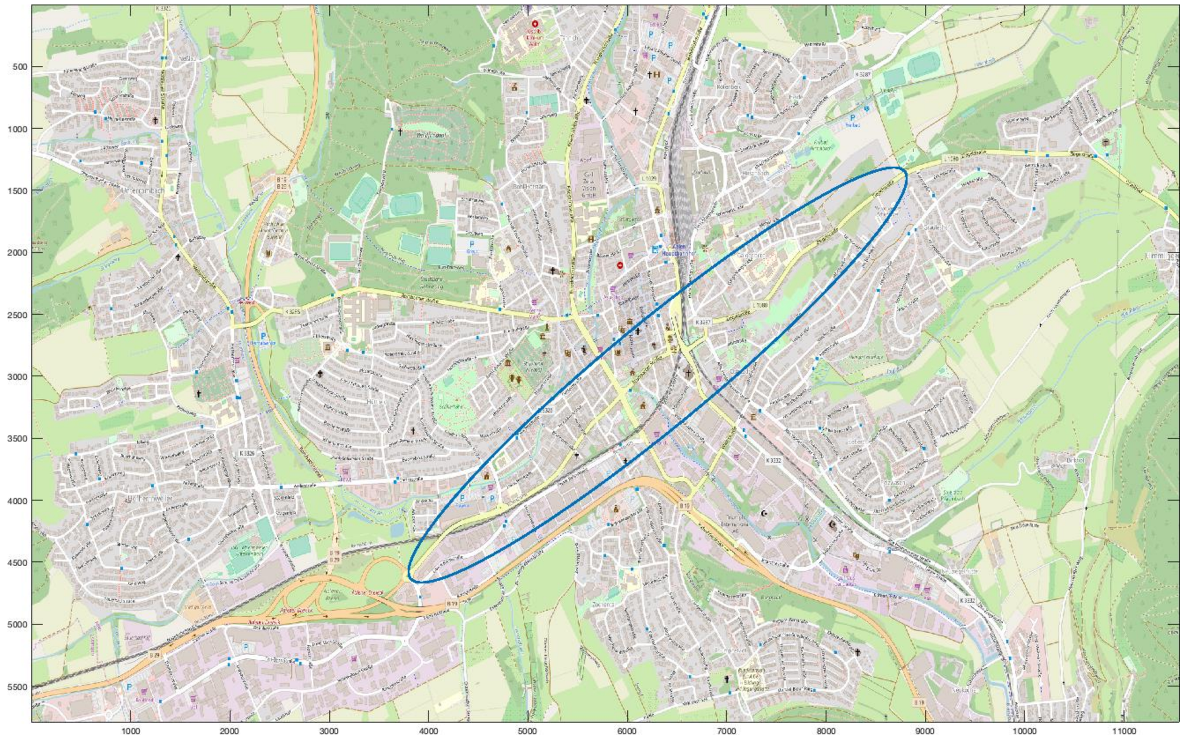


Figure 11-29. Example city C3 with flight path.

11.3.11 Schwedt/Oder – C4

$N_{PPL\|City/Area}$	30,075	[/]
$A_{City/Area}$	205.56	[km^2]
ρ_{PPL}	146	[PPL/km^2]
$A_{Mission}$	66.8555	[km^2]
$N_{PPL\|Mission}$	9,761	[/]

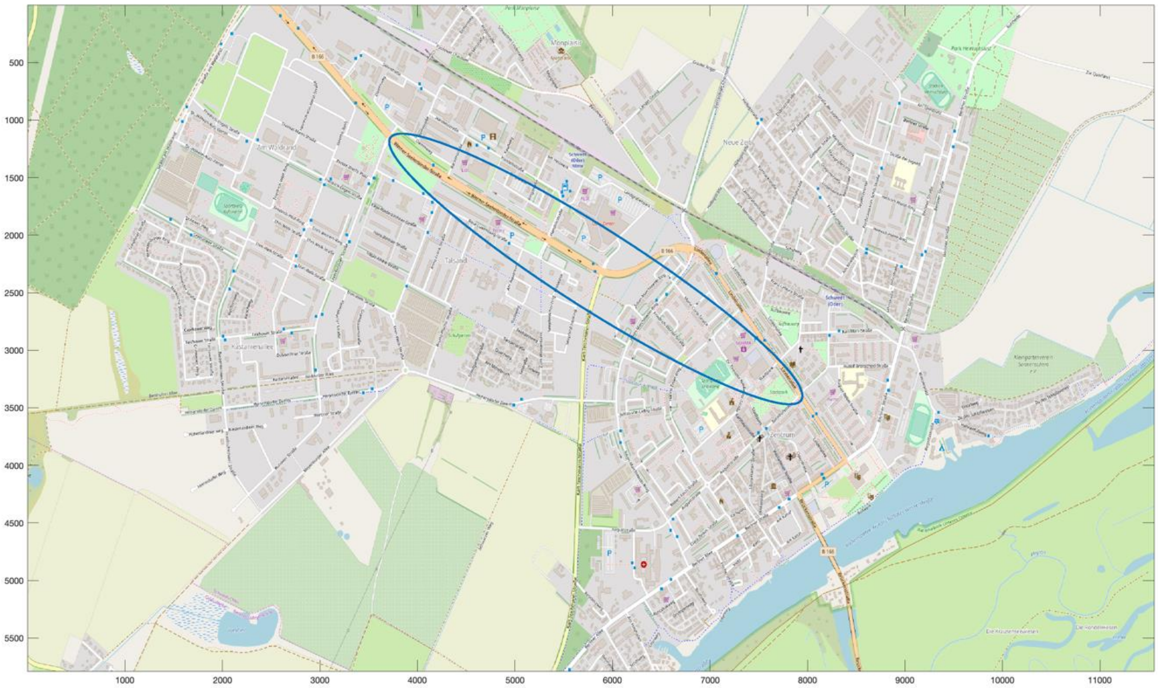


Figure 11-30. Example city C4 with flight path.

11.3.12 Kemberg – C5

$N_{PPL\|City/Area}$	9,799	[/]
$A_{City/Area}$	235.22	$[\mathrm{km}^2]$
$\rho_{PPL/City}$	42	$[\mathrm{PPL/km}^2]$
$\rho_{PPL/SurM}$	66	$[\mathrm{PPL/km}^2]$
$A_{SMP/Area}$	15.2596	$[\mathrm{km}^2]$
$A_{SurM/Area}$	51.5959	$[\mathrm{km}^2]$
$A_{Mission}$	66.8555	$[\mathrm{km}^2]$
$N_{PPL\|Mission}$	13,205	[/]

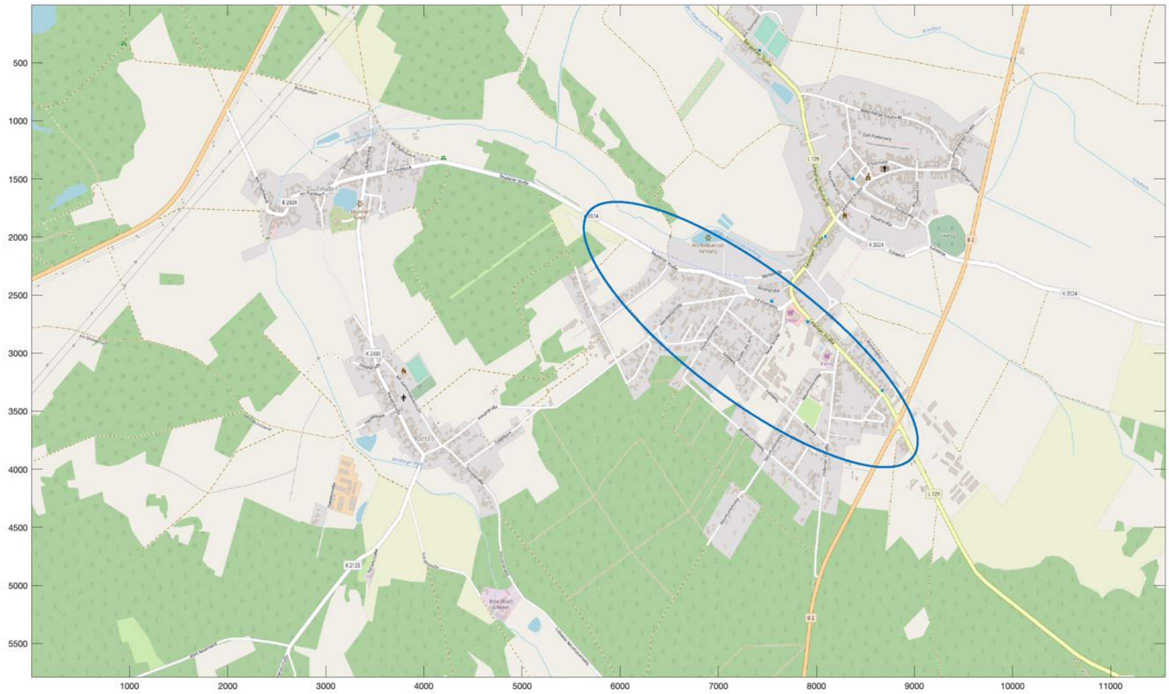


Figure 11-31. Example city C5 with flight path.

11.3.13 Bad Köstritz – C6

$N_{PPL\|City/Area}$	3,571	[/]
$A_{City/Area}$	16.93	[km^2]
$\rho_{PPL/City}$	211	[PPL/km^2]
$\rho_{PPL/SurM}$	117	[PPL/km^2]
$A_{SMP/Area}$	13.5387	[km^2]
$A_{SurM/Area}$	53.3168	[km^2]
$A_{Mission}$	66.8555	[km^2]
$N_{PPL\|Mission}$	9,810	[/]

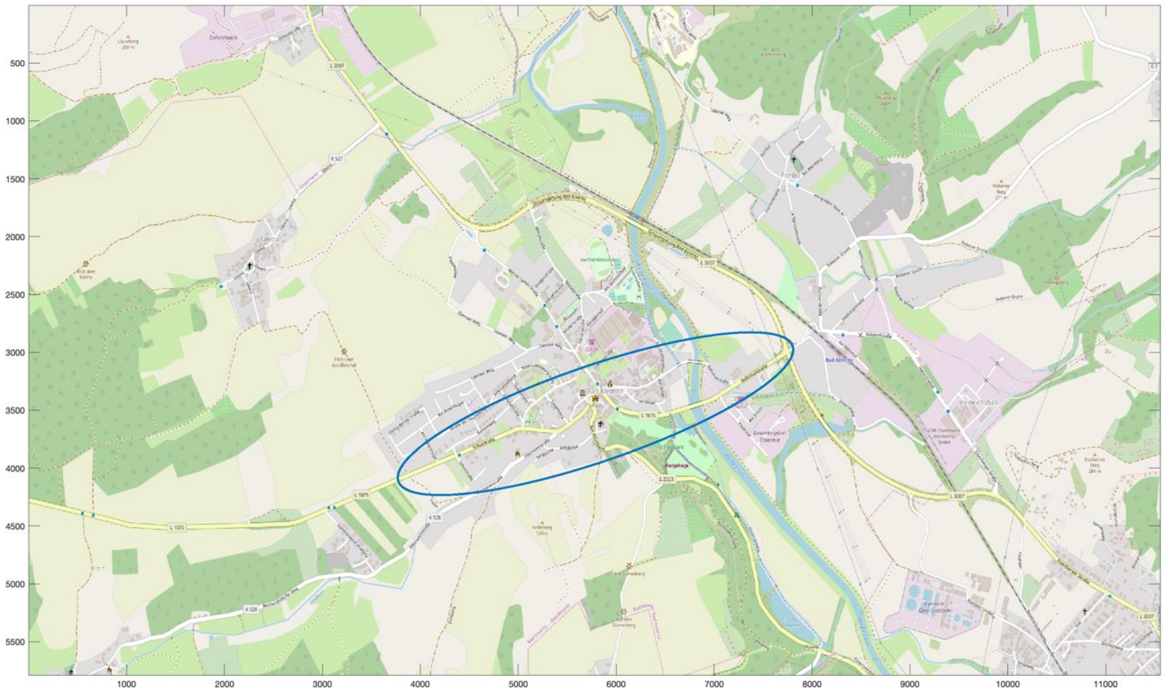


Figure 11-32. Example city C6 with flight path.

11.3.14 Kroppenstedt – C7

$N_{PPL\|City/Area}$	1,440	[/]
$A_{City/Area}$	38.65	[km^2]
$\rho_{PPL/City}$	37	[PPL/km^2]
$\rho_{PPL/SurM}$	73	[PPL/km^2]
$A_{SMP/Area}$	11.7983	[km^2]
$A_{SurM/Area}$	55.0572	[km^2]
$A_{Mission}$	66.8555	[km^2]
$N_{PPL\|Mission}$	5,460	[/]

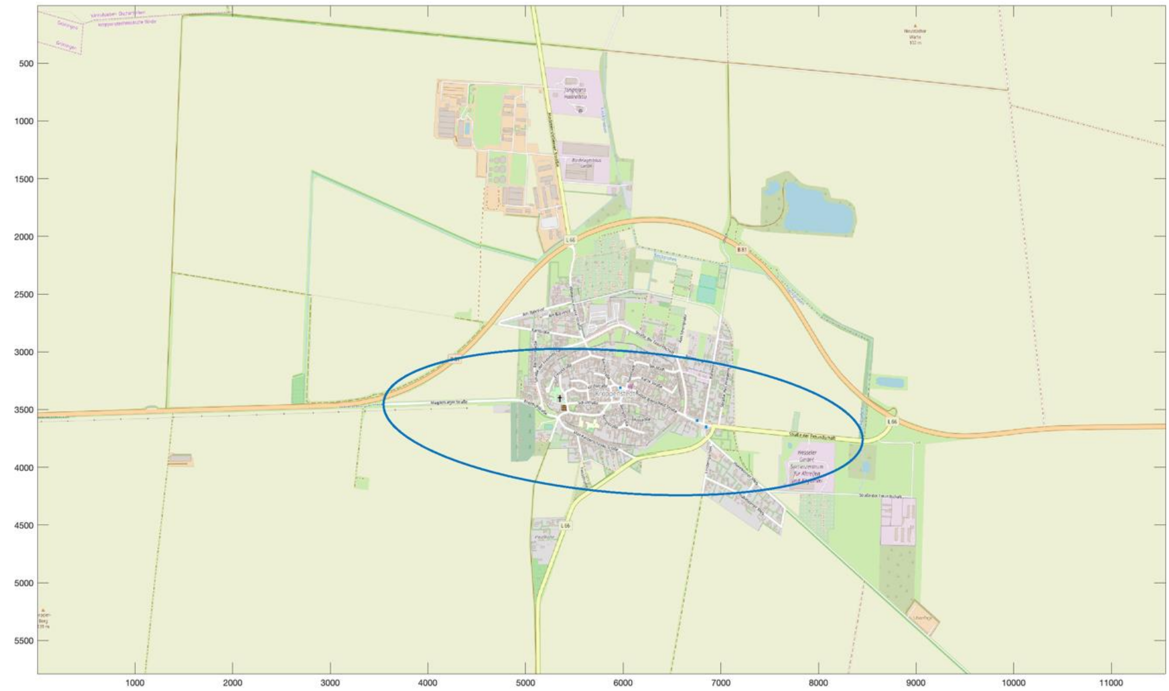


Figure 11-33. Example city C7 with flight path.

11.4 Example Mission Protocols

The following protocols are extracted raw data from the O.R.C.U.S. evaluation tables. For a better handling, not all columns are shown. Nevertheless, as the files contain much more columns and the number of rows is big, it was necessary to reduce the font size to a minimum in order to include the pages in the appendix. Within the digital version, by zooming in, the values can be read.

As this is the original data, the pages do not have a page number but they are preceded by a plain sheet with page number and title. The entire evaluation tables are deposited at the Institute of Flight System Dynamics and can be retrieved there.

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11.4.1 Cologne – R71

11.4.1.1 Cologne – R71 – Phase 1

O.R.C.U.S. 02.00 - Simulation Summary

UA Parameters

MTOW [kg]	Wingspan [m]	Length [m]	L/D
90	5	4	8

v [km/h]	Alt [m]	CCF [m]
100	100	9927.607

P_CumCat [1/Fh]	Engine [%]	ESys [%]	FCS [%]	NavSys [%]	Struct [%]
0.01	20	20	20	20	20

General map parameters

	Name	Area [km2]	PPL	PPL/km2
City	Koeln	405.01	1080394	2668
County	Koeln, Stadt	405.01	1080394	2668
FS	NW	34112.45	17912134	525

Mission specific map parameters

	Area [km2]	PPL	Tourists	Total PPL
City	66.8555	178371	0	178371
Map total	66.8555	178371	0	178371

PPL MOD NA

Sim FH [Fh]	19600	Ev/Fh [1/Fh]	0.01107143
Events total	217		

Hits due to UA impacts		Hits/Fh [1/Fh]
City ATB	1579	0.0805612
City OTW	373	0.0190306
Total	1952	0.0995918

Prot	cyc	k_UA	Day	Time of impact	UA X Pos	UA Y Pos	Travelled Distance [km]	PPL_TD_CITY_ATB	PPL_CITY_ATB_COUNT	HIT_CITY_ATB_COUNT	PPL_TD_CITY_OTW	PPL_CITY_OTW_COUNT	HIT_CITY_OTW_COUNT	PPL_ALL_ATB_COUNT	PPL_ALL_OTW_COUNT	E	Case	Outcome
1007	10	367	Saturday	06:54:12	5391	1110	90.36	173911	173911	1	4460	4460	0	173911	4460	28	Generator Failure	UA ground impact tangential to trajectory
1017	31	606	Tuesday	08:59:41	4760	1550	299.50	146264	146264	40	32107	32107	10	146264	32107	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
104	42	2819	Saturday	10:08:53	4036	1739	414.81	127535	127535	0	50836	50836	0	127535	50836	32	Connection Failure	UA approaches Emergency landing site
1046	41	1705	Wednesday	10:01:05	1623	3436	401.81	149831	149831	0	28540	28540	0	149831	28540	50	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
1049	26	1281	Saturday	08:31:02	2438	3010	251.72	158750	158750	0	19621	19621	0	158750	19621	35	Connection Failure	UA ground impact tangential to trajectory
1050	131	1277	Sunday	18:56:27	2450	3004	1294.11	157858	157858	0	20513	20513	0	157858	20513	35	Connection Failure	UA ground impact tangential to trajectory
1061	38	941	Thursday	09:41:56	3593	2309	369.92	147156	147156	1	31215	31215	0	147156	31215	57	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
1065	127	1988	Monday	18:33:48	1672	3334	1256.36	130210	130210	0	48161	48161	0	130210	48161	17	Engine Fire	Central UA ground impact point below flight path
1068	72	2368	Thursday	13:06:50	2470	2752	711.39	138237	138237	0	40134	40134	0	138237	40134	51	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
1069	82	2690	Friday	14:06:55	3567	2033	811.55	136453	136453	9	41918	41918	0	136453	41918	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
1078	126	965	Sunday	18:26:10	3506	2364	1243.61	131994	131994	0	46377	46377	0	131994	46377	72	Degradation of altitude	UA approaches Emergency landing site
1089	77	1673	Thursday	13:35:28	1649	3428	759.11	138237	138237	0	40134	40134	0	138237	40134	1	Engine Out	No Ground Effect
1095	96	308	Wednesday	15:26:22	5504	1026	943.97	140913	140913	0	37458	37458	16	140913	37458	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1099	51	1061	Sunday	10:59:35	3160	2578	499.31	135561	135561	0	42810	42810	0	135561	42810	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
110	104	2412	Friday	16:17:31	2605	2661	1029.20	135561	135561	0	42810	42810	0	135561	42810	68	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
1100	124	2463	Monday	18:16:43	2769	2551	1227.89	130210	130210	0	48161	48161	0	130210	48161	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1108	19	2386	Tuesday	07:51:09	2524	2715	185.28	157858	157858	0	20513	20513	0	157858	20513	74	Degradation of altitude	Central UA ground impact point below flight path
1109	100	1189	Wednesday	15:51:40	2724	2842	986.11	140913	140913	45	37458	37458	18	140913	37458	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1109	123	1410	Wednesday	18:09:02	2092	3207	1215.06	128427	128427	0	49944	49944	0	128427	49944	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
1110	127	981	Thursday	18:32:09	3448	2400	1253.58	130210	130210	0	48161	48161	0	130210	48161	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
1111	103	2093	Friday	16:11:01	1816	3218	1018.39	135561	135561	0	42810	42810	0	135561	42810	47	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
1118	108	694	Friday	16:38:30	4474	1741	1064.17	135561	135561	43	42810	42810	6	135561	42810	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1133	66	135	Saturday	12:27:24	5722	847	645.67	127535	127535	25	50836	50836	10	127535	50836	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1135	59	2480	Monday	11:49:35	2825	2514	582.64	146264	146264	45	32107	32107	7	146264	32107	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1147	136	1952	Saturday	19:27:21	1637	3364	1345.61	160533	160533	0	17838	17838	0	160533	17838	44	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
1149	139	2656	Monday	19:46:24	3443	2112	1377.33	159642	159642	43	18729	18729	2	159642	18729	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1158	48	1838	Wednesday	10:42:59	1582	3428	471.67	149831	149831	0	28540	28540	0	149831	28540	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
1160	45	2656	Friday	10:26:29	3443	2112	444.14	147156	147156	0	31215	31215	0	147156	31215	6	Engine Out	UA approaches Emergency landing site
1165	110	383	Wednesday	16:49:53	5357	1135	1083.17	128427	128427	0	49944	49944	0	128427	49944	46	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
1165	29	3294	Wednesday	08:52:14	5437	919	287.06	145372	145372	0	32999	32999	0	145372	32999	74	Degradation of altitude	Central UA ground impact point below flight path
1179	115	1995	Wednesday	17:22:20	1679	3327	1137.25	128427	128427	0	49944	49944	0	128427	49944	52	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
1186	99	2835	Wednesday	15:48:26	4093	1703	980.72	140913	140913	0	37458	37458	0	140913	37458	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
1192	34	2428	Tuesday	09:20:35	2655	2627	334.31	146264	146264	0	32107	32107	0	146264	32107	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
1195	24	1510	Friday	08:19:29	1879	3321	232.50	147156	147156	0	31215	31215	0	147156	31215	36	Short Circuit / Overload	Central UA ground impact point below flight path
1203	97	314	Saturday	15:32:20	5494	1034	953.92	135561	135561	0	42810	42810	0	135561	42810	72	Degradation of altitude	UA approaches Emergency landing site
1204	3	2933	Sunday	06:16:45	4436	1494	27.94	175695	175695	0	2676	2676	0	175695	2676	73	Degradation of altitude	Central UA ground impact point below flight path
122	3	1866	Wednesday	06:15:00	1588	3417	25.00	159642	159642	0	18729	18729	9	159642	18729	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1223	129	278	Friday	18:42:54	5555	987	1271.50	135561	135561	0	42810	42810	0	135561	42810	37	Short Circuit / Overload	Central UA ground impact point below flight path
1226	58	2091	Monday	11:42:59	1812	3221	571.64	146264	146264	0	32107	32107	0	146264	32107	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
123	51	3166	Thursday	11:03:04	5144	1079	505.11	147156	147156	0	31215	31215	0	147156	31215	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1243	141	1600	Thursday	19:56:33	1732	3393	1394.28	156966	156966	0	21405	21405	0	156966	21405	35	Connection Failure	UA ground impact tangential to trajectory
1261	43	1777	Monday	10:13:06	1587	3441	421.86	146264	146264	0	32107	32107	0	146264	32107	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
1262	20	3480	Tuesday	07:58:55	5703	794	198.22	157858	157858	0	20513	20513	0	157858	20513	29	Connection Failure	UA approaches Emergency landing site
1264	33	3338	Thursday	09:16:07	5518	877	326.89	147156	147156	6	31215	31215	0	147156	31215	9	Engine Out	UA ground impact tangential to trajectory
1266	115	2197	Saturday	17:22:41	2020	3067	1137.81	139129	139129	0	39242	39242	11	139129	39242	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1278	52	2769	Thursday	11:08:21	3855	1851	513.94	147156	147156	6	31215	31215	4	147156	31215	12	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
1286	55	1589	Friday	11:24:17	1748	3386	540.47	147156	147156	0	31215	31215	0	147156	31215	1	Engine Out	No Ground Effect
129	20	2664	Wednesday	07:57:34	3472	2093	195.97	159642	159641	0	18729	18729	1	159641	18729	76	Degradation of altitude	Central UA ground impact point below flight path
1297	58	3309	Tuesday	11:44:59	5466	904	575.00	148047	148047	55	30324	30324	8	148047	30324	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1301	136	2033	Saturday	19:27:29	1725	3289	1345.83	160533	160533	0	17838	17838	0	160533	17838	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
1309	9	724	Sunday	06:48:51	4372	1809	81.42	175695	175695	0	2676	2676	0	175695	2676	78	Degradation of altitude	Central UA ground impact point below flight path
1321	26	1643	Friday	08:31:37	1679	3416	252.72	147156	147156	0	31215	31215	0	147156	31215	78	Degradation of altitude	Central UA ground impact point below flight path
1349	56	44	Friday	11:27:41	5763	798	546.14	147156	147156	2	31215	31215	0	147156	31215	77	Degradation of altitude	Central UA ground impact point below flight path
1355	104	95	Thursday	16:13:40	5746	821	1022.81	130210	130210	0	48161	48161	0	130210	48161	78	Degradation of altitude	Central UA ground impact point below flight path
1361	58	3239	Wednesday	11:44:53	5321	981	574.81	149831	149831	1	28540	28540	0	149831	28540	78	Degradation of altitude	Central UA ground impact point below flight path
1363	124	1839	Friday	18:15:42	1583	3428	1226.17	135561	135561	0	42810	42810	0	135561	42810	72	Degradation of altitude	UA approaches Emergency landing site
1364	121	138	Saturday	17:55:00	5720	849	1191.69	139129	139129	29	39242	39242	11	139129	39242	20	Engine Fire	UA structural desintegration - Debris Impact
137	52	1732	Thursday	11:06:39	1605	3440	511.08	147156	147156	0	31215	31215	0	147156	31215	72	Degradation of altitude	UA approaches Emergency landing site
1371	96	1215	Saturday	15:27:53	2640	2892	946.47	135561	135561	0	42810	42810	0	135561	42810	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
1376	95	3082	Thursday	15:25:00	4911	1212	941.69	138237	138237	0	40134	40134	0	138237	40134	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
1386	39	1904	Sunday	09:49:29	1604	3397	382.50	159642	159642	0	18729	18729	0	159642	18729	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1389	115	3053	Wednesday	17:24:05	4824	1263	1140.17	128427	128427	34	49944	49944	18	128427	49944	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1389	94	1092	Wednesday	15:15:46	3052	2644	926.28	140913	140913	0	37458	37458	0	140913	37458	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
139	23	991	Saturday	08:12:41	3411	2423	221.14	158750	158750	0	19621	19621	0	158750	19621	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1393	119	86	Sunday	17:43:01	5750	817	1171.69	131994	131994	0	46377	46377	0	131994	46377	73	Degradation of altitude	Central UA ground impact point below flight path
142	6	2982	Tuesday	06:34:43	4599	1396	57.86	157858	157858	76	20513	20513	1	157858	20513	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
144	1	3485	Thursday	06:05:45	5708	793	9.61	158750	158750	39	19621	19621	4	158750	19621	63	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
146	85	1329	Saturday	14:22:33	2301	3089	837.58	135561	135561	0	42810	42810	0	135561	42810	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
155	103	2043	Monday	16:10:56	1739	3278	1018.25	130210	130210	0	48161	48161	0	130210	48161	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
158	93	1911	Thursday	15:11:09	1608	3393	918.61	138237	138237	0	40134	40134	17	138237	40134	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
16	23	3317	Tuesday	08:16:31	5480	896	227.55	146264	146264	0	32107	32107	0	146264	32107	37	Short Circuit / Overload	Central UA ground impact point below flight path
164	97	3255	Wednesday	15:37:12	5356	962	962.03	140913	140913	0	37458	37458	0	140913	37458	44	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
171	108	3232	Wednesday	16:42:42	5305	989	1071.17	128427	128427	0	49944	49944	0	128427	49944	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
173	4	3292	Friday	06:23:18	5433	921	38.86	160533	160533	0	17838	17838	0	160533	17838	51	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
18	128	3525	Thursday	18:42:18	5736	784	1270.53	130210	130210	0	48161	48161	0	130210	48161	44	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
185	115	525	Wednesday	17:19:55	5001	1386	1133.19	128427	128427	0	49944	49944	0	128427	49944	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
187	78	128	Friday	13:38:52	5727	842	764.78	136453	136453	0	41918	41918	0	136453	41918	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
201	85	2578	Friday	14:24:37	3163	2292	841.03	136453	136453	1	41918	41918	0	136453	41918	28	Generator Failure	UA ground impact tangential to trajectory
203	104	3228	Sunday	16:18:52	5296	994	1031.45	131994	131994	0	46377	46377	0	131994	46377	78	Degradation of altitude	Central UA ground impact point below flight path
203	27	2385	Sunday	08:38:49	2521	2717	264.69	159642	159642	17	18729	18729	1	159642	18729	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
22	9	2587	Monday	06:51:55	3195	2272	86.55	158750	158750	66	19621	19621	4	158750	19621	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
224	120	2248	Sunday	17:52:33	2140	2981	1187.58	131994	131994	0	46377	46377	0	131994	46377	57	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
224	78	3240	Sunday	13:44:00	5323	979	773.36	126643	126643	14	51728	51728	14	126643	51728	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
227	73	1799	Wednesday	13:11:50	1583	3438	719.75	140913	140913	0	37458	37458	0	140913	37458	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
247	132	749	Tuesday	19:01:32	4285	1865	1302.58	159642	159642	0	18729	18729	0	159642	18729	57	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
25	55	2626	Thursday	11:25:59	3334	2181	543.33	147156	147156	0	31215	31215	0	147156	31215	30	Connection Failure	Central UA ground impact point below flight path
251	112	1232	Saturday	17:03:13	2587	2923	1105.36	139129	139129	0	39242	39242	0	139129	39242	39	Short Circuit / Overload	Central UA ground impact point below flight path
259	95	2619	Sunday	15:24:15	3309	2198	940.42	126643	126643	71	51728	51728	2	126643	51728	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
261	59	3164	Tuesday	11:50:42	5139	1082	584.53	148047	148047	0	30324	30324	0	148047	30324	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
262	35	842	Wednesday	09:23:54	3954	2080	339.86	145372	145372	0	32999	32999	0	145372	32999	45	Partial Lock of Flight Control Surfaces	Central UA ground impact point below flight path
275	99	2200	Tuesday	15:47:23	2027	3062	978.97	139129	139129	0	39242	39242	0	139129	39242	35	Connection Failure	UA ground impact tangential to trajectory
276	127	3096	Wednesday	18:35:38	4952	1188	1259.42	128427	128427	0	49944	49944	0	128427	49944	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
28	16	1572	Sunday	07:31:56	1773	3374	153.25	175695	175695	0	2676	2676	0	175695	2676	33	Connection Failure	Central UA ground impact point below flight path
282	102	788	Tuesday	16:02:55	4148	1955	1004.86	127535	127535	0	50836	50836	0	127535	50836	23	Generator Failure	Central UA ground impact point below flight path
282	64	878	Tuesday	12:16:42	3823	2163	627.86	148047	148047	59	30324	30324	2	148047	30324	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
286	31	3336	Saturday	09:04:13	5514	879	307.03	158750	158750	0	19621	19621	0	158750	19621	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
291	69	3427	Thursday	12:50:43	5648	816	684.53	147156	147156	0	31215	31215	0	147156	31215	72	Degradation of altitude	UA approaches Emergency landing site
294	48	2251	Sunday	10:43:40	2148	2975	472.81	135561	135561	0	42810	42810	0	135561	42810	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
295	117	2854	Monday	17:35:41	4161	1661	1159.47	130210	130210	2	48161	48161	0	130210	48161	33	Connection Failure	Central UA ground impact point below flight path
300	102	2541	Saturday	16:05:49	3033	2377	1009.70	139129	139129	2	39242	39242	1	139129	39242	15	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
300	91	2010	Saturday	14:59:24	1696	3313	899.03	135561	135561	40	42810	42810	9	135561	42810	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
301	12	1578	Sunday	07:08:07	1764	3378	113.56	175695	175695	0	2676	2676	0	175695	2676	26	Generator Failure	Central UA ground impact point below flight path
307	129	3058	Saturday	18:47:29	4839	1254	1279.17	139129	139129	0	39242	39242	0	139129	39242	55	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
312	93	2083	Thursday	15:11:27	1799	3231	919.08	138237	138237	0	40134	40134	0	138237	40134	44	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
313	54	1260	Friday	11:17:46	2501	2974	529.64	147156	147156	0	31215	31215	0	147156	31215	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
319	78	2555	Thursday	13:42:52	3082	2345	771.47	138237	138237	0	40134	40134	0	138237	40134	29	Connection Failure	UA approaches Emergency landing site
323	102	3477	Monday	16:07:21	5701	795	1012.28	130210	130210	0	48161	48161	0	130210	48161	37	Short Circuit / Overload	Central UA ground impact point below flight path
327	20	3208	Friday	07:58:28	5249	1020	197.47	160533	160533	0	17838	17838	0	160533	17838	11	Engine Anomaly	Central UA ground impact point below flight path
340	116	3482	Thursday	17:30:45	5705	794	1151.28	130210	130210	0	48161	48161	0	130210	48161	55	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
354	63	1174	Thursday	12:11:14	2773	2813	618.75	147156	147156	3	31215	31215	0	147156	31215	28	Generator Failure	UA ground impact tangential to trajectory
359	51	2592	Tuesday	11:02:07	3213	2260	503.53	148047	148047	5	30324	30324	0	148047	30324	15	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
36	108	3393	Monday	16:42:57	5604	836	1071.61	130210	130210	0	48161	48161	0	130210	48161	68	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
368	57	1118	Thursday	11:35:25	2962	2699	559.03	147156	147156	7	31215	31215	0	147156	31215	15	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
370	15	2553	Saturday	07:27:36	3075	2350	146.03	173911	173911	99	4460	4460	0	173911	4460	18	Engine Fire	UA structural desintegration - Debris Impact
370	91	147	Saturday	14:56:20	5713	856	893.89	135561	135561	0	42810	42810	0	135561	42810	44	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
404	81	307	Friday	13:57:01	5506	1024	795.06	136453	136453	1	41918	41918	0	136453	41918	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
411	50	914	Friday	10:53:23	3692	2247	488.97	147156	147156	55	31215	31215	5	147156	31215	20	Engine Fire	UA structural desintegration - Debris Impact
414	59	1563	Monday	11:48:04	1787	3367	580.11	146264	146264	0	32107	32107	0	146264	32107	9	Engine Out	UA ground impact tangential to trajectory
42	22	3583	Sunday	08:11:00	5760	784	218.36	159642	159642	0	18729	18729	0	159642	18729	42	Partial Lock of Flight Control Surfaces	Central UA ground impact point below flight path
425	65	3493	Friday	12:26:59	5714	790	645.00	147156	147156	0	31215	31215	0	147156	31215	68	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
436	12	97	Tuesday	07:05:40	5745	823	109.47	157858	157858	0	20513	20513	0	157858	20513	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
440	39	1995	Saturday	09:49:39	1679	3327	382.75	158750	158750	41	19621	19621	8	158750	19621	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
451	10	2432	Wednesday	06:57:37	2668	2618	96.06	159642	159642	0	18729	18729	0	159642	18729	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
468	105	857	Saturday	16:20:54	3899	2115	1034.83	139129	139129	1	39242	39242	0	139129	39242	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
485	24	2628	Tuesday	08:21:20	3342	2177	235.58	146264	146264	0	32107	32107	0	146264	32107	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
487	74	2430	Thursday	13:18:50	2662	2623	731.42	138237	138237	0	40134	40134	0	138237	40134	74	Degradation of altitude	Central UA ground impact point below flight path
494	4	3302	Thursday	06:23:19	5452	911	38.89	158750	158750	0	19621	19621	0	158750	19621	73	Degradation of altitude	Central UA ground impact point below flight path
496	12	1437	Saturday	07:07:53	2030	3241	113.17	173911	173911	0	4460	4460	0	173911	4460	68	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
50	58	6	Monday	11:39:32	5764	788	565.89	146264	146264	30	32107	32107	11	146264	32107	18	Engine Fire	UA structural desintegration - Debris Impact
51	125	2439	Tuesday	18:22:38	2691	2603	1237.75	127535	127535	2	50836	50836	0	127535	50836	40	Short Circuit / Overload	Central UA ground impact point below flight path
521	38	2251	Wednesday	09:44:07	2148	2975	373.53	145372	145372	66	32999	32999	3	145372	32999	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
521	42	2456	Wednesday	10:08:16	2746	2567	413.80	149831	149831	25	28540	28540	11	149831	28540	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
523	86	882	Friday	14:27:46	3809	2173	846.28	136453	136453	1	41918	41918	0	136453	41918	31	Connection Failure	UA ground impact tangential to trajectory
537	120	2348	Friday	17:52:42	2411	2793	1187.86	135561	135561	0	42810	42810	0	135561	42810	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
548	18	2390	Tuesday	07:45:12	2536	2707	175.36	157858	157858	0	20513	20513	0	157858	20513	69	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
56	130	939	Sunday	18:49:57	3601	2304	1283.25	131994	131994	47	46377	46377	6	131994	46377	63	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
561	115	2479	Monday	17:23:09	2822	2516	1138.58	130210	130210	0	48161	48161	0	130210	48161	30	Connection Failure	Central UA ground impact point below flight path

563	65	824	Wednesday	12:22:35	4019	2038	637.64	149831	149831	0	28540	28540	0	149831	28540	11	Engine Anomaly	Central UA ground impact point below flight path
564	37	2788	Thursday	09:39:02	3924	1808	365.08	147156	147156	46	31215	31215	9	147156	31215	20	Engine Fire	UA structural desintegration - Debris Impact
570	71	407	Wednesday	12:57:37	5303	1174	696.05	140913	140913	0	37458	37458	0	140913	37458	5	Engine Out	No Ground Effect
571	133	222	Thursday	19:06:38	5635	923	1311.06	156966	156966	0	21405	21405	0	156966	21405	25	Generator Failure	UA approaches Emergency landing site
574	101	2827	Sunday	16:00:20	4064	1721	1000.56	131994	131994	1	46377	46377	0	131994	46377	78	Degradation of altitude	Central UA ground impact point below flight path
574	13	2571	Sunday	07:15:43	3138	2308	126.22	175695	175695	0	2676	2676	0	175695	2676	74	Degradation of altitude	Central UA ground impact point below flight path
580	105	2478	Saturday	16:23:34	2818	2518	1039.30	139129	139129	0	39242	39242	1	139129	39242	58	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
580	121	249	Saturday	17:55:11	5599	953	1192.00	139129	139128	0	39242	39242	10	139128	39242	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
580	33	598	Saturday	09:11:35	4785	1534	319.33	158750	158750	0	19621	19621	0	158750	19621	75	Degradation of altitude	UA approaches Emergency landing site
587	27	2586	Saturday	08:39:08	3191	2274	265.25	158750	158750	60	19621	19621	5	158750	19621	18	Engine Fire	UA structural desintegration - Debris Impact
59	112	2551	Wednesday	17:05:23	3068	2354	1109.00	128427	128427	2	49944	49944	0	128427	49944	26	Generator Failure	Central UA ground impact point below flight path
597	81	1526	Tuesday	13:59:03	1849	3336	798.42	139129	139129	0	39242	39242	16	139129	39242	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
608	87	2781	Saturday	14:36:51	3898	1824	861.44	135561	135561	0	42810	42810	0	135561	42810	72	Degradation of altitude	UA approaches Emergency landing site
61	75	311	Friday	13:21:18	5499	1030	735.50	136453	136453	0	41918	41918	0	136453	41918	17	Engine Fire	Central UA ground impact point below flight path
610	108	1066	Monday	16:39:06	3143	2589	1065.19	130210	130210	0	48161	48161	0	130210	48161	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
614	76	2422	Friday	13:30:44	2636	2640	751.25	136453	136453	0	41918	41918	0	136453	41918	17	Engine Fire	Central UA ground impact point below flight path
624	102	294	Monday	16:02:05	5529	1007	1003.50	130210	130210	0	48161	48161	0	130210	48161	40	Short Circuit / Overload	Central UA ground impact point below flight path
629	11	111	Saturday	06:59:44	5738	831	99.58	173911	173911	0	4460	4460	0	173911	4460	35	Connection Failure	UA ground impact tangential to trajectory
65	124	2071	Tuesday	18:16:05	1780	3246	1226.81	127535	127535	0	50836	50836	0	127535	50836	68	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
653	54	82	Tuesday	11:15:50	5752	815	526.39	148047	148047	0	30324	30324	0	148047	30324	53	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
654	15	257	Wednesday	07:23:49	5587	962	139.70	159642	159642	0	18729	18729	8	159642	18729	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
658	105	977	Sunday	16:21:05	3462	2391	1035.17	131994	131994	0	46377	46377	0	131994	46377	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
661	117	2904	Wednesday	17:35:45	4336	1554	1159.61	128427	128427	0	49944	49944	0	128427	49944	72	Degradation of altitude	UA approaches Emergency landing site
661	70	2265	Wednesday	12:54:45	2183	2950	691.25	149831	149831	0	28540	28540	0	149831	28540	72	Degradation of altitude	UA approaches Emergency landing site
673	121	632	Monday	17:55:50	4678	1606	1193.06	130210	130210	0	48161	48161	0	130210	48161	47	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
679	29	1581	Sunday	08:49:23	1759	3380	282.33	159642	159642	0	18729	18729	0	159642	18729	25	Generator Failure	UA approaches Emergency landing site
684	10	3298	Friday	06:59:03	5445	915	98.44	160533	160533	1	17838	17838	0	160533	17838	28	Generator Failure	UA ground impact tangential to trajectory
687	8	647	Monday	06:42:45	4630	1638	71.28	158750	158750	0	19621	19621	0	158750	19621	53	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
706	55	3483	Saturday	11:27:25	5706	793	545.70	127535	127535	28	50836	50836	16	127535	50836	18	Engine Fire	UA structural desintegration - Debris Impact
715	27	975	Monday	08:36:29	3469	2386	260.81	146264	146264	0	32107	32107	0	146264	32107	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
716	69	1392	Tuesday	12:47:20	2136	3182	678.92	148047	148047	0	30324	30324	0	148047	30324	47	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
725	83	2394	Thursday	14:12:23	2549	2699	820.67	138237	138237	0	40134	40134	0	138237	40134	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
729	47	1026	Monday	10:35:41	3285	2501	459.50	146264	146264	0	32107	32107	0	146264	32107	42	Partial Lock of Flight Control Surfaces	Central UA ground impact point below flight path
736	85	2316	Monday	14:24:11	2320	2855	840.31	138237	138237	0	40134	40134	0	138237	40134	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
737	97	2268	Tuesday	15:35:34	2191	2945	959.30	139129	139129	0	39242	39242	0	139129	39242	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
738	111	3411	Wednesday	17:00:51	5628	825	1101.44	128427	128427	25	49944	49944	14	128427	49944	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
740	32	1861	Friday	09:07:43	1587	3419	312.89	147156	147156	0	31215	31215	0	147156	31215	14	Engine Anomaly	Central UA ground impact point below flight path
752	14	1550	Wednesday	07:19:59	1808	3357	133.33	159642	159642	0	18729	18729	0	159642	18729	53	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
769	103	2204	Saturday	16:11:12	2036	3055	1018.69	139129	139129	0	39242	39242	0	139129	39242	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
778	83	1891	Monday	14:11:34	1598	3405	819.28	138237	138237	0	40134	40134	8	138237	40134	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
786	27	854	Tuesday	08:36:17	3910	2108	260.47	146264	146264	50	32107	32107	3	146264	32107	18	Engine Fire	UA structural desintegration - Debris Impact
800	95	856	Tuesday	15:21:20	3903	2112	935.56	139129	139129	0	39242	39242	0	139129	39242	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
803	3	2248	Friday	06:15:37	2140	2981	26.05	160533	160533	0	17838	17838	0	160533	17838	35	Connection Failure	UA ground impact tangential to trajectory
803	94	3288	Friday	15:19:24	5425	925	932.33	136453	136453	0	41918	41918	0	136453	41918	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
813	4	2043	Monday	06:21:15	1739	3278	35.42	158750	158750	14	19621	19621	11	158750	19621	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
813	88	1256	Monday	14:40:17	2513	2967	867.17	138237	138237	0	40134	40134	0	138237	40134	51	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
813	98	2990	Monday	15:42:44	4625	1380	971.22	138237	138237	1	40134	40134	0	138237	40134	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
814	84	1857	Tuesday	14:17:28	1586	3421	829.11	139129	139129	0	39242	39242	7	139129	39242	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
82	17	3160	Friday	07:40:32	5128	1087	167.56	160533	160533	0	17838	17838	0	160533	17838	75	Degradation of altitude	UA approaches Emergency landing site
820	97	2923	Monday	15:36:39	4402	1514	961.11	138237	138237	48	40134	40134	8	138237	40134	18	Engine Fire	UA structural desintegration - Debris Impact
828	125	2641	Tuesday	18:22:59	3389	2147	1238.31	127535	127535	2	50836	50836	0	127535	50836	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
830	75	2497	Thursday	13:24:55	2882	2476	741.53	138237	138237	0	40134	40134	0	138237	40134	1	Engine Out	No Ground Effect
831	132	1193	Friday	19:02:17	2711	2850	1303.81	160533	160533	0	17838	17838	0	160533	17838	10	Engine Anomaly	UA approaches Emergency landing site
837	79	2229	Thursday	13:48:18	2094	3013	780.50	138237	138237	0	40134	40134	0	138237	40134	66	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
841	92	1059	Monday	15:03:47	3168	2573	906.33	138237	138237	0	40134	40134	0	138237	40134	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
843	62	2367	Wednesday	12:07:16	2467	2754	612.11	149831	149831	0	28540	28540	0	149831	28540	51	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
859	85	3565	Friday	14:26:15	5755	783	843.75	136453	136453	0	41918	41918	0	136453	41918	78	Degradation of altitude	Central UA ground impact point below flight path
878	58	3027	Wednesday	11:44:31	4744	1310	574.22	149831	149831	0	28540	28540	0	149831	28540	32	Connection Failure	UA approaches Emergency landing site
879	78	3462	Thursday	13:44:23	5686	800	773.97	138237	138237	29	40134	40134	11	138237	40134	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
880	118	3001	Friday	17:41:53	4661	1359	1169.81	135561	135561	0	42810	42810	0	135561	42810	36	Short Circuit / Overload	Central UA ground impact point below flight path
884	116	2153	Tuesday	17:28:34	1926	3135	1147.61	127535	127535	0	50836	50836	0	127535	50836	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
887	107	63	Friday	16:31:30	5759	806	1052.50	135561	135561	0	42810	42810	0	135561	42810	9	Engine Out	UA ground impact tangential to trajectory
889	17	2868	Sunday	07:40:03	4210	1631	166.75	175695	175695	0	2676	2676	0	175695	2676	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
9	68	3330	Tuesday	12:44:35	5504	884	674.33	148047	148047	0	30324	30324	0	148047	30324	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
9	89	2512	Tuesday	14:48:20	2933	2442	880.56	139129	139129	0	39242	39242	0	139129	39242	22	Generator Failure	UA approaches Emergency landing site
905	34	554	Tuesday	09:17:28	4918	1443	329.14	146264	146264	27	32107	32107	3	146264	32107	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
919	120	2308	Tuesday	17:52:38	2298	2871	1187.75	127535	127535	0	50836	50836	0	127535	50836	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
919	83	2636	Tuesday	14:12:47	3370	2158	821.33	139129	139129	0	39242	39242	0	139129	39242	67	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
926	132	467	Tuesday	19:01:04	5158	1277	1301.80	159642	159642	0	18729	18729	0	159642	18729	6	Engine Out	UA approaches Emergency landing site
93	67	806	Tuesday	12:34:28	4083	1996	657.44	148047	148047	0	30324	30324	4	148047	30324	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
932	6	2146	Monday	06:33:20	1913	3145	55.56	158750	158750	0	19621	19621	0	158750	19621	50	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
937	121	310	Saturday	17:55:18	5501	1028	1192.17	139129	139129	0	39242	39242	0	139129	39242	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
943	111	2314	Friday	16:59:03	2314	2859	1098.42	135561	135561	0	42810	42810	0	135561	42810	29	Connection Failure	UA approaches Emergency landing site
95	134	2736	Thursday	19:16:45	3734	1927	1327.92	156966	156966	65	21405	21405	7	156966	21405	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
950	86	2393	Friday	14:30:16	2546	2701	850.45	136453	136453	0	41918	41918	0	136453	41918	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
961	22	1720	Tuesday	08:07:56	1613	3439	213.22	146264	146264	0	32107	32107	2	146264	32107	12	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
973	85	1470	Sunday	14:22:47	1958	3279	837.97	126643	126643	0	51728	51728	0	126643	51728	47	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
980	16	1542	Sunday	07:31:53	1821	3350	153.17	175695	175695	0	2676	2676	0	175695	2676	12	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
993	48	539	Saturday	10:40:51	4961	1414	468.08	127535	127535	25	50836	50836	0	127535	50836	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
995	89	2209	Monday	14:47:49	2047	3047	879.72	138237	138237	0	40134	40134	0	138237	40134	22	Generator Failure	UA approaches Emergency landing site

O.R.C.U.S. 02.00 - tTest of the Simulation

nProbes	1400
nEvents	217
nEvents_cor	199
tMission	14
x_cross_ATB	1.1278571
x_cross_OTW	0.2664286
x_cross_TOT	1.3942857
s2ATB	1.3907307
sATB	1.1792925
tATB	35.467355
s2OTW	0.0760984
sOTW	0.2758593
tOTW	34.781053
s2TOT	2.0586078
sTOT	1.4347849
tTOT	36.099647

UADay/Prot	HIT_TOT_ATB	HIT_TOT_OTW	UADay/Prot cor	HIT_TOT_mean_ATB	HIT_TOT_mean_OTW	HIT_TOT_mean_ATB/Fh	HIT_TOT_mean_OTW/Fh	x_i-x_cross ATB	x_i-x_cross OTW	(x_i-x_cross ATB)^2	(x_i-x_cross OTW)^2
9	0	0	9	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
9	0	0	16	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
16	0	0	18	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
18	0	0	22	66	4	4.714285714	0.285714286	3.586428571	0.019285714	12.8624699	0.000371939
22	66	4	25	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
25	0	0	28	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
28	0	0	36	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
36	0	0	42	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
42	0	0	50	30	11	2.142857143	0.785714286	1.015	0.519285714	1.030225	0.269657653
50	30	11	51	2	0	0.142857143	0	-0.985	-0.266428571	0.970225	0.070984184
51	2	0	56	47	6	3.357142857	0.428571429	2.229285714	0.162142857	4.969714796	0.026290306
56	47	6	59	2	0	0.142857143	0	-0.985	-0.266428571	0.970225	0.070984184
59	2	0	61	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
61	0	0	65	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
65	0	0	82	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
82	0	0	93	0	4	0	0.285714286	-1.127857143	0.019285714	1.272061735	0.000371939
93	0	4	95	65	7	4.642857143	0.5	3.515	0.233571429	12.355225	0.054555612
95	65	7	104	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
104	0	0	110	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
110	0	0	122	0	9	0	0.642857143	-1.127857143	0.376428571	1.272061735	0.141698469
122	0	9	123	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
123	0	0	129	0	1	0	0.071428571	-1.127857143	-0.195	1.272061735	0.038025
129	0	1	137	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
137	0	0	139	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
139	0	0	142	76	1	5.428571429	0.071428571	4.300714286	-0.195	18.49614337	0.038025
142	76	1	144	39	4	2.785714286	0.285714286	1.657857143	0.019285714	2.748490306	0.000371939
144	39	4	146	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
146	0	0	155	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
155	0	0	158	0	17	0	1.214285714	-1.127857143	0.947857143	1.272061735	0.898433163
158	0	17	164	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
164	0	0	171	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
171	0	0	173	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
173	0	0	185	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
185	0	0	187	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
187	0	0	201	1	0	0.071428571	0	-1.056428571	-0.266428571	1.116041327	0.070984184
201	1	0	203	17	1	1.214285714	0.071428571	0.086428571	-0.195	0.007469898	0.038025
203	0	0	224	14	14	1	1	-0.127857143	0.733571429	0.016347449	0.538127041
203	17	1	227	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
224	0	0	247	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
224	14	14	251	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
227	0	0	259	71	2	5.071428571	0.142857143	3.943571429	-0.123571429	15.55175561	0.015269898
247	0	0	261	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
251	0	0	262	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
259	71	2	275	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
261	0	0	276	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
262	0	0	282	59	2	4.214285714	0.142857143	3.086428571	-0.123571429	9.526041327	0.015269898
275	0	0	286	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
276	0	0	291	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
282	0	0	294	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
282	59	2	295	2	0	0.142857143	0	-0.985	-0.266428571	0.970225	0.070984184
286	0	0	300	42	10	3	0.714285714	1.872142857	0.447857143	3.504918878	0.20057602
291	0	0	301	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
294	0	0	307	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
295	2	0	312	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
300	2	1	313	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
300	40	9	319	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
301	0	0	323	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
307	0	0	327	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
312	0	0	340	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
313	0	0	354	3	0	0.214285714	0	-0.913571429	-0.266428571	0.834612755	0.070984184
319	0	0	359	5	0	0.357142857	0	-0.770714286	-0.266428571	0.59400051	0.070984184
323	0	0	368	7	0	0.5	0	-0.627857143	-0.266428571	0.394204592	0.070984184
327	0	0	370	99	0	7.071428571	0	5.943571429	-0.266428571	35.32604133	0.070984184
340	0	0	404	1	0	0.071428571	0	-1.056428571	-0.266428571	1.116041327	0.070984184
354	3	0	411	55	5	3.928571429	0.357142857	2.800714286	0.090714286	7.84400051	0.008229082
359	5	0	414	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
368	7	0	425	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
370	99	0	436	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
370	0	0	440	41	8	2.928571429	0.571428571	1.800714286	0.305	3.242571939	0.093025
404	1	0	451	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
411	55	5	468	1	0	0.071428571	0	-1.056428571	-0.266428571	1.116041327	0.070984184
414	0	0	485	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
425	0	0	487	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
436	0	0	494	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
440	41	8	496	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
451	0	0	521	91	14	6.5	1	5.372142857	0.733571429	28.85991888	0.538127041
468	1	0	523	1	0	0.071428571	0	-1.056428571	-0.266428571	1.116041327	0.070984184
485	0	0	537	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
487	0	0	548	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
494	0	0	561	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
496	0	0	563	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
521	66	3	564	46	9	3.285714286	0.642857143	2.157857143	0.376428571	4.656347449	0.141698469
521	25	11	570	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
523	1	0	571	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
537	0	0	574	1	0	0.071428571	0	-1.056428571	-0.266428571	1.116041327	0.070984184
548	0	0	580	0	11	0	0.785714286	-1.127857143	0.519285714	1.272061735	0.269657653
561	0	0	587	60	5	4.285714286	0.357142857	3.157857143	0.090714286	9.972061735	0.008229082
563	0	0	597	0	16	0	1.142857143	-1.127857143	0.876428571	1.272061735	0.768127041
564	46	9	608	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
570	0	0	610	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
571	0	0	614	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
574	1	0	624	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
574	0	0	629	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
580	0	1	653	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
580	0	10	654	0	8	0	0.571428571	-1.127857143	0.305	1.272061735	0.093025
580	0	0	658	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
587	60	5	661	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
597	0	16	673	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
608	0	0	679	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
610	0	0	684	1	0	0.071428571	0	-1.056428571	-0.266428571	1.116041327	0.070984184
614	0	0	687	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
624	0	0	706	28	16	2	1.142857143	0.872142857	0.876428571	0.760633163	0.768127041
629	0	0	715	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
653	0	0	716	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
654	0	8	725	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
658	0	0	729	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
661	0	0	736	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
661	0	0	737	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
673	0	0	738	25	14	1.785714286	1	0.657857143	0.733571429	0.43277602	0.538127041
679	0	0	740	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
684	1	0	752	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
687	0	0	769	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
706	28	16	778	0	8	0	0.571428571	-1.127857143	0.305	1.272061735	0.093025
715	0	0	786	50	3	3.571428571	0.214285714	2.443571429	-0.052142857	5.971041327	0.002718878
716	0	0	800	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
725	0	0	803	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
729	0	0	813	15	11	1.071428571	0.785714286	-0.056428571	0.519285714	0.003184184	0.269657653
736	0	0	814	0	7	0	0.5	-1.127857143	0.233571429	1.272061735	0.054555612
737	0	0	820	48	8	3.428571429	0.571428571	2.300714286	0.305	5.293286224	0.093025
738	25	14	828	2	0	0.142857143	0	-0.985	-0.266428571	0.970225	0.070984184
740	0	0	830	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
752	0	0	831	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
769	0	0	837	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
778	0	8	841	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
786	50	3	843	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
800	0	0	859	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
803	0	0	878	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
803	0	0	879	29	11	2.071428571	0.785714286	0.943571429	0.519285714	0.890327041	0.269657653
813	14	11	880	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
813	0	0	884	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
813	1	0	887	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
814	0	7	889	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
820	48	8	905	27	3	1.928571429	0.214285714	0.800714286	-0.052142857	0.641143367	0.002718878
828	2	0	919	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
830	0	0	926	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
831	0	0	932	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
837	0	0	937	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
841	0	0	943	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
843	0	0	950	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
859	0	0	961	0	2	0	0.142857143	-1.127857143	-0.123571429	1.272061735	0.015269898
878	0	0	973	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
879	29	11	980	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
880	0	0	993	25	0	1.785714286	0	0.657857143	-0.266428571	0.43277602	0.070984184
884	0	0	995	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
887	0	0	1007	1	0	0.071428571	0	-1.056428571	-0.266428571	1.116041327	0.070984184
889	0	0	1017	40	10	2.857142857	0.714285714	1.729285714	0.447857143	2.990429082	0.20057602
905	27	3	1046	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
919	0	0	1049	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
919	0	0	1050	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
926	0	0	1061	1	0	0.071428571	0	-1.056428571	-0.266428571	1.116041327	0.070984184
932	0	0	1065	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
937	0	0	1068	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
943	0	0	1069	9	0	0.642857143	0	-0.485	-0.266428571	0.235225	0.070984184
950	0	0	1078	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
961	0	2	1089	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
973	0	0	1095	0	16	0	1.142857143	-1.127857143	0.876428571	1.272061735	0.768127041
980	0	0	1099	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
993	25	0	1100	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
995	0	0	1108	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
1007	1	0	1109	45	18	3.214285714	1.285714286	2.086428571	1.019285714	4.353184184	1.038943367
1017	40	10	1110	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
1046	0	0	1111	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
1049	0	0	1118	43	6	3.071428571	0.428571429	1.943571429	0.162142857	3.777469898	0.026290306
1050	0	0	1133	25	10	1.785714286	0.714285714	0.657857143	0.447857143	0.43277602	0.20057602
1061	1	0	1135	45	7	3.214285714	0.5	2.086428571	0.233571429	4.353184184	0.054555612
1065	0	0	1147	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
1068	0	0	1149	43	2	3.071428571	0.142857143	1.943571429	-0.123571429	3.777469898	0.015269898
1069	9	0	1158	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
1078	0	0	1160	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
1089	0	0	1165	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
1095	0	16	1179	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
1099	0	0	1186	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
1100	0	0	1192	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
1108	0	0	1195	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
1109	45	18	1203	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
1109	0	0	1204	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
1110	0	0	1223	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
1111	0	0	1226	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
1118	43	6	1243	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
1133	25	10	1261	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
1135	45	7	1262	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
1147	0	0	1264	6	0	0.428571429	0	-0.699285714	-0.266428571	0.48900051	0.070984184
1149	43	2	1266	0	11	0	0.785714286	-1.127857143	0.519285714	1.272061735	0.269657653
1158	0	0	1278	6	4	0.428571429	0.285714286	-0.699285714	0.019285714	0.48900051	0.000371939
1160	0	0	1286	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
1165	0	0	1297	55	8	3.928571429	0.571428571	2.800714286	0.305	7.84400051	0.093025
1165	0	0	1301	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
1179	0	0	1309	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
1186	0	0	1321	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
1192	0	0	1349	2	0	0.142857143	0	-0.985	-0.266428571	0.970225	0.070984184
1195	0	0	1355	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
1203	0	0	1361	1	0	0.071428571	0	-1.056428571	-0.266428571	1.116041327	0.070984184
1204	0	0	1363	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
1223	0	0	1364	29	11	2.071428571	0.785714286	0.943571429	0.519285714	0.890327041	0.269657653
1226	0	0	1371	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
1243	0	0	1376	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
1261	0	0	1386	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
1262	0	0	1389	34	18	2.428571429	1.285714286	1.300714286	1.019285714	1.691857653	1.038943367
1264	6	0	1393	0	0	0	0	-1.127857143	-0.266428571	1.272061735	0.070984184
1266	0	11									
1278	6	4									
1286	0	0									
1297	55	8									
1301	0	0									
1309	0	0									
1321	0	0									
1349	2	0									
1355	0	0									
1361	1	0									
1363	0	0									
1364	29	11									
1371	0	0									
1376	0	0									
1386	0	0									
1389	34	18									
1389	0	0									
1393	0	0									

11.4.1.2 Cologne – R71 – Phase 2

O.R.C.U.S. 02.00 - Simulation Summary

UA Parameters

MTOW [kg]	Wingspan [m]	Length [m]	L/D
90	5	4	8

v [km/h]	Alt [m]	CCF [m]
100	100	9927.606968

P_CumCat [1/Fh]	Engine [%]	ESys [%]	FCS [%]	NavSys [%]	Struct [%]
0.01	20	20	20	20	20

General map parameters

	Name	Area [km2]	PPL	PPL/km2
City	Koeln	405.01	1080394	2668
County	Koeln, Stadt	405.01	1080394	2668
FS	NW	34112.45	17912134	525

Mission specific map parameters

	Area [km2]	PPL	Tourists	Total PPL
City	66.8555	178371	0	178371
Map total	66.8555	178371	0	178371

PPL MOD NA

Sim FH [Fh] 19600 Ev/Fh [1/Fh] 0.01137755
Events total 223

Hits due to UA impacts		Hits/Fh [1/Fh]
City ATB	1791	0.091377551
City OTW	356	0.018163265
Total	2147	0.109540816

Prot	cyc	k_UA	Day	Time of impact	UA X Pos	UA Y Pos	Travelled Distance [km]	PPL_TD_CITY_ATB	PPL_CITY_ATB_COUNT	HIT_CITY_ATB_COUNT	PPL_TD_CITY_OTW	PPL_CITY_OTW_COUNT	HIT_CITY_OTW_COUNT	PPL_ALL_ATB_COUNT	PPL_ALL_OTW_COUNT	E	Case	Outcome
1003	129	1245	Tuesday	18:44:30	2547	2947	1274.17	127535	127535	0	50836	50836	1	127535	50836	36	Short Circuit / Overload	Central UA ground impact point below flight path
1005	107	1121	Thursday	16:33:15	2951	2705	1055.42	130210	130210	0	48161	48161	0	130210	48161	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1006	129	3018	Friday	18:47:26	4715	1327	1279.06	135561	135561	3	42810	42810	1	135561	42810	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
1006	46	1332	Friday	10:30:14	2293	3094	450.42	147156	147156	58	31215	31215	7	147156	31215	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
102	80	1560	Thursday	13:53:08	1792	3365	788.58	138237	138237	0	40134	40134	0	138237	40134	22	Generator Failure	UA approaches Emergency landing site
1027	2	1386	Friday	06:08:14	2151	3174	13.75	160533	160533	0	17838	17838	0	160533	17838	71	Degradation of lateral and horizontal navigation data accuracy.	Central UA ground impact point on a random Map coordinate
1029	95	3012	Sunday	15:24:54	4696	1338	941.50	126643	126643	0	51728	51728	0	126643	51728	71	Degradation of lateral and horizontal navigation data accuracy.	Central UA ground impact point on a random Map coordinate
1036	14	3373	Sunday	07:23:00	5575	850	138.36	175695	175695	0	2676	2676	0	175695	2676	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
1042	115	2983	Saturday	17:23:59	4603	1394	1139.97	139129	139129	0	39242	39242	0	139129	39242	29	Connection Failure	Central UA ground impact point below flight path
1047	109	55	Thursday	16:43:23	5761	802	1072.33	130210	130210	0	48161	48161	0	130210	48161	10	Engine Anomaly	UA approaches Emergency landing site
1051	103	3101	Monday	16:12:42	4966	1180	1021.17	130210	130210	0	48161	48161	0	130210	48161	19	Engine Fire	Central UA ground impact point below flight path
106	14	3403	Monday	07:23:03	5618	830	138.44	158750	158750	0	19621	19621	0	158750	19621	40	Short Circuit / Overload	Central UA ground impact point below flight path
1066	84	2118	Tuesday	14:17:53	1859	3185	829.83	139129	139129	4	39242	39242	0	139129	39242	33	Connection Failure	Central UA ground impact point below flight path
1071	36	3518	Sunday	09:34:18	5732	785	357.17	159642	159642	0	18729	18729	0	159642	18729	10	Engine Anomaly	UA approaches Emergency landing site
1077	51	2340	Saturday	11:01:41	2388	2808	502.83	127535	127535	0	50836	50836	0	127535	50836	1	Engine Out	No Ground Effect
1078	50	2414	Sunday	10:55:51	2611	2657	493.11	135561	135561	2	42810	42810	0	135561	42810	70	Degradation of lateral and horizontal navigation data accuracy.	Central UA ground impact point on a random Map coordinate
1080	124	2151	Tuesday	18:16:12	1922	3138	1227.03	127535	127535	10	50836	50836	3	127535	50836	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1081	104	3147	Wednesday	16:18:43	5094	1107	1031.22	128427	128427	0	49944	49944	0	128427	49944	55	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
1081	89	870	Wednesday	14:45:37	3852	2145	876.03	140913	140913	0	37458	37458	0	140913	37458	71	Degradation of lateral and horizontal navigation data accuracy.	Central UA ground impact point on a random Map coordinate
1084	16	2469	Saturday	07:33:26	2789	2538	155.72	173911	173911	0	4460	4460	0	173911	4460	28	Generator Failure	UA ground impact tangential to trajectory
1087	10	1888	Tuesday	06:56:43	1596	3406	94.55	157858	157858	0	20513	20513	0	157858	20513	72	Degradation of altitude	UA approaches Emergency landing site
1090	50	2072	Friday	10:55:17	1782	3244	492.17	147156	147156	3	31215	31215	0	147156	31215	70	Degradation of lateral and horizontal navigation data accuracy.	Central UA ground impact point on a random Map coordinate
1092	51	477	Sunday	10:58:37	5132	1295	497.70	135561	135561	3	42810	42810	0	135561	42810	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1096	84	2159	Thursday	14:17:58	1939	3126	829.95	138237	138237	0	40134	40134	0	138237	40134	28	Generator Failure	UA ground impact tangential to trajectory
1097	38	2392	Friday	09:44:21	2543	2703	373.92	147156	147156	26	31215	31215	3	147156	31215	21	Engine Fire	UA structural desintegration - Debris Impact
1105	75	2678	Saturday	13:25:13	3523	2061	742.03	135561	135561	62	42810	42810	3	135561	42810	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1106	104	2774	Sunday	16:18:06	3873	1840	1030.19	131994	131994	0	46377	46377	0	131994	46377	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1116	15	1627	Wednesday	07:26:05	1698	3408	143.47	159642	159642	0	18729	18729	0	159642	18729	40	Short Circuit / Overload	Central UA ground impact point below flight path
1118	10	1213	Friday	06:55:36	2647	2888	92.69	160533	160533	1	17838	17838	0	160533	17838	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1132	51	43	Friday	10:57:53	5763	798	496.50	147156	147156	0	31215	31215	0	147156	31215	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1135	116	3533	Monday	17:30:51	5741	784	1151.42	130210	130210	0	48161	48161	1	130210	48161	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1135	123	684	Monday	18:07:49	4508	1719	1213.05	130210	130210	0	48161	48161	0	130210	48161	78	Degradation of altitude	Central UA ground impact point below flight path
1136	23	1121	Tuesday	08:12:53	2951	2705	221.50	146264	146264	63	32107	32107	10	146264	32107	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1137	140	1715	Wednesday	19:50:48	1616	3438	1384.67	160533	160533	0	17838	17838	0	160533	17838	57	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
1137	92	1835	Wednesday	15:05:05	1582	3429	908.47	140913	140913	0	37458	37458	0	140913	37458	67	Degradation of lateral and horizontal navigation data accuracy.	Central UA ground impact point on a random Map coordinate
1149	55	541	Monday	11:22:32	4955	1418	537.58	146264	146264	0	32107	32107	0	146264	32107	44	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
1150	117	315	Tuesday	17:31:28	5492	1035	1152.47	127535	127535	2	50836	50836	22	127535	50836	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1157	116	1720	Tuesday	17:27:51	1613	3439	1146.42	127535	127535	0	50836	50836	0	127535	50836	13	Engine Anomaly	UA approaches Emergency landing site
1165	67	1803	Wednesday	12:36:06	1582	3437	660.19	149831	149831	0	28540	28540	0	149831	28540	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1173	135	2430	Thursday	19:22:12	2662	2623	1337.00	156966	156966	0	21405	21405	0	156966	21405	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1201	136	2768	Thursday	19:28:42	3851	1854	1347.86	156966	156966	0	21405	21405	0	156966	21405	78	Degradation of altitude	Central UA ground impact point below flight path
1220	133	2005	Tuesday	19:09:35	1690	3318	1315.97	159642	159642	0	18729	18729	0	159642	18729	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1221	111	3462	Wednesday	17:00:57	5686	800	1101.58	128427	128427	29	49944	49944	9	128427	49944	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1222	26	1140	Thursday	08:30:48	2887	2745	251.33	147156	147156	3	31215	31215	0	147156	31215	9	Engine Out	UA ground impact tangential to trajectory
1231	60	1821	Saturday	11:54:27	1581	3433	590.75	127535	127535	0	50836	50836	0	127535	50836	36	Short Circuit / Overload	Central UA ground impact point below flight path
1245	1	1430	Saturday	06:02:21	2046	3232	3.94	173911	173911	0	4460	4460	0	173911	4460	76	Degradation of altitude	Central UA ground impact point below flight path
1247	43	2815	Monday	10:14:50	4021	1748	424.72	146264	146264	1	32107	32107	0	146264	32107	28	Generator Failure	UA ground impact tangential to trajectory
125	86	3400	Saturday	14:31:56	5614	831	853.22	135561	135561	0	42810	42810	0	135561	42810	22	Generator Failure	UA approaches Emergency landing site
1265	10	55	Friday	06:53:42	5761	802	89.50	160533	160533	0	17838	17838	0	160533	17838	17	Engine Fire	Central UA ground impact point below flight path
1265	22	3291	Friday	08:10:31	5431	922	217.56	147156	147156	0	31215	31215	0	147156	31215	29	Connection Failure	UA approaches Emergency landing site
1268	134	1064	Monday	19:13:59	3150	2584	1323.31	159642	159642	2	18729	18729	0	159642	18729	55	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
1270	46	3377	Wednesday	10:33:37	5581	847	456.05	149831	149831	0	28540	28540	0	149831	28540	49	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
1274	125	32	Sunday	18:18:40	5764	794	1231.11	131994	131994	3	46377	46377	0	131994	46377	74	Degradation of altitude	Central UA ground impact point below flight path
1275	19	2326	Monday	07:51:04	2348	2836	185.11	158750	158750	0	19621	19621	0	158750	19621	9	Engine Out	UA ground impact tangential to trajectory
1284	58	1597	Wednesday	11:42:09	1737	3391	570.28	149831	149831	0	28540	28540	0	149831	28540	29	Connection Failure	UA approaches Emergency landing site
1286	22	2314	Friday	08:08:54	2314	2859	214.86	147156	147156	17	31215	31215	9	147156	31215	21	Engine Fire	UA structural desintegration - Debris Impact
1299	15	1143	Thursday	07:25:16	2876	2751	142.14	158750	158750	75	19621	19621	4	158750	19621	21	Engine Fire	UA structural desintegration - Debris Impact
1311	121	2717	Tuesday	17:59:16	3665	1971	1198.81	127535	127535	40	50836	50836	12	127535	50836	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
132	69	768	Saturday	12:46:19	4218	1909	677.20	127535	127535	0	50836	50836	0	127535	50836	28	Generator Failure	UA ground impact tangential to trajectory
1333	36	3437	Wednesday	09:34:09	5660	811	356.94	145372	145372	2	32999	32999	0	145372	32999	9	Engine Out	UA ground impact tangential to trajectory
1334	54	2127	Thursday	11:19:13	1876	3172	532.03	147156	147156	1	31215	31215	0	147156	31215	43	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
1335	112	1252	Friday	17:03:15	2525	2960	1105.42	135561	135561	0	42810	42810	0	135561	42810	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
1336	85	2165	Saturday	14:23:56	1951	3117	839.89	135561	135561	0	42810	42810	0	135561	42810	55	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
134	130	1583	Monday	18:51:00	1757	3381	1285.03	130210	130210	0	48161	48161	14	130210	48161	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
134	5	578	Monday	06:24:46	4846	1492	41.30	158750	158750	0	19621	19621	0	158750	19621	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
1361	59	2721	Wednesday	11:49:58	3680	1961	583.30	149831	149831	1	28540	28540	0	149831	28540	19	Engine Fire	Central UA ground impact point below flight path
1363	86	700	Friday	14:27:27	4454	1755	845.78	136453	136453	0	41918	41918	0	136453	41918	72	Degradation of altitude	UA approaches Emergency landing site
1370	83	2153	Friday	14:12:00	1926	3135	820.00	136453	136453	0	41918	41918	0	136453	41918	3	Engine Out	Central UA ground impact point below flight path
1373	52	2568	Monday	11:08:02	3128	2315	513.39	146264	146264	2	32107	32107	0	146264	32107	36	Short Circuit / Overload	Central UA ground impact point below flight path
1382	17	3271	Wednesday	07:40:43	5390	943	167.86	159642	159642	26	18729	18729	4	159642	18729	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1390	95	2931	Thursday	15:24:46	4429	1498	941.28	138237	138237	1	40134	40134	0	138237	40134	69	Degradation of lateral and horizontal navigation data accuracy.	Central UA ground impact point below flight path
1392	139	943	Saturday	19:43:33	3586	2313	1372.61	160533	160533	46	17838	17838	5	160533	17838	18	Engine Fire	UA structural desintegration - Debris Impact
1396	116	2606	Wednesday	17:29:19	3263	2228	1148.86	128427	128427	0	49944	49944	0	128427	49944	37	Short Circuit / Overload	Central UA ground impact point below flight path
146	110	897	Saturday	16:50:44	3754	2207	1084.58	139129	139129	0	39242	39242	0	139129	39242	3	Engine Out	Central UA ground impact point below flight path
153	2	1175	Saturday	06:07:54	2770	2815	13.17	173911	173911	0	4460	4460	0	173911	4460	78	Degradation of altitude	Central UA ground impact point below flight path
156	83	2374	Tuesday	14:12:21	2488	2740	820.61	139129	139129	0	39242	39242	0	139129	39242	62	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
170	138	3476	Tuesday	19:41:48	5700	795	1369.67	159642	159642	0	18729	18729	0	159642	18729	44	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
170	46	627	Tuesday	10:29:04	4694	1595	448.47	148047	148047	0	30324	30324	0	148047	30324	22	Generator Failure	UA approaches Emergency landing site
175	82	1683	Sunday	14:05:15	1640	3431	808.78	126643	126643	0	51728	51728	0	126643	51728	22	Generator Failure	UA approaches Emergency landing site
177	22	3483	Tuesday	08:10:51	5706	793	218.08	146264	146264	0	32107	32107	0	146264	32107	65	Degradation of lateral and horizontal navigation data accuracy.	UA approaches Emergency landing site
19	28	3519	Friday	08:46:38	5733	785	277.75	147156	147156	20	31215	31215	7	147156	31215	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
190	67	846	Monday	12:34:31	3939	2089	657.56	146264	146264	74	32107	32107	4	146264	32107	18	Engine Fire	UA structural desintegration - Debris Impact
207	41	1947	Thursday	10:01:29	1633	3368	402.47	147156	147156	0	31215	31215	0	147156	31215	36	Short Circuit / Overload	Central UA ground impact point below flight path
207	95	1480	Thursday	15:22:21	1937	3290	937.28	138237	138237	0	40134	40134	0	138237	40134	74	Degradation of altitude	Central UA ground impact point below flight path
217	141	1127	Sunday	19:55:47	2931	2718	1392.97	157858	157858	0	20513	20513	0	157858	20513	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
220	111	3583	Wednesday	17:01:09	5760	784	1101.92	128427	128427	20	49944	49944	16	128427	49944	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
222	33	1505	Friday	09:13:06	1888	3316	321.83	147156	147156	0	31215	31215	0	147156	31215	74	Degradation of altitude	Central UA ground impact point below flight path
233	81	1556	Tuesday	13:59:05	1798	3361	798.50	139129	139129	2	39242	39242	15	139129	39242	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
243	94	1102	Friday	15:15:47	3017	2666	926.31	136453	136453	1	41918	41918	1	136453	41918	31	Connection Failure	UA ground impact tangential to trajectory
262	13	668	Wednesday	07:12:35	4561	1684	120.97	159642	159642	0	18729	18729	0	159642	18729	45	Partial Lock of Flight Control Surfaces	Central UA ground impact point below flight path
270	24	3193	Thursday	08:22:17	5212	1040	237.14	147156	147156	74	31215	31215	3	147156	31215	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
273	120	485	Sunday	17:49:38	5111	1310	1182.72	131994	131994	34	46377	46377	14	131994	46377	21	Engine Fire	UA structural desintegration - Debris Impact
277	57	1198	Thursday	11:35:32	2695	2859	559.25	147156	147156	0	31215	31215	0	147156	31215	62	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
281	104	1213	Monday	16:15:31	2647	2888	1025.89	130210	130210	0	48161	48161	0	130210	48161	10	Engine Anomaly	UA approaches Emergency landing site
316	112	3065	Monday	17:06:14	4860	1241	1110.42	130210	130210	0	48161	48161	0	130210	48161	1	Engine Out	No Ground Effect
325	18	1715	Wednesday	07:44:05	1616	3438	173.50	159642	159642	0	18729	18729	0	159642	18729	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
326	108	613	Thursday	16:38:21	4738	1565	1063.94	130210	130210	0	48161	48161	0	130210	48161	29	Connection Failure	UA approaches Emergency landing site
347	67	2961	Thursday	12:38:01	4530	1437	663.39	147156	147156	0	31215	31215	0	147156	31215	37	Short Circuit / Overload	Central UA ground impact point below flight path
35	129	3300	Sunday	18:47:54	5448	913	1279.83	131994	131994	37	46377	46377	13	131994	46377	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
35	80	915	Sunday	13:52:04	3688	2249	786.80	126643	126643	65	51728	51728	9	126643	51728	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
353	59	2751	Wednesday	11:50:01	3789	1892	583.39	149831	149831	32	28540	28540	10	149831	28540	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
359	125	717	Tuesday	18:19:48	4396	1793	1233.00	127535	127535	0	50836	50836	0	127535	50836	31	Connection Failure	UA ground impact tangential to trajectory
360	74	1080	Wednesday	13:16:36	3094	2619	727.69	140913	140913	0	37458	37458	0	140913	37458	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
361	75	573	Thursday	13:21:44	4861	1482	736.22	138237	138237	0	40134	40134	0	138237	40134	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
364	111	1095	Sunday	16:57:02	3041	2651	1095.06	131994	131994	0	46377	46377	0	131994	46377	43	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
370	23	2713	Saturday	08:15:32	3651	1980	225.89	158750	158750	0	19621	19621	1	158750	19621	36	Short Circuit / Overload	Central UA ground impact point below flight path
370	46	486	Saturday	10:28:50	5108	1312	448.08	127535	127535	0	50836	50836	0	127535	50836	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
372	111	1407	Monday	16:57:33	2100	3203	1095.92	130210	130210	1	48161	48161	0	130210	48161	37	Short Circuit / Overload	Central UA ground impact point below flight path
374	45	1316	Wednesday	10:24:15	2337	3069	440.44	149831	149831	71	28540	28540	2	149831	28540	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
374	8	3316	Wednesday	06:47:10	5479	897	78.64	159642	159642	0	18729	18729	0	159642	18729	32	Connection Failure	UA approaches Emergency landing site
376	109	2684	Friday	16:47:44	3545	2047	1079.58	135561	135561	0	42810	42810	0	135561	42810	44	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
376	15	3450	Friday	07:29:06	5674	805	148.50	160533	160533	59	17838	17838	2	160533	17838	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
378	90	815	Sunday	14:51:28	4051	2017	885.80	126643	126643	0	51728	51728	0	126643	51728	75	Degradation of altitude	UA approaches Emergency landing site
385	118	2397	Sunday	17:40:53	2558	2693	1168.14	131994	131994	20	46377	46377	10	131994	46377	63	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
393	31	1593	Monday	09:01:19	1742	3388	302.22	146264	146264	0	32107	32107	0	146264	32107	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
399	79	1453	Sunday	13:47:00	1994	3260	778.36	126643	126643	0	51728	51728	0	126643	51728	47	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
400	71	991	Monday	12:58:35	3411	2423	697.67	138237	138237	0	40134	40134	0	138237	40134	22	Generator Failure	UA approaches Emergency landing site
406	55	2364	Sunday	11:25:33	2458	2760	542.61	135561	135561	0	42810	42810	0	135561	42810	3	Engine Out	Central UA ground impact point below flight path
408	5	2381	Tuesday	06:27:45	2509	2726	46.28	157858	157858	12	20513	20513	1	157858	20513	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
413	131	2839	Sunday	18:59:03	4107	1694	1298.42	157858	157858	0	20513	20513	0	157858	20513	68	Degradation of lateral and horizontal navigation data accuracy.	UA approaches Emergency landing site
419	66	1777	Saturday	12:30:07	1587	3441	650.19	127535	127535	0	50836	50836	0	127535	50836	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
422	112	335	Tuesday	17:01:43	5455	1063	1102.89	127535	127535	0	50836	50836	0	127535	50836	35	Connection Failure	UA ground impact tangential to trajectory
435	52	3162	Monday	11:09:00	5133	1084	515.03	146264	146264	69	32107	32107	6	146264	32107	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
441	3	2379	Sunday	06:15:50	2503	2730	26.42	175695	175695	10	2676	2676	1	175695	2676	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
442	60	642	Monday	11:52:29	4646	1627	587.50	146264	146264	0	32107	32107	0	146264	32107	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
452	89	2371	Thursday	14:48:06	2479	2746	880.17	138237	138237	0	40134	40134	1	138237	40134	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
454	39	1481	Sunday	09:48:47	1935	3291	381.33	158750	158750	0	19621	19621	0	158750	19621	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
457	110	1018	Tuesday	16:50:56	3314	2483	1084.92	127535	127535	1	50836	50836	0	127535	50836	34	Connection Failure	UA ground impact tangential to trajectory
462	64	2399	Sunday	12:19:13	2564	2688	632.05	135561	135561	17	42810	42810	8	135561	42810	18	Engine Fire	UA structural desintegration - Debris Impact
47	25	570	Friday	08:23:54	4870	1476	239.83	147156	147156	47	31215	31215	6	147156	31215	21	Engine Fire	UA structural desintegration - Debris Impact
493	63	469	Wednesday	12:10:04	5152	1281	616.80	149831	149831	66	28540	28540	5	149831	28540	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
501	65	3523	Thursday	12:27:02	5735	785	645.08	147156	147156	0	31215	31215	0	147156	31215	10	Engine Anomaly	UA approaches Emergency landing site
502	93	2627	Friday	15:12:21	3338	2179	920.58	136453	136453	4	41918	41918	1	136453	41918	9	Engine Out	UA ground impact tangential to trajectory
503	62	473	Saturday	12:04:07	5142	1288	606.89	127535	127535	0	50836	50836	0	127535	50836	47	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
506	63	3562	Tuesday	12:15:12	5754	783	625.33	148047	148047	0	30324	30324	0	148047	30324	54	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
51	39	3324	Tuesday	09:51:50	5493	890	386.42	146264	146264	73	32107	32107	2	146264	32107	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
512	80	3051	Monday	13:55:37	4818	1266	792.69	138237	138237	33	40134	40134	17	138237	40134	21	Engine Fire	UA structural desintegration - Debris Impact
537	7	1527	Friday	06:38:15	1847	3337	63.78	160533	160533	0	17838	17838	0	160533	17838	35	Connection Failure	UA ground impact tangential to trajectory
539	10	65	Sunday	06:53:42	5758	806	89.53	175695	175695	3	2676	2676	0	175695	2676	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
540	141	3131	Monday	19:59:05	5050	1132	1398.50	159642	159642	0	18729	18729	0	159642	18729	76	Degradation of altitude	Central UA ground impact point below flight path
542	77	1169	Wednesday	13:34:37	2790	2803	757.72	140913	140913	0	37458	37458	0	140913	37458	73	Degradation of altitude	Central UA ground impact point below flight path

55	116	1367	Saturday	17:27:16	2200	3147	1145.44	139129	139129	0	39242	39242	0	139129	39242	45	Partial Lock of Flight Control Surfaces	Central UA ground impact point below flight path
555	66	1797	Tuesday	12:30:08	1583	3438	650.25	148047	148047	0	30324	30324	0	148047	30324	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
561	63	227	Monday	12:09:40	5629	929	616.14	146264	146264	0	32107	32107	0	146264	32107	34	Connection Failure	UA ground impact tangential to trajectory
562	45	1437	Tuesday	10:24:27	2030	3241	440.78	148047	148047	0	30324	30324	0	148047	30324	36	Short Circuit / Overload	Central UA ground impact point below flight path
579	120	2651	Friday	17:53:13	3425	2123	1188.70	135561	135561	0	42810	42810	0	135561	42810	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
582	67	2871	Monday	12:37:53	4221	1625	663.14	146264	146264	0	32107	32107	0	146264	32107	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
590	97	3447	Tuesday	15:37:32	5671	806	962.56	139129	139129	0	39242	39242	0	139129	39242	37	Short Circuit / Overload	Central UA ground impact point below flight path
6	112	2783	Saturday	17:05:47	3906	1819	1109.64	139129	139129	3	39242	39242	0	139129	39242	9	Engine Out	UA ground impact tangential to trajectory
601	12	440	Saturday	07:06:15	5225	1229	110.42	173911	173911	1	4460	4460	0	173911	4460	78	Degradation of altitude	Central UA ground impact point below flight path
609	88	2153	Sunday	14:41:47	1926	3135	869.64	126643	126643	0	51728	51728	0	126643	51728	39	Short Circuit / Overload	Central UA ground impact point below flight path
610	5	1797	Monday	06:26:47	1583	3438	44.67	158750	158750	0	19621	19621	1	158750	19621	20	Engine Fire	UA structural desintegration - Debris Impact
616	87	1683	Sunday	14:35:02	1640	3431	858.42	126643	126643	0	51728	51728	18	126643	51728	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
618	73	2897	Tuesday	13:13:39	4312	1569	722.78	139129	139129	0	39242	39242	0	139129	39242	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
623	109	1304	Sunday	16:45:27	2371	3049	1075.78	131994	131994	0	46377	46377	1	131994	46377	74	Degradation of altitude	Central UA ground impact point below flight path
623	49	1472	Sunday	10:48:21	1954	3282	480.58	135561	135561	0	42810	42810	0	135561	42810	50	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
626	91	2060	Wednesday	14:59:29	1763	3259	899.17	140913	140913	0	37458	37458	0	140913	37458	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
628	122	648	Friday	18:01:48	4626	1640	1203.03	135561	135561	0	42810	42810	0	135561	42810	53	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
658	43	1969	Sunday	10:13:26	1652	3351	422.39	135561	135561	0	42810	42810	0	135561	42810	31	Connection Failure	UA ground impact tangential to trajectory
66	113	2134	Wednesday	17:10:39	1889	3162	1117.78	128427	128427	13	49944	49944	6	128427	49944	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
665	76	1908	Sunday	13:29:53	1606	3395	749.83	126643	126643	0	51728	51728	0	126643	51728	40	Short Circuit / Overload	Central UA ground impact point below flight path
668	96	721	Wednesday	15:27:03	4382	1802	945.11	140913	140913	25	37458	37458	5	140913	37458	20	Engine Fire	UA structural desintegration - Debris Impact
670	12	460	Friday	07:06:16	5175	1265	110.47	160533	160533	66	17838	17838	2	160533	17838	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
679	86	2151	Sunday	14:29:52	1922	3138	849.78	126643	126643	0	51728	51728	0	126643	51728	22	Generator Failure	UA approaches Emergency landing site
690	135	707	Thursday	19:19:20	4430	1770	1332.25	156966	156966	33	21405	21405	4	156966	21405	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
690	54	1341	Thursday	11:17:55	2268	3108	529.86	147156	147156	0	31215	31215	0	147156	31215	72	Degradation of altitude	UA approaches Emergency landing site
693	95	1662	Sunday	15:22:40	1660	3424	937.78	126643	126643	0	51728	51728	0	126643	51728	24	Generator Failure	UA ground impact tangential to trajectory
695	22	3080	Tuesday	08:10:11	4905	1215	216.97	146264	146264	0	32107	32107	0	146264	32107	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
708	11	3365	Monday	07:05:08	5562	856	108.56	158750	158750	53	19621	19621	4	158750	19621	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
709	104	941	Tuesday	16:15:04	3593	2309	1025.14	127535	127535	0	50836	50836	0	127535	50836	72	Degradation of altitude	UA approaches Emergency landing site
72	98	330	Tuesday	15:38:19	5464	1056	963.89	139129	139129	24	39242	39242	15	139129	39242	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
725	25	449	Thursday	08:23:42	5203	1245	239.50	147156	147156	67	31215	31215	3	147156	31215	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
73	66	1656	Wednesday	12:29:55	1666	3421	649.86	149831	149831	0	28540	28540	1	149831	28540	31	Connection Failure	UA ground impact tangential to trajectory
744	31	173	Tuesday	08:58:58	5690	877	298.31	146264	146264	0	32107	32107	0	146264	32107	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
745	19	2860	Wednesday	07:51:57	4182	1648	186.58	159642	159642	1	18729	18729	0	159642	18729	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
747	128	211	Friday	18:36:49	5649	912	1261.39	135561	135561	0	42810	42810	0	135561	42810	33	Connection Failure	Central UA ground impact point below flight path
749	71	2502	Sunday	13:01:05	2899	2465	701.83	126643	126643	0	51728	51728	0	126643	51728	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
756	2	1678	Sunday	06:08:43	1644	3429	14.55	175695	175695	0	2676	2676	0	175695	2676	74	Degradation of altitude	Central UA ground impact point below flight path
765	138	2015	Tuesday	19:39:22	1702	3308	1365.64	159642	159642	0	18729	18729	0	159642	18729	29	Connection Failure	UA approaches Emergency landing site
78	3	1866	Monday	06:15:00	1588	3417	25.00	158750	158750	0	19621	19621	0	158750	19621	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
79	60	2234	Tuesday	11:55:08	2106	3005	591.89	148047	148047	0	30324	30324	0	148047	30324	35	Connection Failure	UA ground impact tangential to trajectory
792	30	2544	Monday	08:56:56	3043	2370	294.92	146264	146264	0	32107	32107	0	146264	32107	10	Engine Anomaly	UA approaches Emergency landing site
796	1	2780	Friday	06:04:35	3895	1826	7.67	160533	160533	0	17838	17838	0	160533	17838	25	Generator Failure	UA approaches Emergency landing site
804	53	348	Saturday	11:10:19	5430	1082	517.20	127535	127535	0	50836	50836	0	127535	50836	23	Generator Failure	Central UA ground impact point below flight path
811	79	1322	Saturday	13:46:47	2321	3078	778.00	135561	135561	1	42810	42810	0	135561	42810	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
816	58	3320	Thursday	11:45:01	5486	894	575.03	147156	147156	0	31215	31215	0	147156	31215	75	Degradation of altitude	UA approaches Emergency landing site
818	129	2756	Saturday	18:47:00	3807	1881	1278.33	139129	139129	0	39242	39242	0	139129	39242	78	Degradation of altitude	Central UA ground impact point below flight path
822	79	3045	Wednesday	13:49:39	4799	1277	782.75	140913	140913	25	37458	37458	10	140913	37458	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
823	102	73	Thursday	16:01:44	5755	810	1002.89	130210	130210	0	48161	48161	0	130210	48161	43	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
83	66	488	Saturday	12:27:59	5103	1316	646.64	127535	127535	0	50836	50836	0	127535	50836	62	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
84	15	2412	Sunday	07:27:22	2605	2661	145.64	175695	175695	0	2676	2676	0	175695	2676	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
846	132	2643	Saturday	19:04:40	3396	2142	1307.81	160533	160533	0	17838	17838	0	160533	17838	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
852	6	333	Friday	06:30:20	5459	1060	50.56	160533	160533	0	17838	17838	0	160533	17838	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
853	131	2023	Saturday	18:57:42	1712	3300	1296.17	160533	160533	0	17838	17838	0	160533	17838	69	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
853	14	664	Saturday	07:18:32	4574	1675	130.89	173911	173911	43	4460	4460	3	173911	4460	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
855	37	2446	Monday	09:38:29	2713	2588	364.14	146264	146264	21	32107	32107	6	146264	32107	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
857	112	1161	Wednesday	17:03:05	2816	2787	1105.17	128427	128427	1	49944	49944	0	128427	49944	31	Connection Failure	UA ground impact tangential to trajectory
863	22	944	Tuesday	08:06:38	3582	2316	211.08	146264	146264	0	32107	32107	0	146264	32107	75	Degradation of altitude	UA approaches Emergency landing site
868	45	2334	Sunday	10:25:57	2370	2820	443.25	135561	135561	20	42810	42810	5	135561	42810	18	Engine Fire	UA structural desintegration - Debris Impact
877	59	22	Tuesday	11:45:31	5765	791	575.86	148047	148047	0	30324	30324	0	148047	30324	44	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
881	140	3165	Saturday	19:53:11	5141	1080	1388.67	160533	160533	0	17838	17838	0	160533	17838	68	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
882	102	2742	Sunday	16:06:08	3756	1913	1010.25	131994	131994	0	46377	46377	0	131994	46377	72	Degradation of altitude	UA approaches Emergency landing site
886	2	1023	Thursday	06:07:38	3296	2494	12.75	158750	158750	0	19621	19621	0	158750	19621	10	Engine Anomaly	UA approaches Emergency landing site
888	112	416	Saturday	17:01:52	5283	1189	1103.11	139129	139129	0	39242	39242	0	139129	39242	70	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
899	140	1745	Wednesday	19:50:50	1599	3441	1384.75	160533	160533	0	17838	17838	0	160533	17838	78	Degradation of altitude	Central UA ground impact point below flight path
900	100	2226	Thursday	15:53:22	2087	3019	988.97	138237	138237	0	40134	40134	0	138237	40134	13	Engine Anomaly	UA approaches Emergency landing site
907	72	3183	Thursday	13:08:10	5187	1054	713.64	138237	138237	6	40134	40134	0	138237	40134	12	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
908	80	502	Friday	13:51:23	5065	1342	785.67	136453	136453	0	41918	41918	0	136453	41918	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
912	26	3033	Tuesday	08:33:55	4762	1299	256.55	146264	146264	1	32107	32107	0	146264	32107	9	Engine Out	UA ground impact tangential to trajectory
939	58	771	Monday	11:40:47	4208	1916	568.00	146264	146264	12	32107	32107	0	146264	32107	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
939	66	2925	Monday	12:32:00	4408	1510	653.36	146264	146264	0	32107	32107	0	146264	32107	1	Engine Out	No Ground Effect
943	100	1843	Friday	15:52:44	1583	3426	987.92	136453	136453	0	41918	41918	0	136453	41918	66	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
946	116	1901	Monday	17:28:09	1603	3399	1146.92	130210	130210	1	48161	48161	0	130210	48161	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
95	24	2477	Thursday	08:21:05	2815	2520	235.17	147156	147156	0	31215	31215	0	147156	31215	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
950	103	1821	Friday	16:10:34	1581	3433	1017.64	135561	135561	0	42810	42810	0	135561	42810	70	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
965	13	1655	Sunday	07:14:13	1667	3421	123.70	173911	173911	0	4460	4460	0	173911	4460	76	Degradation of altitude	Central UA ground impact point below flight path
967	91	731	Monday	14:57:18	4348	1824	895.50	138237	138237	0	40134	40134	0	138237	40134	44	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
968	126	1881	Tuesday	18:27:40	1594	3410	1246.14	127535	127535	0	50836	50836	0	127535	50836	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
968	17	3210	Tuesday	07:40:36	5254	1017	167.69	157858	157858	0	20513	20513	0	157858	20513	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
968	83	2314	Tuesday	14:12:16	2314	2859	820.45	139129	139129	0	39242	39242	1	139129	39242	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
977	85	362	Thursday	14:20:57	5401	1103	834.92	138237	138237	2	40134	40134	0	138237	40134	37	Short Circuit / Overload	Central UA ground impact point below flight path
99	94	1394	Monday	15:16:16	2131	3185	927.11	138237	138237	38	40134	40134	8	138237	40134	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
999	134	842	Friday	19:13:36	3954	2080	1322.69	160533	160533	2	17838	17838	0	160533	17838	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path

O.R.C.U.S. 02.00 - tTest of the Simulation

nProbes	200
nEvents	223
nEvents_cor	205
tMission	14
x_cross_ATB	8.955
x_cross_OTW	1.78
x_cross_TOT	10.735
s2ATB	71.495976
sATB	8.4555293
tATB	14.960791
s2OTW	2.8327925
sOTW	1.6830902
tOTW	14.872394
s2TOT	102.38321
sTOT	10.118459
tTOT	14.989872

UADay/Prot	HIT_TOT_ATB	HIT_TOT_OTW	UADay/Prot cor	HIT_TOT_mean_ATB	HIT_TOT_mean_OTW	HIT_TOT_mean_ATB/Fh	HIT_TOT_mean_OTW/Fh	x_i-x_cross ATB	x_i-x_cross OTW	(x_i-x_cross ATB)^2	(x_i-x_cross OTW)^2
6	3	0	6	3	0	0.214285714	0	-8.740714286	-1.78	76.40008622	3.1684
19	20	7	19	20	7	1.428571429	0.5	-7.526428571	-1.28	56.64712704	1.6384
35	37	13	35	102	22	7.285714286	1.571428571	-1.669285714	-0.208571429	2.786514796	0.043502041
35	65	9	47	47	6	3.357142857	0.428571429	-5.597857143	-1.351428571	31.33600459	1.826359184
47	47	6	51	73	2	5.214285714	0.142857143	-3.740714286	-1.637142857	13.99294337	2.680236735
51	73	2	55	0	0	0	0	-8.955	-1.78	80.192025	3.1684
55	0	0	66	13	6	0.928571429	0.428571429	-8.026428571	-1.351428571	64.42355561	1.826359184
66	13	6	72	24	15	1.714285714	1.071428571	-7.240714286	-0.708571429	52.42794337	0.502073469
72	24	15	73	0	1	0	0.071428571	-8.955	-1.708571429	80.192025	2.919216327
73	0	1	78	0	0	0	0	-8.955	-1.78	80.192025	3.1684
78	0	0	79	0	0	0	0	-8.955	-1.78	80.192025	3.1684
79	0	0	83	0	0	0	0	-8.955	-1.78	80.192025	3.1684
83	0	0	84	0	0	0	0	-8.955	-1.78	80.192025	3.1684
84	0	0	95	0	0	0	0	-8.955	-1.78	80.192025	3.1684
95	0	0	99	38	8	2.714285714	0.571428571	-6.240714286	-1.208571429	38.9465148	1.460644898
99	38	8	102	0	0	0	0	-8.955	-1.78	80.192025	3.1684
102	0	0	106	0	0	0	0	-8.955	-1.78	80.192025	3.1684
106	0	0	125	0	0	0	0	-8.955	-1.78	80.192025	3.1684
125	0	0	132	0	0	0	0	-8.955	-1.78	80.192025	3.1684
132	0	0	134	0	14	0	1	-8.955	-0.78	80.192025	0.6084
134	0	14	146	0	0	0	0	-8.955	-1.78	80.192025	3.1684
134	0	0	153	0	0	0	0	-8.955	-1.78	80.192025	3.1684
146	0	0	156	0	0	0	0	-8.955	-1.78	80.192025	3.1684
153	0	0	170	0	0	0	0	-8.955	-1.78	80.192025	3.1684
156	0	0	175	0	0	0	0	-8.955	-1.78	80.192025	3.1684
170	0	0	177	0	0	0	0	-8.955	-1.78	80.192025	3.1684
170	0	0	190	74	4	5.285714286	0.285714286	-3.669285714	-1.494285714	13.46365765	2.232889796
175	0	0	207	0	0	0	0	-8.955	-1.78	80.192025	3.1684
177	0	0	217	0	0	0	0	-8.955	-1.78	80.192025	3.1684
190	74	4	220	20	16	1.428571429	1.142857143	-7.526428571	-0.637142857	56.64712704	0.40595102
207	0	0	222	0	0	0	0	-8.955	-1.78	80.192025	3.1684
207	0	0	233	2	15	0.142857143	1.071428571	-8.812142857	-0.708571429	77.65386173	0.502073469
217	0	0	243	1	1	0.071428571	0.071428571	-8.883571429	-1.708571429	78.91784133	2.919216327
220	20	16	262	0	0	0	0	-8.955	-1.78	80.192025	3.1684
222	0	0	270	74	3	5.285714286	0.214285714	-3.669285714	-1.565714286	13.46365765	2.451461224
233	2	15	273	34	14	2.428571429	1	-6.526428571	-0.78	42.5942699	0.6084
243	1	1	277	0	0	0	0	-8.955	-1.78	80.192025	3.1684
262	0	0	281	0	0	0	0	-8.955	-1.78	80.192025	3.1684
270	74	3	316	0	0	0	0	-8.955	-1.78	80.192025	3.1684
273	34	14	325	0	0	0	0	-8.955	-1.78	80.192025	3.1684
277	0	0	326	0	0	0	0	-8.955	-1.78	80.192025	3.1684
281	0	0	347	0	0	0	0	-8.955	-1.78	80.192025	3.1684
316	0	0	353	32	10	2.285714286	0.714285714	-6.669285714	-1.065714286	44.47937194	1.135746939
325	0	0	359	0	0	0	0	-8.955	-1.78	80.192025	3.1684
326	0	0	360	1	0	0.071428571	0	-8.883571429	-1.78	78.91784133	3.1684
347	0	0	361	0	0	0	0	-8.955	-1.78	80.192025	3.1684
353	32	10	364	0	0	0	0	-8.955	-1.78	80.192025	3.1684
359	0	0	370	0	1	0	0.071428571	-8.955	-1.708571429	80.192025	2.919216327
360	1	0	372	1	0	0.071428571	0	-8.883571429	-1.78	78.91784133	3.1684
361	0	0	374	71	2	5.071428571	0.142857143	-3.883571429	-1.637142857	15.08212704	2.680236735
364	0	0	376	59	2	4.214285714	0.142857143	-4.740714286	-1.637142857	22.47437194	2.680236735
370	0	1	378	0	0	0	0	-8.955	-1.78	80.192025	3.1684
370	0	0	385	20	10	1.428571429	0.714285714	-7.526428571	-1.065714286	56.64712704	1.135746939
372	1	0	393	0	0	0	0	-8.955	-1.78	80.192025	3.1684
374	71	2	399	0	0	0	0	-8.955	-1.78	80.192025	3.1684
374	0	0	400	0	0	0	0	-8.955	-1.78	80.192025	3.1684
376	0	0	406	0	0	0	0	-8.955	-1.78	80.192025	3.1684
376	59	2	408	12	1	0.857142857	0.071428571	-8.097857143	-1.708571429	65.57529031	2.919216327
378	0	0	413	0	0	0	0	-8.955	-1.78	80.192025	3.1684
385	20	10	419	0	0	0	0	-8.955	-1.78	80.192025	3.1684
393	0	0	422	0	0	0	0	-8.955	-1.78	80.192025	3.1684
399	0	0	435	69	6	4.928571429	0.428571429	-4.026428571	-1.351428571	16.21212704	1.826359184
400	0	0	441	10	1	0.714285714	0.071428571	-8.240714286	-1.708571429	67.90937194	2.919216327
406	0	0	442	0	0	0	0	-8.955	-1.78	80.192025	3.1684
408	12	1	452	0	1	0	0.071428571	-8.955	-1.708571429	80.192025	2.919216327
413	0	0	454	0	0	0	0	-8.955	-1.78	80.192025	3.1684
419	0	0	457	1	0	0.071428571	0	-8.883571429	-1.78	78.91784133	3.1684
422	0	0	462	17	8	1.214285714	0.571428571	-7.740714286	-1.208571429	59.91865765	1.460644898
435	69	6	493	66	5	4.714285714	0.357142857	-4.240714286	-1.422857143	17.98365765	2.024522449
441	10	1	501	0	0	0	0	-8.955	-1.78	80.192025	3.1684
442	0	0	502	4	1	0.285714286	0.071428571	-8.669285714	-1.708571429	75.1565148	2.919216327
452	0	1	503	0	0	0	0	-8.955	-1.78	80.192025	3.1684
454	0	0	506	0	0	0	0	-8.955	-1.78	80.192025	3.1684
457	1	0	512	33	17	2.357142857	1.214285714	-6.597857143	-0.565714286	43.53171888	0.320032653
462	17	8	537	0	0	0	0	-8.955	-1.78	80.192025	3.1684
493	66	5	539	3	0	0.214285714	0	-8.740714286	-1.78	76.40008622	3.1684
501	0	0	540	0	0	0	0	-8.955	-1.78	80.192025	3.1684
502	4	1	542	0	0	0	0	-8.955	-1.78	80.192025	3.1684
503	0	0	555	0	0	0	0	-8.955	-1.78	80.192025	3.1684
506	0	0	561	0	0	0	0	-8.955	-1.78	80.192025	3.1684
512	33	17	562	0	0	0	0	-8.955	-1.78	80.192025	3.1684
537	0	0	579	0	0	0	0	-8.955	-1.78	80.192025	3.1684
539	3	0	582	0	0	0	0	-8.955	-1.78	80.192025	3.1684
540	0	0	590	0	0	0	0	-8.955	-1.78	80.192025	3.1684
542	0	0	601	1	0	0.071428571	0	-8.883571429	-1.78	78.91784133	3.1684
555	0	0	609	0	0	0	0	-8.955	-1.78	80.192025	3.1684
561	0	0	610	0	1	0	0.071428571	-8.955	-1.708571429	80.192025	2.919216327
562	0	0	616	0	18	0	1.285714286	-8.955	-0.494285714	80.192025	0.244318367
579	0	0	618	0	0	0	0	-8.955	-1.78	80.192025	3.1684
582	0	0	623	0	1	0	0.071428571	-8.955	-1.708571429	80.192025	2.919216327
590	0	0	626	0	0	0	0	-8.955	-1.78	80.192025	3.1684
601	1	0	628	0	0	0	0	-8.955	-1.78	80.192025	3.1684
609	0	0	658	0	0	0	0	-8.955	-1.78	80.192025	3.1684
610	0	1	665	0	0	0	0	-8.955	-1.78	80.192025	3.1684
616	0	18	668	25	5	1.785714286	0.357142857	-7.169285714	-1.422857143	51.39865765	2.024522449
618	0	0	670	66	2	4.714285714	0.142857143	-4.240714286	-1.637142857	17.98365765	2.680236735
623	0	1	679	0	0	0	0	-8.955	-1.78	80.192025	3.1684
623	0	0	690	33	4	2.357142857	0.285714286	-6.597857143	-1.494285714	43.53171888	2.232889796
626	0	0	693	0	0	0	0	-8.955	-1.78	80.192025	3.1684
628	0	0	695	0	0	0	0	-8.955	-1.78	80.192025	3.1684
658	0	0	708	53	4	3.785714286	0.285714286	-5.169285714	-1.494285714	26.7215148	2.232889796
665	0	0	709	0	0	0	0	-8.955	-1.78	80.192025	3.1684
668	25	5	725	67	3	4.785714286	0.214285714	-4.169285714	-1.565714286	17.38294337	2.451461224
670	66	2	744	0	0	0	0	-8.955	-1.78	80.192025	3.1684
679	0	0	745	1	0	0.071428571	0	-8.883571429	-1.78	78.91784133	3.1684
690	33	4	747	0	0	0	0	-8.955	-1.78	80.192025	3.1684
690	0	0	749	0	0	0	0	-8.955	-1.78	80.192025	3.1684
693	0	0	756	0	0	0	0	-8.955	-1.78	80.192025	3.1684
695	0	0	765	0	0	0	0	-8.955	-1.78	80.192025	3.1684
708	53	4	792	0	0	0	0	-8.955	-1.78	80.192025	3.1684
709	0	0	796	0	0	0	0	-8.955	-1.78	80.192025	3.1684
725	67	3	804	0	0	0	0	-8.955	-1.78	80.192025	3.1684
744	0	0	811	1	0	0.071428571	0	-8.883571429	-1.78	78.91784133	3.1684
745	1	0	816	0	0	0	0	-8.955	-1.78	80.192025	3.1684
747	0	0	818	0	0	0	0	-8.955	-1.78	80.192025	3.1684
749	0	0	822	25	10	1.785714286	0.714285714	-7.169285714	-1.065714286	51.39865765	1.135746939
756	0	0	823	0	0	0	0	-8.955	-1.78	80.192025	3.1684
765	0	0	846	0	0	0	0	-8.955	-1.78	80.192025	3.1684
792	0	0	852	0	0	0	0	-8.955	-1.78	80.192025	3.1684
796	0	0	853	43	3	3.071428571	0.214285714	-5.883571429	-1.565714286	34.61641276	2.451461224
804	0	0	855	21	6	1.5	0.428571429	-7.455	-1.351428571	55.577025	1.826359184
811	1	0	857	1	0	0.071428571	0	-8.883571429	-1.78	78.91784133	3.1684
816	0	0	863	0	0	0	0	-8.955	-1.78	80.192025	3.1684
818	0	0	868	20	5	1.428571429	0.357142857	-7.526428571	-1.422857143	56.64712704	2.024522449
822	25	10	877	0	0	0	0	-8.955	-1.78	80.192025	3.1684
823	0	0	881	0	0	0	0	-8.955	-1.78	80.192025	3.1684
846	0	0	882	0	0	0	0	-8.955	-1.78	80.192025	3.1684
852	0	0	886	0	0	0	0	-8.955	-1.78	80.192025	3.1684
853	0	0	888	0	0	0	0	-8.955	-1.78	80.192025	3.1684
853	43	3	899	0	0	0	0	-8.955	-1.78	80.192025	3.1684
855	21	6	900	0	0	0	0	-8.955	-1.78	80.192025	3.1684
857	1	0	907	6	0	0.428571429	0	-8.526428571	-1.78	72.69998418	3.1684
863	0	0	908	0	0	0	0	-8.955	-1.78	80.192025	3.1684
868	20	5	912	1	0	0.071428571	0	-8.883571429	-1.78	78.91784133	3.1684
877	0	0	939	12	0	0.857142857	0	-8.097857143	-1.78	65.57529031	3.1684
881	0	0	943	0	0	0	0	-8.955	-1.78	80.192025	3.1684
882	0	0	946	1	0	0.071428571	0	-8.883571429	-1.78	78.91784133	3.1684
886	0	0	950	0	0	0	0	-8.955	-1.78	80.192025	3.1684
888	0	0	965	0	0	0	0	-8.955	-1.78	80.192025	3.1684
899	0	0	967	0	0	0	0	-8.955	-1.78	80.192025	3.1684
900	0	0	968	0	1	0	0.071428571	-8.955	-1.708571429	80.192025	2.919216327
907	6	0	977	2	0	0.142857143	0	-8.812142857	-1.78	77.65386173	3.1684
908	0	0	999	2	0	0.142857143	0	-8.812142857	-1.78	77.65386173	3.1684
912	1	0	1003	0	1	0	0.071428571	-8.955	-1.708571429	80.192025	2.919216327
939	12	0	1005	0	0	0	0	-8.955	-1.78	80.192025	3.1684
939	0	0	1006	61	8	4.357142857	0.571428571	-4.597857143	-1.208571429	21.14029031	1.460644898
943	0	0	1027	0	0	0	0	-8.955	-1.78	80.192025	3.1684
946	1	0	1029	0	0	0	0	-8.955	-1.78	80.192025	3.1684
950	0	0	1036	0	0	0	0	-8.955	-1.78	80.192025	3.1684
965	0	0	1042	0	0	0	0	-8.955	-1.78	80.192025	3.1684
967	0	0	1047	0	0	0	0	-8.955	-1.78	80.192025	3.1684
968	0	0	1051	0	0	0	0	-8.955	-1.78	80.192025	3.1684
968	0	0	1066	4	0	0.285714286	0	-8.669285714	-1.78	75.1565148	3.1684
968	0	1	1071	0	0	0	0	-8.955	-1.78	80.192025	3.1684
977	2	0	1077	0	0	0	0	-8.955	-1.78	80.192025	3.1684
999	2	0	1078	2	0	0.142857143	0	-8.812142857	-1.78	77.65386173	3.1684
1003	0	1	1080	10	3	0.714285714	0.214285714	-8.240714286	-1.565714286	67.90937194	2.451461224
1005	0	0	1081	0	0	0	0	-8.955	-1.78	80.192025	3.1684
1006	3	1	1084	0	0	0	0	-8.955	-1.78	80.192025	3.1684
1006	58	7	1087	0	0	0	0	-8.955	-1.78	80.192025	3.1684
1027	0	0	1090	3	0	0.214285714	0	-8.740714286	-1.78	76.40008622	3.1684
1029	0	0	1092	3	0	0.214285714	0	-8.740714286	-1.78	76.40008622	3.1684
1036	0	0	1096	0	0	0	0	-8.955	-1.78	80.192025	3.1684
1042	0	0	1097	26	3	1.857142857	0.214285714	-7.097857143	-1.565714286	50.37957602	2.451461224
1047	0	0	1105	62	3	4.428571429	0.214285714	-4.526428571	-1.565714286	20.48855561	2.451461224
1051	0	0	1106	0	0	0	0	-8.955	-1.78	80.192025	3.1684
1066	4	0	1116	0	0	0	0	-8.955	-1.78	80.192025	3.1684
1071	0	0	1118	1	0	0.071428571	0	-8.883571429	-1.78	78.91784133	3.1684
1077	0	0	1132	0	0	0	0	-8.955	-1.78	80.192025	3.1684
1078	2	0	1135	0	1	0	0.071428571	-8.955	-1.708571429	80.192025	2.919216327
1080	10	3	1136	63	10	4.5	0.714285714	-4.455	-1.065714286	19.847025	1.135746939
1081	0	0	1137	0	0	0	0	-8.955	-1.78	80.192025	3.1684
1081	0	0	1149	0	0	0	0	-8.955	-1.78	80.192025	3.1684
1084	0	0	1150	2	22	0.142857143	1.571428571	-8.812142857	-0.208571429	77.65386173	0.043502041
1087	0	0	1157	0	0	0	0	-8.955	-1.78	80.192025	3.1684
1090	3	0	1165	0	0	0	0	-8.955	-1.78	80.192025	3.1684
1092	3	0	1173	0	0	0	0	-8.955	-1.78	80.192025	3.1684
1096	0	0	1201	0	0	0	0	-8.955	-1.78	80.192025	3.1684
1097	26	3	1220	0	0	0	0	-8.955	-1.78	80.192025	3.1684
1105	62	3	1221	29	9	2.071428571	0.642857143	-6.883571429	-1.137142857	47.38355561	1.293093878
1106	0	0	1222	3	0	0.214285714	0	-8.740714286	-1.78	76.40008622	3.1684
1116	0	0	1231	0	0	0	0	-8.955	-1.78	80.192025	3.1684
1118	1	0	1245	0	0	0	0	-8.955	-1.78	80.192025	3.1684
1132	0	0	1247	1	0	0.071428571	0	-8.883571429	-1.78	78.91784133	3.1684
1135	0	1	1265	0	0	0	0	-8.955	-1.78	80.192025	3.1684
1135	0	0	1268	2	0	0.142857143	0	-8.812142857	-1.78	77.65386173	3.1684
1136	63	10	1270	0	0	0	0	-8.955	-1.78	80.192025	3.1684
1137	0	0	1274	3	0	0.214285714	0	-8.740714286	-1.78	76.40008622	3.1684
1137	0	0	1275	0	0	0	0	-8.955	-1.78	80.192025	3.1684
1149	0	0	1284	0	0	0	0	-8.955	-1.78	80.192025	3.1684
1150	2	22	1286	17	9	1.214285714	0.642857143	-7.740714286	-1.137142857	59.91865765	1.293093878
1157	0	0	1299	75	4	5.357142857	0.285714286	-3.597857143	-1.494285714	12.94457602	2.232889796
1165	0	0	1311	40	12	2.857142857	0.857142857	-6.097857143	-0.922857143	37.18386173	0.851665306
1173	0	0	1333	2	0	0.142857143	0	-8.812142857	-1.78	77.65386173	3.1684
1201	0	0	1334	1	0	0.071428571	0	-8.883571429	-1.78	78.91784133	3.1684
1220	0	0	1335	0	0	0	0	-8.955	-1.78	80.192025	3.1684
1221	29	9	1336	0	0	0	0	-8.955	-1.78	80.192025	3.1684
1222	3	0	1361	1	0	0.071428571	0	-8.883571429	-1.78	78.91784133	3.1684
1231	0	0	1363	0	0	0	0	-8.955	-1.78	80.192025	3.1684
1245	0	0	1370	0	0	0	0	-8.955	-1.78	80.192025	3.1684
1247	1	0	1373	2	0	0.142857143	0	-8.812142857	-1.78	77.65386173	3.1684
1265	0	0	1382	26	4	1.857142857	0.285714286	-7.097857143	-1.494285714	50.37957602	2.232889796
1265	0	0	1390	1	0	0.071428571	0	-8.883571429	-1.78	78.91784133	3.1684
1268	2	0	1392	46	5	3.285714286	0.357142857	-5.669285714	-1.422857143	32.14080051	2.024522449
1270	0	0	1396	0	0	0	0	-8.955	-1.78	80.192025	3.1684
1274	3	0									
1275	0	0									
1284	0	0									
1286	17	9									
1299	75	4									
1311	40	12									
1333	2	0									
1334	1	0									
1335	0	0									
1336	0	0									
1361	1	0									
1363	0	0									
1370	0	0									
1373	2	0									
1382	26	4									
1390	1	0									
1392	46	5									
1396	0	0									

11.4.2 Saarbrücken – R72

11.4.2.1 Saarbrücken – R72 – Phase 1

O.R.C.U.S. 02.00 - Simulation Summary

UA Parameters

MTOW [kg]	Wingspan [m]	Length [m]	L/D
90	5	4	8

v [km/h]	Alt [m]	CCF [m]
100	100	10209.741

P_CumCat [1/Fh]	Engine [%]	ESys [%]	FCS [%]	NavSys [%]	Struct [%]
0.01	20	20	20	20	20

General map parameters

	Name	Area [km2]	PPL	PPL/km2
City	Saarbruecken, Landeshauptstadt	167.52	180966	1080
County	Regionalverband Saarbruecken	410.95	330150	803
FS	SL	2571.12	994187	387

Mission specific map parameters

	Area [km2]	PPL	Tourists	Total PPL
City	65.2964	70521	0	70521
Map total	65.2964	70521	0	70521

PPL MOD NA

Sim FH [Fh]	19600	Ev/Fh [1/Fh]	0.0091837
Events total	180		

Hits due to UA impacts		Hits/Fh [1/Fh]
City ATB	519	0.0264796
City OTW	129	0.0065816
Total	648	0.0330612

Prot	cyc	k_UA	Day	Time of impact	UA X Pos	UA Y Pos	Travelled Distance [km]	PPL_TD_CITY_ATB	PPL_CITY_ATB_COUNT	HIT_CITY_ATB_COUNT	PPL_TD_CITY_OTW	PPL_CITY_OTW_COUNT	HIT_CITY_OTW_COUNT	PPL_ALL_ATB_COUNT	PPL_ALL_OTW_COUNT	E	Case	Outcome
1000	3	2350	Saturday	06:16:15	5138	3672	27.08	67700	67700	0	2821	2821	0	67700	2821	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
1003	49	3032	Tuesday	10:59:11	6988	1554	498.67	58179	58179	0	12342	12342	0	58179	12342	17	Engine Fire	Central UA ground impact point below flight path
1011	3	2222	Wednesday	06:16:01	4904	4023	26.72	61705	61705	1	8816	8816	0	61705	8816	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
1011	96	1153	Wednesday	15:43:55	5872	3818	973.20	53948	53948	15	16573	16573	9	53948	16573	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1017	71	3266	Tuesday	13:14:21	7545	1082	723.94	55006	55006	0	15515	15515	0	55006	15515	74	Degradation of altitude	Central UA ground impact point below flight path
1019	44	62	Thursday	10:23:31	7996	943	439.19	58179	58179	0	12342	12342	0	58179	12342	1	Engine Out	No Ground Effect
102	10	1029	Thursday	06:56:53	6230	3451	94.81	62058	62058	0	8463	8463	0	62058	8463	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
1035	94	2094	Saturday	15:33:16	4740	4313	955.44	53243	53243	0	17278	17278	0	53243	17278	69	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
1039	67	2455	Wednesday	12:48:28	5375	3350	680.81	58179	58179	0	12342	12342	0	58179	12342	42	Partial Lock of Flight Control Surfaces	Central UA ground impact point below flight path
1041	18	85	Friday	07:44:17	7999	963	173.81	62763	62763	0	7758	7758	0	62763	7758	40	Short Circuit / Overload	Central UA ground impact point below flight path
106	79	774	Monday	13:59:07	6961	2619	798.55	55358	55358	19	15163	15163	7	55358	15163	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1062	120	1258	Friday	18:11:06	5585	4092	1218.53	53243	53243	3	17278	17278	1	53243	17278	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1064	118	1651	Sunday	17:59:31	4796	4676	1199.22	52185	52185	0	18336	18336	0	52185	18336	47	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
1066	103	1007	Tuesday	16:26:32	6295	3382	1044.25	52538	52538	0	17983	17983	0	52538	17983	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
1066	117	1500	Tuesday	17:53:09	5032	4546	1188.58	52538	52538	4	17983	17983	2	52538	17983	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
108	34	2692	Wednesday	09:26:44	6012	2572	344.56	59237	59237	0	11284	11284	0	59237	11284	35	Connection Failure	UA ground impact tangential to trajectory
1099	55	336	Sunday	11:31:22	7857	1356	552.28	51832	51832	4	18689	18689	7	51832	18689	18	Engine Fire	UA structural desintegration - Debris Impact
1104	133	1208	Friday	19:30:40	5719	3967	1351.11	63468	63468	0	7053	7053	0	63468	7053	62	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
1111	35	3421	Friday	09:34:05	7807	922	356.83	58885	58885	4	11636	11636	3	58885	11636	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1118	34	606	Friday	09:23:11	7382	2079	338.64	58885	58885	0	11636	11636	0	58885	11636	5	Engine Out	No Ground Effect
1122	50	2625	Tuesday	11:04:37	5822	2794	507.72	58179	58179	0	12342	12342	0	58179	12342	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
1135	53	288	Monday	11:19:02	7908	1257	531.72	57827	57827	0	12694	12694	0	57827	12694	2	Engine Out	UA approaches Emergency landing site
115	111	670	Wednesday	17:14:58	7230	2280	1124.97	51127	51127	20	19394	19394	6	51127	19394	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
1154	83	214	Saturday	14:22:41	7965	1125	837.81	53243	53243	0	17278	17278	0	53243	17278	68	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
1160	83	2369	Friday	14:26:21	5179	3615	843.92	53243	53243	0	17278	17278	0	53243	17278	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
1171	79	2498	Tuesday	14:02:03	5482	3212	803.44	55006	55006	27	15515	15515	0	55006	15515	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1175	117	3028	Saturday	17:55:45	6977	1564	1192.92	53948	53948	0	16573	16573	0	53948	16573	39	Short Circuit / Overload	Central UA ground impact point below flight path
1176	31	1033	Sunday	09:05:31	6218	3463	309.22	63116	63116	0	7405	7405	0	63116	7405	38	Short Circuit / Overload	Central UA ground impact point below flight path
1179	39	1225	Wednesday	09:54:51	5673	4010	391.44	59237	59237	14	11284	11284	1	59237	11284	21	Engine Fire	UA structural desintegration - Debris Impact
120	2	1229	Monday	06:08:13	5662	4021	13.70	62763	62763	0	7758	7758	0	62763	7758	26	Generator Failure	Central UA ground impact point below flight path
1202	35	1971	Friday	09:31:37	4656	4521	352.72	58885	58885	2	11636	11636	0	58885	11636	17	Engine Fire	Central UA ground impact point below flight path
122	116	1446	Wednesday	17:46:55	5138	4470	1178.22	51127	51127	0	19394	19394	0	51127	19394	1	Engine Out	No Ground Effect
1220	23	303	Tuesday	08:15:17	7893	1287	225.47	59590	59590	0	10931	10931	0	59590	10931	36	Short Circuit / Overload	Central UA ground impact point below flight path
1221	102	2589	Wednesday	16:23:06	5722	2914	1038.53	51127	51127	0	19394	19394	0	51127	19394	75	Degradation of altitude	UA approaches Emergency landing site
1229	123	3309	Thursday	18:32:59	7627	1025	1254.97	51832	51832	1	18689	18689	0	51832	18689	37	Short Circuit / Overload	Central UA ground impact point below flight path
1235	82	102	Wednesday	14:16:22	7999	979	827.28	53948	53948	0	16573	16573	5	53948	16573	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
1245	98	1122	Saturday	15:56:06	5961	3730	993.53	53948	53948	23	16573	16573	6	53948	16573	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1270	112	3270	Wednesday	17:25:31	7553	1077	1142.56	51127	51127	0	19394	19394	0	51127	19394	43	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
1271	58	2523	Thursday	11:53:27	5546	3131	589.11	58179	58179	0	12342	12342	0	58179	12342	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1276	50	1753	Tuesday	11:03:08	4696	4690	505.25	58179	58179	0	12342	12342	0	58179	12342	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
1281	70	754	Sunday	13:03:57	7014	2553	706.61	47601	47601	0	22920	22920	0	47601	22920	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
1295	62	3109	Sunday	12:18:58	7188	1372	631.61	51832	51832	0	18689	18689	2	51832	18689	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
1296	14	1742	Monday	07:22:36	4704	4691	137.67	62763	62763	0	7758	7758	0	62763	7758	47	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
130	63	3339	Thursday	12:25:29	7681	990	642.47	58179	58179	0	12342	12342	0	58179	12342	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
1327	57	237	Thursday	11:43:27	7950	1163	572.42	58179	58179	0	12342	12342	0	58179	12342	45	Partial Lock of Flight Control Surfaces	Central UA ground impact point below flight path
1336	56	2416	Saturday	11:41:01	5283	3472	568.39	49717	49717	0	20804	20804	0	49717	20804	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
1338	128	1881	Monday	19:01:10	4643	4623	1301.97	64174	64174	0	6347	6347	0	64174	6347	17	Engine Fire	Central UA ground impact point below flight path
1340	73	562	Wednesday	13:22:01	7478	1946	736.70	53948	53948	0	16573	16573	0	53948	16573	22	Generator Failure	UA approaches Emergency landing site
1346	27	986	Tuesday	08:40:56	6356	3315	268.25	59590	59590	0	10931	10931	0	59590	10931	73	Degradation of altitude	Central UA ground impact point below flight path
1352	82	3549	Monday	14:22:13	7943	891	837.05	55358	55358	0	15163	15163	0	55358	15163	40	Short Circuit / Overload	Central UA ground impact point below flight path
1353	84	3245	Tuesday	14:33:58	7502	1114	856.61	55006	55006	10	15515	15515	7	55006	15515	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1361	67	1574	Wednesday	12:46:59	4904	4626	678.31	58179	58179	0	12342	12342	0	58179	12342	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1362	77	2391	Thursday	13:49:37	5227	3549	782.72	54653	54653	25	15868	15868	2	54653	15868	21	Engine Fire	UA structural desintegration - Debris Impact
1365	60	2816	Sunday	12:06:12	6374	2172	610.36	51832	51832	0	18689	18689	0	51832	18689	69	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
1376	86	3205	Thursday	14:46:09	7415	1181	876.92	54653	54653	4	15868	15868	6	54653	15868	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1387	74	1428	Monday	13:29:36	5176	4441	749.36	55358	55358	0	15163	15163	0	55358	15163	78	Degradation of altitude	Central UA ground impact point below flight path
139	109	936	Saturday	17:03:11	6502	3154	1105.31	53948	53948	0	16573	16573	0	53948	16573	2	Engine Out	UA approaches Emergency landing site
153	127	848	Saturday	18:53:17	6755	2864	1288.83	53948	53948	13	16573	16573	5	53948	16573	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
156	125	3141	Tuesday	18:44:56	7267	1303	1274.92	52538	52538	0	17983	17983	0	52538	17983	10	Engine Anomaly	UA approaches Emergency landing site
173	92	2242	Friday	15:21:16	4936	3972	935.44	53243	53243	0	17278	17278	0	53243	17278	18	Engine Fire	UA structural desintegration - Debris Impact
186	136	3268	Thursday	19:52:32	7549	1079	1387.58	64174	64174	28	6347	6347	0	64174	6347	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
193	26	1041	Thursday	08:34:55	6195	3488	258.20	59590	59590	0	10931	10931	0	59590	10931	66	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
194	116	2916	Friday	17:49:26	6664	1869	1182.39	53243	53243	0	17278	17278	0	53243	17278	10	Engine Anomaly	UA approaches Emergency landing site
195	110	2096	Saturday	17:11:17	4742	4309	1118.81	53948	53948	0	16573	16573	0	53948	16573	37	Short Circuit / Overload	Central UA ground impact point below flight path
208	88	1108	Friday	14:54:50	6001	3689	891.39	53243	53243	0	17278	17278	0	53243	17278	44	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
215	92	1879	Friday	15:20:38	4644	4625	934.42	53243	53243	1	17278	17278	0	53243	17278	3	Engine Out	Central UA ground impact point below flight path
216	104	2657	Saturday	16:35:28	5912	2688	1059.14	53948	53948	0	16573	16573	0	53948	16573	72	Degradation of altitude	UA approaches Emergency landing site
225	45	2632	Tuesday	10:34:00	5842	2771	456.69	58179	58179	0	12342	12342	0	58179	12342	9	Engine Out	UA ground impact tangential to trajectory
236	103	1066	Friday	16:26:39	6122	3564	1044.42	53243	53243	0	17278	17278	0	53243	17278	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
246	116	1495	Monday	17:47:00	5041	4540	1178.36	53243	53243	0	17278	17278	0	53243	17278	37	Short Circuit / Overload	Central UA ground impact point below flight path
252	79	1186	Sunday	13:59:50	5780	3908	799.72	47601	47601	0	22920	22920	0	47601	22920	75	Degradation of altitude	UA approaches Emergency landing site
254	17	198	Tuesday	07:38:21	7974	1100	163.92	62411	62411	0	8110	8110	1	62411	8110	12	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
26	105	898	Friday	16:38:36	6612	3029	1064.36	53243	53243	0	17278	17278	0	53243	17278	75	Degradation of altitude	UA approaches Emergency landing site
271	14	508	Friday	07:20:30	7588	1789	134.17	62763	62763	0	7758	7758	0	62763	7758	43	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
275	49	2111	Tuesday	10:57:37	4757	4279	496.05	58179	58179	0	12342	12342	0	58179	12342	69	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
285	40	2199	Friday	10:02:38	4869	4080	404.42	56769	56769	0	13752	13752	0	56769	13752	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
287	53	2011	Sunday	11:21:57	4675	4462	536.61	51832	51832	7	18689	18689	6	51832	18689	63	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
289	94	2564	Tuesday	15:34:03	5654	2996	956.78	55006	55006	0	15515	15515	4	55006	15515	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
31	28	2303	Wednesday	08:49:18	5045	3807	282.19	59237	59237	0	11284	11284	0	59237	11284	31	Connection Failure	UA ground impact tangential to trajectory
313	3	3447	Friday	06:18:07	7841	908	30.20	62763	62763	0	7758	7758	2	62763	7758	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
319	5	2192	Thursday	06:28:14	4859	4097	47.06	62058	62058	0	8463	8463	0	62058	8463	35	Connection Failure	UA ground impact tangential to trajectory
335	96	65	Saturday	15:42:03	7997	946	970.11	53243	53243	0	17278	17278	3	53243	17278	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
345	137	1989	Tuesday	19:56:29	4664	4495	1394.17	64526	64526	3	5995	5995	0	64526	5995	9	Engine Out	UA ground impact tangential to trajectory
356	129	2885	Saturday	19:09:01	6575	1961	1315.03	62763	62763	0	7758	7758	0	62763	7758	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
36	39	3272	Monday	09:58:20	7556	1074	397.25	58532	58532	22	11989	11989	0	58532	11989	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
381	38	1005	Wednesday	09:48:21	6300	3375	380.61	59237	59237	0	11284	11284	1	59237	11284	40	Short Circuit / Overload	Central UA ground impact point below flight path
387	73	905	Tuesday	13:22:36	6592	3052	737.67	55006	55006	0	15515	15515	0	55006	15515	10	Engine Anomaly	UA approaches Emergency landing site
39	9	3120	Thursday	06:54:18	7215	1348	90.53	62058	62058	0	8463	8463	2	62058	8463	21	Engine Fire	UA structural desintegration - Debris Impact
404	113	111	Friday	17:26:17	7999	988	1143.81	53243	53243	0	17278	17278	0	53243	17278	44	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
417	121	1508	Thursday	18:17:40	5017	4556	1229.45	51832	51832	0	18689	18689	0	51832	18689	30	Connection Failure	Central UA ground impact point below flight path
422	117	236	Tuesday	17:50:59	7951	1161	1185.00	52538	52538	0	17983	17983	0	52538	17983	29	Connection Failure	UA approaches Emergency landing site
430	13	3569	Wednesday	07:19:34	7957	895	132.64	61705	61705	0	8816	8816	0	61705	8816	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
433	63	3446	Saturday	12:25:39	7840	908	642.78	49717	49717	0	20804	20804	0	49717	20804	23	Generator Failure	Central UA ground impact point below flight path
434	102	2178	Sunday	16:22:24	4839	4131	1037.36	52185	52185	0	18336	18336	0	52185	18336	78	Degradation of altitude	Central UA ground impact point below flight path
437	16	2926	Wednesday	07:36:51	6693	1840	161.44	61705	61705	0	8816	8816	0	61705	8816	68	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
457	52	1390	Tuesday	11:14:47	5260	4374	524.64	58179	58179	0	12342	12342	0	58179	12342	74	Degradation of altitude	Central UA ground impact point below flight path
458	29	3042	Wednesday	08:56:42	7014	1529	294.50	59237	59237	0	11284	11284	3	59237	11284	18	Engine Fire	UA structural desintegration - Debris Impact
464	126	579	Tuesday	18:46:42	7442	1997	1277.86	52538	52538	0	17983	17983	0	52538	17983	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
473	71	925	Thursday	13:10:22	6534	3118	717.31	54653	54653	1	15868	15868	0	54653	15868	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
474	118	3502	Friday	18:02:40	7902	892	1204.47	53243	53243	0	17278	17278	0	53243	17278	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
486	128	882	Wednesday	18:59:28	6658	2977	1299.14	62763	62763	0	7758	7758	0	62763	7758	39	Short Circuit / Overload	Central UA ground impact point below flight path
497	9	437	Sunday	06:49:45	7714	1597	82.92	68405	68405	0	2116	2116	0	68405	2116	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
50	16	1153	Monday	07:33:50	5872	3818	156.42	62763	62763	0	7758	7758	0	62763	7758	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
500	44	3088	Wednesday	10:28:39	7135	1419	447.78	58179	58179	0	12342	12342	2	58179	12342	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
513	12	2830	Tuesday	07:12:11	6415	2128	120.33	62411	62411	0	8110	8110	0	62411	8110	1	Engine Out	No Ground Effect
515	120	1111	Thursday	18:10:51	5992	3698	1218.11	51832	51832	13	18689	18689	4	51832	18689	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
524	51	3384	Saturday	11:12:03	7754	948	520.08	49717	49717	0	20804	20804	1	49717	20804	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
524	58	623	Saturday	11:50:13	7343	2131	583.72	49717	49717	0	20804	20804	0	49717	20804	72	Degradation of altitude	UA approaches Emergency landing site
525	2	2179	Sunday	06:09:50	4841	4128	16.39	68405	68405	7	2116	2116	0	68405	2116	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
528	119	1107	Wednesday	18:04:44	6004	3686	1207.89	51127	51127	0	19394	19394	0	51127	19394	42	Partial Lock of Flight Control Surfaces	Central UA ground impact point below flight path
531	31	2630	Saturday	09:08:15	5836	2778	313.75	62058	62058	0	8463	8463	0	62058	8463	78	Degradation of altitude	Central UA ground impact point below flight path
534	40	181	Tuesday	09:59:12	7982	1075	398.69	58179	58179	3	12342	12342	2	58179	12342	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
534	90	1440	Tuesday	15:07:39	5151	4460	912.75	55006	55006	0	15515	15515	0	55006	15515	10	Engine Anomaly	UA approaches Emergency landing site
535	20	1445	Wednesday	07:58:50	5140	4468	198.08	59237	59237	0	11284	11284	0	59237	11284	11	Engine Anomaly	Central UA ground impact point below flight path
537	112	2996	Friday	17:25:04	6890	1647	1141.78	53243	53243	0	17278	17278	0	53243	17278	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
570	70	1841	Wednesday	13:05:48	4651	4654	709.69	53948	53948	19	16573	16573	4	53948	16573	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
575	82	2198	Monday	14:19:56	4868	4083	833.22	55358	55358	0	15163	15163	0	55358	15163	36	Short Circuit / Overload	Central UA ground impact point below flight path
580	12	2752	Saturday	07:12:04	6186	2376	120.11	67700	67700	0	2821	2821	0	67700	2821	35	Connection Failure	UA ground impact tangential to trajectory
586	8	1559	Friday	06:45:32	4928	4612	75.89	62763	62763	0	7758	7758	0	62763	7758	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
587	60	2395	Saturday	12:05:30	5235	3537	609.17	49717	49717	1	20804	20804	0	49717	20804	38	Short Circuit / Overload	Central UA ground impact point below flight path
589	132	2594	Monday	19:26:53	5736	2897	1344.83	64174	64174	2	6347	6347	0	64174	6347	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
593	78	1416	Friday	13:54:05	5202	4421	790.17	53243	53243	0	17278	17278	0	53243	17278	62	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
599	31	445	Thursday	09:04:31	7701	1618	307.55	59590	59590	0	10931	10931	0	59590	10931	22	Generator Failure	UA approaches Emergency landing site
60	77	3537	Thursday	13:51:34	7934	890	785.97	54653	54653	0	15868	15868	0	54653	15868	28	Generator Failure	UA ground impact tangential to trajectory
605	117	2293	Wednesday	17:54:29	5026	3835	1190.83	51127	51127	23	19394	19394	2	51127	19394	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
62	9	1024	Saturday	06:50:44	6245	3435	84.58	67700	67700	0	2821	2821	0	67700	2821	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
635	101	450	Friday	16:13:21	7692	1631	1022.25	53243	53243	0	17278	17278	1	53243	17278	21	Engine Fire	UA structural desintegration - Debris Impact
635	134	1702	Friday	19:37:38	4740	4690	1362.72	63468	63468	0	7053	7053	0	63468	7053	15	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
643	3	3202	Saturday	06:17:42	7409	1186	29.50	67700	67700	0	2821	2821	0	67700	2821	40	Short Circuit / Overload	Central UA ground impact point below flight path
649	31	573	Friday	09:04:45	7455	1979	307.92	58885	58885	0	11636	11636	0	58885	11636	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
668	9	74	Wednesday	06:49:07	7998	953	81.89	61705	61705	1	8816	8816	0	61705	8816	35	Connection Failure	UA ground impact tangential to trajectory
675	28	2773	Wednesday	08:50:06	6248	2309	283.53	59237	59237	0	11284	11284	0	59237	11284	72	Degradation of altitude	UA approaches Emergency landing site
678	90	1224	Saturday	15:07:16	5676	4008	912.14	53243	53243	0	17278	17278	1	53243	17278	36	Short Circuit / Overload	Central UA ground impact point below flight path
68	119	3105	Friday	18:08:07	7178	1380	1213.56	53243	53243	0	17278	17278	1	53243	17278	12	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
686	88	2303	Sunday	14:56:52	5045	3807	894.78	47601	47601	0	22920	22920	0	47601	22920	72	Degradation of altitude	UA approaches Emergency landing site
687	63	2682	Monday	12:24:21	5984	2605	640.61	57827	57827	0	12694	12694	0	57827	12694	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
688	94	1242	Tuesday	15:31:49	5628	4053	953.03	55006	55006	0	15515	15515	0	55006	15515	68	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
694	35	1061	Monday	09:30:05	6137	3549	350.14	58532	58532	0	11989	11989	0	58532	11989	57	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
721	100	2767	Sunday	16:11:10	6230	2328	1018.61	52185	52185	0	18336	18336	0	52185	18336	51	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
723	107	2347	Tuesday	16:53:19	5132	3681	1088.89	52538	52538	0	17983	17983	0	52538	17983	78	Degradation of altitude	Central UA ground impact point below flight path
725	78	3356	Thursday	13:57:24	7709	973	795.67	54653	54653	39	15868	15868	2	54653	15868	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
73	100	181	Wednesday	16:06:45	7982	1075	1011.28	51127	51127	0	19394	19394	0	51127	19394	17	Engine Fire	Central UA ground impact point below flight path
732	80	1885	Thursday	14:07:08	4643	4619	811.92	54653	54653	42	15868	15868	1	54653	15868	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
734	113	3578	Saturday	17:32:10	7963	898	1153.64	53948	53948	0	16573	16573	0	53948	16573	50	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
74	36	938	Thursday	09:36:00	6496	3160	360.00	59590	59590	0	10931	10931	0	59590	10931	68	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
74	44	3030	Thursday	10:28:34	6982	1559	447.61	58179	58179	0	12342	12342	0	58179	12342	40	Short Circuit / Overload	Central UA ground impact point below flight path

750	59	2733	Monday	11:59:56	6131	2438	599.92	57827	57827	10	12694	12694	0	57827	12694	9	Engine Out	UA ground impact tangential to trajectory
760	18	2641	Thursday	07:48:38	5867	2741	181.06	62058	62058	0	8463	8463	0	62058	8463	47	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
772	72	2908	Tuesday	13:19:52	6641	1893	733.14	55006	55006	0	15515	15515	0	55006	15515	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
779	51	220	Tuesday	11:06:39	7961	1135	511.11	58179	58179	2	12342	12342	5	58179	12342	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
795	58	3033	Thursday	11:54:20	6990	1551	590.56	58179	58179	0	12342	12342	1	58179	12342	78	Degradation of altitude	Central UA ground impact point below flight path
799	41	636	Monday	10:06:06	7312	2172	410.19	57827	57827	24	12694	12694	3	57827	12694	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
801	11	2502	Wednesday	07:05:30	5492	3199	109.19	61705	61705	0	8816	8816	0	61705	8816	62	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
804	137	745	Saturday	19:54:22	7038	2523	1390.64	62763	62763	0	7758	7758	0	62763	7758	29	Connection Failure	UA approaches Emergency landing site
826	33	3138	Sunday	09:21:22	7260	1309	335.61	63116	63116	0	7405	7405	0	63116	7405	50	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
832	42	3178	Saturday	10:16:34	7354	1230	427.61	49717	49717	0	20804	20804	0	49717	20804	36	Short Circuit / Overload	Central UA ground impact point below flight path
837	123	674	Thursday	18:28:29	7220	2293	1247.50	51832	51832	0	18689	18689	0	51832	18689	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
840	94	1046	Sunday	15:31:29	6181	3503	952.47	47601	47601	0	22920	22920	0	47601	22920	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
844	33	2119	Thursday	09:19:37	4766	4262	332.72	59590	59590	0	10931	10931	0	59590	10931	37	Short Circuit / Overload	Central UA ground impact point below flight path
846	90	891	Saturday	15:06:42	6633	3006	911.19	53243	53243	0	17278	17278	0	53243	17278	73	Degradation of altitude	Central UA ground impact point below flight path
851	20	3159	Thursday	08:01:45	7310	1267	202.94	59590	59590	0	10931	10931	0	59590	10931	37	Short Circuit / Overload	Central UA ground impact point below flight path
860	119	1489	Saturday	18:05:23	5052	4532	1208.97	53948	53948	0	16573	16573	0	53948	16573	32	Connection Failure	UA approaches Emergency landing site
866	118	201	Friday	17:57:03	7972	1105	1195.11	53243	53243	0	17278	17278	0	53243	17278	31	Connection Failure	UA ground impact tangential to trajectory
870	28	2176	Tuesday	08:49:06	4836	4135	281.83	59590	59590	0	10931	10931	0	59590	10931	72	Degradation of altitude	UA approaches Emergency landing site
881	122	1218	Saturday	18:23:17	5692	3993	1238.83	53948	53948	0	16573	16573	1	53948	16573	38	Short Circuit / Overload	Central UA ground impact point below flight path
89	7	1907	Friday	06:40:00	4643	4598	66.67	62763	62763	1	7758	7758	0	62763	7758	36	Short Circuit / Overload	Central UA ground impact point below flight path
907	67	1652	Thursday	12:47:07	4795	4676	678.53	58179	58179	0	12342	12342	0	58179	12342	37	Short Circuit / Overload	Central UA ground impact point below flight path
909	50	1606	Saturday	11:02:53	4856	4651	504.83	49717	49717	7	20804	20804	3	49717	20804	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
914	77	3048	Thursday	13:50:45	7030	1514	784.58	54653	54653	0	15868	15868	2	54653	15868	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
92	36	3308	Monday	09:40:02	7625	1026	366.72	58532	58532	1	11989	11989	0	58532	11989	36	Short Circuit / Overload	Central UA ground impact point below flight path
920	21	1665	Wednesday	08:05:21	4779	4681	208.92	59237	59237	0	11284	11284	0	59237	11284	2	Engine Out	UA approaches Emergency landing site
925	49	1504	Monday	10:56:35	5024	4551	494.33	57827	57827	0	12694	12694	0	57827	12694	3	Engine Out	Central UA ground impact point below flight path
928	94	1820	Thursday	15:32:48	4658	4667	954.67	54653	54653	0	15868	15868	0	54653	15868	44	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
93	27	3161	Tuesday	08:44:39	7315	1263	274.42	59590	59590	18	10931	10931	1	59590	10931	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
938	79	745	Sunday	13:59:05	7038	2523	798.47	47601	47601	2	22920	22920	0	47601	22920	28	Generator Failure	UA ground impact tangential to trajectory
950	49	25	Friday	10:54:04	7986	918	490.14	56769	56769	0	13752	13752	0	56769	13752	22	Generator Failure	UA approaches Emergency landing site
952	44	3598	Sunday	10:29:32	7974	905	449.22	51832	51832	0	18689	18689	0	51832	18689	66	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
980	4	1051	Sunday	06:20:09	6166	3519	33.61	68405	68405	0	2116	2116	0	68405	2116	21	Engine Fire	UA structural desintegration - Debris Impact
988	7	1946	Monday	06:40:03	4649	4554	66.78	62763	62763	37	7758	7758	0	62763	7758	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
994	81	1400	Sunday	14:12:26	5238	4393	820.75	47601	47601	1	22920	22920	0	47601	22920	47	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.

O.R.C.U.S. 02.00 - tTest of the Simulation

nProbes	1400
nEvents	180
nEvents_cor	174
tMission	14
x_cross_ATB	0.3707143
x_cross_OTW	0.0921429
x_cross_TOT	0.4628571
s2ATB	0.1610346
sATB	0.4012911
tATB	33.633171
s2OTW	0.0094452
sOTW	0.0971866
tOTW	31.624782
s2TOT	0.2387948
sTOT	0.4886663
tTOT	34.67471

UADay/Prot	HIT_TOT_ATB	HIT_TOT_OTW	UADay/Prot cor	HIT_TOT_mean_ATB	HIT_TOT_mean_OTW	HIT_TOT_mean_ATB/Fh	HIT_TOT_mean_OTW/Fh	x_i-x_cross ATB	x_i-x_cross OTW	(x_i-x_cross ATB)^2	(x_i-x_cross OTW)^2
26	0	0	26	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
31	0	0	31	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
36	22	0	36	22	0	1.571428571	0	1.200714286	-0.092142857	1.441714796	0.008490306
39	0	2	39	0	2	0	0.142857143	-0.370714286	0.050714286	0.137429082	0.002571939
50	0	0	50	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
60	0	0	60	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
62	0	0	62	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
68	0	1	68	0	1	0	0.071428571	-0.370714286	-0.020714286	0.137429082	0.000429082
73	0	0	73	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
74	0	0	74	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
74	0	0	89	1	0	0.071428571	0	-0.299285714	-0.092142857	0.089571939	0.008490306
89	1	0	92	1	0	0.071428571	0	-0.299285714	-0.092142857	0.089571939	0.008490306
92	1	0	93	18	1	1.285714286	0.071428571	0.915	-0.020714286	0.837225	0.000429082
93	18	1	102	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
102	0	0	106	19	7	1.357142857	0.5	0.986428571	0.407857143	0.973041327	0.166347449
106	19	7	108	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
108	0	0	115	20	6	1.428571429	0.428571429	1.057857143	0.336428571	1.119061735	0.113184184
115	20	6	120	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
120	0	0	122	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
122	0	0	130	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
130	0	0	139	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
139	0	0	153	13	5	0.928571429	0.357142857	0.557857143	0.265	0.311204592	0.070225
153	13	5	156	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
156	0	0	173	0	1	0	0.071428571	-0.370714286	-0.020714286	0.137429082	0.000429082
173	0	1	186	28	0	2	0	1.629285714	-0.092142857	2.654571939	0.008490306
186	28	0	193	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
193	0	0	194	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
194	0	0	195	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
195	0	0	208	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
208	0	0	215	1	0	0.071428571	0	-0.299285714	-0.092142857	0.089571939	0.008490306
215	1	0	216	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
216	0	0	226	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
226	0	0	236	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
236	0	0	246	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
246	0	0	252	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
252	0	0	254	0	1	0	0.071428571	-0.370714286	-0.020714286	0.137429082	0.000429082
254	0	1	271	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
271	0	0	275	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
275	0	0	285	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
285	0	0	287	7	6	0.5	0.428571429	0.129285714	0.336428571	0.016714796	0.113184184
287	7	6	289	15	4	1.071428571	0.285714286	0.700714286	0.193571429	0.49100051	0.037469898
289	15	4	313	0	2	0	0.142857143	-0.370714286	0.050714286	0.137429082	0.002571939
313	0	2	319	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
319	0	0	335	0	3	0	0.214285714	-0.370714286	0.122142857	0.137429082	0.014918878
335	0	3	345	3	0	0.214285714	0	-0.156428571	-0.092142857	0.024469898	0.008490306
345	3	0	356	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
356	0	0	381	0	1	0	0.071428571	-0.370714286	-0.020714286	0.137429082	0.000429082
381	0	1	387	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
387	0	0	404	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
404	0	0	417	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
417	0	0	422	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
422	0	0	430	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
430	0	0	433	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
433	0	0	434	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
434	0	0	437	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
437	0	0	457	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
457	0	0	458	0	3	0	0.214285714	-0.370714286	0.122142857	0.137429082	0.014918878
458	0	3	464	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
464	0	0	473	1	0	0.071428571	0	-0.299285714	-0.092142857	0.089571939	0.008490306
473	1	0	474	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
474	0	0	486	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
486	0	0	497	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
497	0	0	500	0	2	0	0.142857143	-0.370714286	0.050714286	0.137429082	0.002571939
500	0	2	513	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
513	0	0	515	13	4	0.928571429	0.285714286	0.557857143	0.193571429	0.311204592	0.037469898
515	13	4	524	0	1	0	0.071428571	-0.370714286	-0.020714286	0.137429082	0.000429082
524	0	1	525	7	0	0.5	0	0.129285714	-0.092142857	0.016714796	0.008490306
524	0	0	528	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
525	7	0	531	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
528	0	0	534	3	2	0.214285714	0.142857143	-0.156428571	0.050714286	0.024469898	0.002571939
531	0	0	535	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
534	3	2	537	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
534	0	0	570	19	4	1.357142857	0.285714286	0.986428571	0.193571429	0.973041327	0.037469898
535	0	0	575	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
537	0	0	580	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
570	19	4	586	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
575	0	0	587	1	0	0.071428571	0	-0.299285714	-0.092142857	0.089571939	0.008490306
580	0	0	589	2	0	0.142857143	0	-0.227857143	-0.092142857	0.051918878	0.008490306
586	0	0	593	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
587	1	0	599	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
589	2	0	605	23	2	1.642857143	0.142857143	1.272142857	0.050714286	1.618347449	0.002571939
593	0	0	635	0	1	0	0.071428571	-0.370714286	-0.020714286	0.137429082	0.000429082
599	0	0	643	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
605	23	2	649	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
635	0	1	668	1	0	0.071428571	0	-0.299285714	-0.092142857	0.089571939	0.008490306
635	0	0	675	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
643	0	0	678	0	1	0	0.071428571	-0.370714286	-0.020714286	0.137429082	0.000429082
649	0	0	686	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
668	1	0	687	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
675	0	0	688	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
678	0	1	694	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
686	0	0	721	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
687	0	0	723	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
688	0	0	725	39	2	2.785714286	0.142857143	2.415	0.050714286	5.832225	0.002571939
694	0	0	732	42	1	3	0.071428571	2.629285714	-0.020714286	6.913143367	0.000429082
721	0	0	734	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
723	0	0	750	10	0	0.714285714	0	0.343571429	-0.092142857	0.118041327	0.008490306
725	39	2	760	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
732	42	1	772	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
734	0	0	779	2	5	0.142857143	0.357142857	-0.227857143	0.265	0.051918878	0.070225
750	10	0	795	0	1	0	0.071428571	-0.370714286	-0.020714286	0.137429082	0.000429082
760	0	0	799	24	3	1.714285714	0.214285714	1.343571429	0.122142857	1.805184184	0.014918878
772	0	0	801	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
779	2	5	804	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
795	0	1	826	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
799	24	3	832	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
801	0	0	837	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
804	0	0	840	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
826	0	0	844	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
832	0	0	846	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
837	0	0	851	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
840	0	0	860	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
844	0	0	866	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
846	0	0	870	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
851	0	0	881	0	1	0	0.071428571	-0.370714286	-0.020714286	0.137429082	0.000429082
860	0	0	907	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
866	0	0	909	7	3	0.5	0.214285714	0.129285714	0.122142857	0.016714796	0.014918878
870	0	0	914	0	2	0	0.142857143	-0.370714286	0.050714286	0.137429082	0.002571939
881	0	1	920	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
907	0	0	925	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
909	7	3	928	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
914	0	2	938	2	0	0.142857143	0	-0.227857143	-0.092142857	0.051918878	0.008490306
920	0	0	950	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
925	0	0	952	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
928	0	0	980	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
938	2	0	988	37	0	2.642857143	0	2.272142857	-0.092142857	5.162633163	0.008490306
950	0	0	994	1	0	0.071428571	0	-0.299285714	-0.092142857	0.089571939	0.008490306
952	0	0	1000	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
980	0	0	1003	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
988	37	0	1011	16	9	1.142857143	0.642857143	0.772142857	0.550714286	0.596204592	0.303286224
994	1	0	1017	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
1000	0	0	1019	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
1003	0	0	1035	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
1011	1	0	1039	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
1011	15	9	1041	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
1017	0	0	1062	3	1	0.214285714	0.071428571	-0.156428571	-0.020714286	0.024469898	0.000429082
1019	0	0	1064	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
1035	0	0	1066	4	2	0.285714286	0.142857143	-0.085	0.050714286	0.007225	0.002571939
1039	0	0	1099	4	7	0.285714286	0.5	-0.085	0.407857143	0.007225	0.166347449
1041	0	0	1104	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
1062	3	1	1111	4	3	0.285714286	0.214285714	-0.085	0.122142857	0.007225	0.014918878
1064	0	0	1118	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
1066	0	0	1122	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
1066	4	2	1135	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
1099	4	7	1154	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
1104	0	0	1160	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
1111	4	3	1171	27	0	1.928571429	0	1.557857143	-0.092142857	2.426918878	0.008490306
1118	0	0	1175	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
1122	0	0	1176	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
1135	0	0	1179	14	1	1	0.071428571	0.629285714	-0.020714286	0.39600051	0.000429082
1154	0	0	1202	2	0	0.142857143	0	-0.227857143	-0.092142857	0.051918878	0.008490306
1160	0	0	1220	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
1171	27	0	1221	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
1175	0	0	1229	1	0	0.071428571	0	-0.299285714	-0.092142857	0.089571939	0.008490306
1176	0	0	1235	0	5	0	0.357142857	-0.370714286	0.265	0.137429082	0.070225
1179	14	1	1245	23	6	1.642857143	0.428571429	1.272142857	0.336428571	1.618347449	0.113184184
1202	2	0	1270	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
1220	0	0	1271	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
1221	0	0	1276	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
1229	1	0	1281	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
1235	0	5	1295	0	2	0	0.142857143	-0.370714286	0.050714286	0.137429082	0.002571939
1245	23	6	1296	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
1270	0	0	1327	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
1271	0	0	1336	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
1276	0	0	1338	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
1281	0	0	1340	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
1295	0	2	1346	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
1296	0	0	1352	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
1327	0	0	1353	10	7	0.714285714	0.5	0.343571429	0.407857143	0.118041327	0.166347449
1336	0	0	1361	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
1338	0	0	1362	25	2	1.785714286	0.142857143	1.415	0.050714286	2.002225	0.002571939
1340	0	0	1365	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
1346	0	0	1376	4	6	0.285714286	0.428571429	-0.085	0.336428571	0.007225	0.113184184
1352	0	0	1387	0	0	0	0	-0.370714286	-0.092142857	0.137429082	0.008490306
1353	10	7									
1361	0	0									
1362	25	2									
1365	0	0									
1376	4	6									
1387	0	0									

11.4.2.2 Saarbrücken – R72 – Phase 2

O.R.C.U.S. 02.00 - Simulation Summary

UA Parameters

MTOW [kg]	Wingspan [m]	Length [m]	L/D
90	5	4	8

v [km/h]	Alt [m]	CCF [m]
100	100	10209.741

P_CumCat [1/Fh]	Engine [%]	ESys [%]	FCS [%]	NavSys [%]	Struct [%]
0.01	20	20	20	20	20

General map parameters

	Name	Area [km2]	PPL	PPL/km2
City	Saarbruecken, Landeshauptstadt	167.52	180966	1080
County	Regionalverband Saarbruecken	410.95	330150	803
FS	SL	2571.12	994187	387

Mission specific map parameters

	Area [km2]	PPL	Tourists	Total PPL
City	65.2964	70521	0	70521
Map total	65.2964	70521	0	70521

PPL MOD NA

Sim FH [Fh] 19600 Ev/Fh [1/Fh] 0.0110714
Events total 217

Hits due to UA impacts		Hits/Fh [1/Fh]
City ATB	561	0.0286224
City OTW	95	0.0048469
Total	656	0.0334694

Prot	cyc	k_UA	Day	Time of impact	UA X Pos	UA Y Pos	Travelled Distance [km]	PPL_TD_CITY_ATB	PPL_CITY_ATB_COUNT	HIT_CITY_ATB_COUNT	PPL_TD_CITY_OTW	PPL_CITY_OTW_COUNT	HIT_CITY_OTW_COUNT	PPL_ALL_ATB_COUNT	PPL_ALL_OTW_COUNT	E	Case	Outcome
1005	134	389	Thursday	19:35:23	7787	1478	1359.00	64174	64174	12	6347	6347	5	64174	6347	63	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
1005	47	202	Thursday	10:42:07	7972	1106	470.22	58179	58179	0	12342	12342	0	58179	12342	77	Degradation of altitude	Central UA ground impact point below flight path
1010	32	1978	Tuesday	09:13:16	4659	4511	322.11	59590	59590	0	10931	10931	0	59590	10931	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
1031	130	2860	Tuesday	19:15:06	6502	2036	1325.17	64526	64526	0	5995	5995	0	64526	5995	7	Engine Out	Central UA ground impact point below flight path
1038	46	698	Tuesday	10:36:51	7160	2370	461.42	58179	58179	0	12342	12342	0	58179	12342	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1038	62	2609	Thursday	12:18:06	5777	2847	630.19	58179	58179	0	12342	12342	0	58179	12342	36	Short Circuit / Overload	Central UA ground impact point below flight path
104	31	2620	Saturday	09:08:14	5808	2811	313.72	62058	62058	0	8463	8463	0	62058	8463	78	Degradation of altitude	Central UA ground impact point below flight path
1041	104	2931	Friday	16:35:56	6707	1826	1059.92	53243	53243	18	17278	17278	3	53243	17278	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1041	40	1837	Friday	10:02:02	4652	4657	403.39	56769	56769	0	13752	13752	0	56769	13752	75	Degradation of altitude	UA approaches Emergency landing site
1045	66	2245	Tuesday	12:42:00	4941	3964	670.00	58179	58179	0	12342	12342	0	58179	12342	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
1046	82	3412	Wednesday	14:21:59	7795	927	836.67	53948	53948	0	16573	16573	0	53948	16573	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1055	17	462	Friday	07:38:47	7672	1663	164.67	62763	62763	0	7758	7758	0	62763	7758	25	Generator Failure	UA approaches Emergency landing site
1059	122	2903	Tuesday	18:26:10	6627	1907	1243.61	52538	52538	0	17983	17983	0	52538	17983	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
107	75	522	Tuesday	13:34:12	7560	1829	757.00	55006	55006	0	15515	15515	0	55006	15515	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
1072	130	3046	Monday	19:15:25	7025	1519	1325.70	64174	64174	0	6347	6347	0	64174	6347	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1076	65	1477	Friday	12:34:34	5076	4515	657.61	56769	56769	0	13752	13752	0	56769	13752	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1082	66	3303	Thursday	12:43:48	7616	1032	673.00	58179	58179	0	12342	12342	0	58179	12342	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1086	104	2726	Monday	16:35:36	6111	2461	1059.33	53243	53243	0	17278	17278	0	53243	17278	10	Engine Anomaly	UA approaches Emergency landing site
1094	92	3006	Tuesday	15:22:34	6917	1621	937.61	55006	55005	0	15515	15515	0	55005	15515	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
1106	80	3590	Sunday	14:10:03	7970	902	816.75	47601	47601	0	22920	22920	0	47601	22920	75	Degradation of altitude	UA approaches Emergency landing site
1113	82	2051	Sunday	14:19:41	4702	4394	832.81	47601	47601	0	22920	22920	0	47601	22920	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
1118	115	2030	Friday	17:41:48	4687	4431	1169.67	53243	53243	0	17278	17278	0	53243	17278	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
1122	8	501	Tuesday	06:43:44	7601	1770	72.89	62411	62411	0	8110	8110	0	62411	8110	55	GCS Override Wrong commands to the flight control surfaces.	UA approaches Emergency landing site
1126	82	445	Saturday	14:16:57	7701	1618	828.25	53243	53243	0	17278	17278	0	53243	17278	78	Degradation of altitude	Central UA ground impact point below flight path
113	25	1183	Monday	08:29:01	5788	3900	248.39	58532	58532	0	11989	11989	0	58532	11989	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
1136	83	2976	Tuesday	14:27:22	6834	1701	845.64	55006	55006	0	15515	15515	0	55006	15515	68	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
1160	21	1028	Friday	08:04:15	6233	3447	207.11	58885	58885	0	11636	11636	0	58885	11636	66	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
1162	124	1707	Sunday	18:36:23	4735	4691	1260.64	52185	52185	0	18336	18336	0	52185	18336	19	Engine Fire	Central UA ground impact point below flight path
1162	75	2373	Sunday	13:37:21	5187	3603	762.25	47601	47601	0	22920	22920	0	47601	22920	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
1166	10	1871	Thursday	06:58:18	4645	4632	97.19	62058	62058	42	8463	8463	0	62058	8463	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1183	73	268	Sunday	13:21:31	7926	1219	735.86	47601	47601	0	22920	22920	0	47601	22920	47	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
12	53	199	Friday	11:18:52	7973	1102	531.47	56769	56769	0	13752	13752	0	56769	13752	74	Degradation of altitude	Central UA ground impact point below flight path
1212	93	1913	Monday	15:26:49	4643	4592	944.72	55358	55358	0	15163	15163	0	55358	15163	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
1213	107	1955	Tuesday	16:52:39	4651	4542	1087.78	52538	52538	0	17983	17983	0	52538	17983	2	Engine Out	UA approaches Emergency landing site
1214	34	2858	Wednesday	09:27:00	6496	2042	345.03	59237	59237	1	11284	11284	0	59237	11284	36	Short Circuit / Overload	Central UA ground impact point below flight path
1220	43	988	Tuesday	10:18:58	6350	3321	431.61	58179	58179	0	12342	12342	0	58179	12342	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
1222	50	2782	Thursday	11:04:54	6274	2280	508.17	58179	58179	2	12342	12342	0	58179	12342	74	Degradation of altitude	UA structural desintegration - Debris Impact
1222	99	1773	Thursday	16:03:20	4682	4686	1005.58	51832	51832	0	18689	18689	0	51832	18689	9	Engine Out	UA ground impact tangential to trajectory
1228	131	3177	Wednesday	19:21:45	7352	1232	1336.28	62763	62763	0	7758	7758	0	62763	7758	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
1233	72	557	Monday	13:15:52	7489	1931	726.47	55358	55358	0	15163	15163	0	55358	15163	69	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
1239	57	2666	Sunday	11:47:35	5938	2658	579.31	51832	51832	0	18689	18689	0	51832	18689	44	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
1249	136	976	Wednesday	19:48:38	6385	3283	1381.08	62763	62763	11	7758	7758	2	62763	7758	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
1265	28	883	Friday	08:46:54	6656	2980	278.17	58885	58885	0	11636	11636	0	58885	11636	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
127	21	3173	Monday	08:07:54	7343	1239	213.19	58532	58532	0	11989	11989	0	58532	11989	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1272	2	1748	Friday	06:09:06	4700	4691	15.17	62763	62763	15	7758	7758	0	62763	7758	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1275	117	2998	Monday	17:55:41	6895	1642	1192.83	53243	53243	0	17278	17278	0	53243	17278	1	Engine Out	No Ground Effect
1277	31	2757	Wednesday	09:08:28	6201	2360	314.11	59237	59237	0	11284	11284	0	59237	11284	75	Degradation of altitude	UA approaches Emergency landing site
1279	74	409	Friday	13:27:52	7758	1526	746.47	53243	53243	0	17278	17278	0	53243	17278	37	Short Circuit / Overload	Central UA ground impact point below flight path
1310	51	1640	Monday	11:09:04	4810	4671	515.14	57827	57827	0	12694	12694	0	57827	12694	72	Degradation of altitude	UA approaches Emergency landing site
1313	33	2580	Thursday	09:20:25	5698	2943	334.03	59590	59590	0	10931	10931	0	59590	10931	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1320	74	1291	Thursday	13:29:23	5500	4170	748.97	54653	54653	0	15868	15868	0	54653	15868	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
134	9	1994	Monday	06:52:23	4666	4488	87.33	62763	62763	18	7758	7758	0	62763	7758	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
1341	101	244	Thursday	16:12:59	7945	1175	1021.67	51832	51832	0	18689	18689	0	51832	18689	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
1342	101	1096	Friday	16:14:26	6035	3654	1024.08	53243	53243	0	17278	17278	0	53243	17278	26	Generator Failure	Central UA ground impact point below flight path
1345	20	701	Monday	07:57:35	7153	2380	195.97	58532	58532	0	11989	11989	0	58532	11989	70	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
1346	104	1971	Tuesday	16:34:18	4656	4521	1057.19	52538	52538	16	17983	17983	4	52538	17983	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
1347	96	1554	Wednesday	15:44:35	4936	4607	974.33	53948	53948	12	16573	16573	4	53948	16573	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1354	10	1675	Wednesday	06:57:58	4768	4685	96.64	61705	61705	0	8816	8816	0	61705	8816	28	Generator Failure	UA ground impact tangential to trajectory
1360	41	1087	Tuesday	10:06:53	6061	3627	411.47	58179	58179	0	12342	12342	0	58179	12342	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
137	133	2648	Thursday	19:33:07	5887	2718	1355.20	64174	64174	0	6347	6347	0	64174	6347	28	Generator Failure	UA ground impact tangential to trajectory
1395	93	3275	Tuesday	15:29:09	7562	1069	948.58	55006	55006	0	15515	15515	0	55006	15515	37	Short Circuit / Overload	Central UA ground impact point below flight path
141	39	79	Monday	09:52:54	7998	957	388.19	58532	58532	0	11989	11989	0	58532	11989	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
152	26	2578	Friday	08:37:31	5692	2950	262.55	58885	58885	0	11636	11636	0	58885	11636	22	Generator Failure	UA approaches Emergency landing site
156	51	2492	Tuesday	11:10:31	5467	3232	517.55	58179	58179	0	12342	12342	0	58179	12342	43	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
160	25	3583	Saturday	08:33:07	7966	899	255.20	62058	62058	0	8463	8463	0	62058	8463	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
160	78	3042	Saturday	13:56:51	7014	1529	794.78	53243	53243	0	17278	17278	0	53243	17278	34	Connection Failure	UA ground impact tangential to trajectory
161	63	3358	Sunday	12:25:30	7712	971	642.53	51832	51832	0	18689	18689	0	51832	18689	67	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
161	69	446	Sunday	12:57:18	7699	1621	695.53	47601	47601	0	22920	22920	0	47601	22920	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
175	24	2452	Sunday	08:25:04	5368	3360	241.78	63116	63116	0	7405	7405	0	63116	7405	15	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
19	109	3159	Friday	17:06:58	7310	1267	1111.61	53243	53243	26	17278	17278	5	53243	17278	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
194	59	2831	Friday	12:00:06	6418	2125	600.19	56769	56769	0	13752	13752	0	56769	13752	1	Engine Out	No Ground Effect
208	66	1412	Friday	12:40:34	5211	4414	667.64	56769	56769	0	13752	13752	0	56769	13752	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
218	74	3524	Monday	13:33:10	7923	890	755.31	55358	55358	0	15163	15163	0	55358	15163	63	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
229	22	2796	Friday	08:13:24	6315	2235	222.33	58885	58885	16	11636	11636	1	58885	11636	63	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
231	96	3347	Sunday	15:47:39	7694	982	979.42	47601	47601	33	22920	22920	0	47601	22920	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
232	11	308	Monday	07:01:46	7888	1297	102.97	62763	62763	6	7758	7758	5	62763	7758	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
24	42	1493	Wednesday	10:13:42	5045	4537	422.83	58179	58179	0	12342	12342	0	58179	12342	40	Short Circuit / Overload	UA structural desintegration - Debris Impact
258	1	1322	Saturday	06:02:14	5422	4239	3.75	67700	67700	18	2821	2821	0	67700	2821	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
263	122	2746	Thursday	18:25:53	6169	2396	1243.17	51832	51832	0	18689	18689	0	51832	18689	74	Degradation of altitude	Central UA ground impact point below flight path
264	86	590	Friday	14:41:42	7418	2030	869.50	53243	53243	41	17278	17278	0	53243	17278	20	Engine Fire	UA structural desintegration - Debris Impact
268	76	1819	Tuesday	13:42:32	4659	4667	770.89	55006	55006	0	15515	15515	0	55006	15515	67	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
291	97	2332	Thursday	15:52:02	5102	3724	986.75	54653	54653	3	15868	15868	0	54653	15868	4	Engine Out	Central ground impact point below flight path with B/G Ratio.
297	135	893	Wednesday	19:42:22	6627	3013	1370.64	62763	62763	57	7758	7758	0	62763	7758	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
301	17	2470	Sunday	07:42:12	5412	3302	170.36	68405	68405	0	2116	2116	0	68405	2116	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
310	124	2412	Tuesday	18:37:34	5274	3485	1262.64	52538	52538	0	17983	17983	0	52538	17983	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
311	41	313	Wednesday	10:05:33	7883	1307	409.28	58179	58179	0	12342	12342	0	58179	12342	66	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
312	134	830	Thursday	19:36:08	6806	2804	1360.25	64174	64174	0	6347	6347	0	64174	6347	51	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
317	135	266	Tuesday	19:41:18	7928	1215	1368.86	64526	64526	0	5995	5995	0	64526	5995	17	Engine Fire	Central UA ground impact point below flight path
326	34	3387	Thursday	09:27:54	7758	946	346.53	59590	59590	0	10931	10931	0	59590	10931	28	Generator Failure	UA ground impact tangential to trajectory
328	23	3114	Saturday	08:20:04	7200	1361	233.45	62058	62058	0	8463	8463	0	62058	8463	47	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
338	51	739	Tuesday	11:07:32	7054	2503	512.58	58179	58179	0	12342	12342	0	58179	12342	2	Engine Out	UA approaches Emergency landing site
343	75	3333	Sunday	13:38:59	7670	997	764.97	47601	47601	0	22920	22920	0	47601	22920	22	Generator Failure	UA approaches Emergency landing site
365	15	2706	Monday	07:30:21	6053	2526	150.61	62763	62763	0	7758	7758	0	62763	7758	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
369	25	2721	Friday	08:31:39	6096	2477	252.75	58885	58885	5	11636	11636	0	58885	11636	8	Engine Out	UA ground impact tangential to trajectory
375	81	3271	Thursday	14:15:38	7554	1075	826.06	54653	54653	0	15868	15868	0	54653	15868	77	Degradation of altitude	Central UA ground impact point below flight path
382	8	3048	Thursday	06:48:04	7030	1514	80.11	62058	62058	0	8463	8463	1	62058	8463	18	Engine Fire	UA structural desintegration - Debris Impact
384	125	2358	Saturday	18:43:37	5155	3648	1272.70	53948	53948	0	16573	16573	0	53948	16573	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
387	5	1869	Tuesday	06:27:41	4645	4633	46.14	62411	62411	0	8110	8110	0	62411	8110	78	Degradation of altitude	Central UA ground impact point below flight path
395	97	520	Wednesday	15:48:57	7564	1823	981.61	53948	53948	0	16573	16573	0	53948	16573	75	Degradation of altitude	UA approaches Emergency landing site
405	82	1032	Saturday	14:17:56	6221	3460	829.92	53243	53243	0	17278	17278	0	53243	17278	1	Engine Out	No Ground Effect
405	83	2379	Saturday	14:26:22	5200	3585	843.95	53243	53243	0	17278	17278	0	53243	17278	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
405	89	456	Saturday	14:59:51	7682	1647	899.75	53243	53243	0	17278	17278	0	53243	17278	44	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
411	26	1315	Friday	08:35:23	5439	4224	258.97	58885	58885	0	11636	11636	0	58885	11636	10	Engine Anomaly	UA approaches Emergency landing site
419	78	2601	Saturday	13:56:06	5755	2874	793.53	53243	53243	0	17278	17278	0	53243	17278	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
420	54	3211	Sunday	11:30:08	7429	1170	550.22	51832	51832	0	18689	18689	0	51832	18689	15	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
421	96	1789	Monday	15:44:59	4673	4681	975.00	55358	55358	0	15163	15163	0	55358	15163	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
428	90	117	Monday	15:05:23	7998	995	909.00	55358	55358	0	15163	15163	0	55358	15163	9	Engine Out	UA ground impact tangential to trajectory
437	34	1066	Wednesday	09:23:58	6122	3564	339.94	59237	59237	0	11284	11284	0	59237	11284	72	Degradation of altitude	UA approaches Emergency landing site
447	91	200	Saturday	15:11:39	7973	1103	919.44	53243	53243	0	17278	17278	0	53243	17278	57	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
462	2	1101	Sunday	06:07:59	6021	3669	13.33	68405	68405	0	2116	2116	0	68405	2116	13	Engine Anomaly	UA approaches Emergency landing site
465	10	1146	Wednesday	06:57:04	5892	3798	95.14	61705	61705	19	8816	8816	1	61705	8816	18	Engine Fire	UA structural desintegration - Debris Impact
465	98	1906	Wednesday	15:57:27	4643	4599	995.75	51127	51127	0	19394	19394	0	51127	19394	2	Engine Out	UA approaches Emergency landing site
468	101	1380	Saturday	16:14:55	5283	4356	1024.89	53948	53948	0	16573	16573	0	53948	16573	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
469	125	2798	Sunday	18:44:21	6321	2229	1273.94	52185	52185	0	18336	18336	0	52185	18336	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
470	36	3181	Monday	09:39:49	7361	1224	366.36	58532	58532	0	11989	11989	0	58532	11989	31	Connection Failure	UA ground impact tangential to trajectory
479	106	51	Wednesday	16:43:18	7994	935	1072.17	51127	51127	0	19394	19394	5	51127	19394	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
48	8	2646	Saturday	06:47:23	5881	2725	78.97	67700	67700	0	2821	2821	0	67700	2821	74	Degradation of altitude	Central UA ground impact point below flight path
485	28	932	Tuesday	08:46:59	6514	3141	278.31	59590	59590	0	10931	10931	0	59590	10931	74	Degradation of altitude	UA approaches Emergency landing site
489	22	1376	Saturday	08:10:59	5292	4348	218.31	62058	62058	6	8463	8463	0	62058	8463	21	Engine Fire	UA structural desintegration - Debris Impact
492	69	995	Tuesday	12:58:15	6330	3344	697.08	55006	55006	0	15515	15515	0	55006	15515	1	Engine Out	No Ground Effect
497	28	2646	Sunday	08:49:54	5881	2725	283.17	63116	63116	0	7405	7405	0	63116	7405	43	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
5	51	1033	Friday	11:08:03	6218	3463	513.42	56769	56769	0	13752	13752	0	56769	13752	9	Engine Out	UA ground impact tangential to trajectory
501	52	391	Thursday	11:13:05	7785	1482	521.81	58179	58179	0	12342	12342	0	58179	12342	68	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
511	114	1869	Sunday	17:35:24	4645	4633	1159.00	52185	52185	35	18336	18336	5	52185	18336	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
514	129	2160	Wednesday	19:07:47	4815	4172	1312.97	62763	62763	0	7758	7758	0	62763	7758	78	Degradation of altitude	Central UA ground impact point below flight path
515	109	113	Thursday	17:01:47	7999	990	1102.97	51832	51832	0	18689	18689	0	51832	18689	74	Degradation of altitude	Central UA ground impact point below flight path
517	79	1440	Saturday	14:00:15	5151	4460	800.44	53243	53243	0	17278	17278	0	53243	17278	35	Connection Failure	UA ground impact tangential to trajectory
526	17	2725	Monday	07:42:39	6108	2464	171.08	62763	62763	6	7758	7758	0	62763	7758	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
526	94	2221	Monday	15:33:28	4902	4026	955.80	55358	55358	0	15163	15163	0	55358	15163	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
53	100	2757	Thursday	16:11:09	6201	2360	1018.58	51832	51832	5	18689	18689	0	51832	18689	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
535	27	2367	Wednesday	08:43:17	5174	3621	272.17	59237	59237	0	11284	11284	0	59237	11284	72	Degradation of altitude	UA approaches Emergency landing site
537	104	1756	Friday	16:33:57	4694	4690	1056.58	53243	53243	0	17278	17278	0	53243	17278	32	Connection Failure	UA approaches Emergency landing site
540	27	1779	Monday	08:42:17	4679	4684	270.50	58532	58532	0	11989	11989	0	58532	11989	1	Engine Out	No Ground Effect
544	79	3595	Friday	14:03:55	7972	904	806.56	53243	53243	0	17278	17278	0	53243	17278	36	Short Circuit / Overload	Central UA ground impact point below flight path
556	82	797	Saturday	14:17:32	6898	2695	829.25	53243	53243	29	17278	17278	1	53243	17278	21	Engine Fire	UA structural desintegration - Debris Impact
566	21	2527	Saturday	08:06:49	5556	3118	211.36	62058	62058	0	8463	8463	0	62058	8463	66	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
569	60	1102	Tuesday	12:03:18	6018	3672	605.50	58179	58179	0	12342	12342	0	58179	12342	51	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
576	116	2602	Tuesday	17:48:53	5758	2871	1181.50	52538	52538	0	17983	17983	0	52538	17983	37	Short Circuit / Overload	Central UA ground impact point below flight path
578	98	329	Thursday	15:54:46	7865	1341	991.28	51832	51832	0	18689	18689	0	51832	18689	77	Degradation of altitude	Central UA ground impact point below flight path
582	36	2524	Monday	09:38:41	5549	3128	364.50	58532	58532	24	11989	11989	3	58532	11989	20	Engine Fire	UA structural desintegration - Debris Impact
595	36	791	Sunday	09:35:45	6914	2675	359.58	63116	63116	0	7405	7405	0	63116	7405	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
596	66	3508	Monday	12:44:08	7908	891	673.58	57827	57827	0	12694	12694	0	57827	12694	46	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
607	32	1655	Friday	09:12:43	4791	4678	321.20	58885	58885	0	11636	11636	0	58885	11636	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
611	37	2725	Tuesday	09:45:10	6108	2464	375.28	59590	59590	0	10931	10931	0	59590	10931	53	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
62	84	3255	Saturday	14:33:59	7522	1099	856.64	53243	53243	0	17278	17278	0	53243	17278	30	Connection Failure	Central UA ground impact point below flight path
622	10	1264	Saturday	06:57:17	5569	4107	95.47	67700	67700	3	2821	2821	0	67700	2821	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact

625	10	3086	Tuesday	07:00:23	7130	1423	100.64	62411	62411	0	8110	8110	0	62411	8110	19	Engine Fire	Central UA ground impact point below flight path
625	46	1814	Tuesday	10:38:44	4661	4670	464.58	58179	58179	0	12342	12342	0	58179	12342	70	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
638	61	2154	Monday	12:11:12	4807	4186	618.69	57827	57827	0	12694	12694	0	57827	12694	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
638	88	256	Monday	14:53:23	7936	1197	888.97	55358	55358	0	15163	15163	0	55358	15163	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
64	42	1023	Monday	10:12:54	6248	3432	421.50	57827	57827	0	12694	12694	0	57827	12694	9	Engine Out	UA ground impact tangential to trajectory
646	104	2197	Tuesday	16:34:42	4866	4085	1057.83	52538	52538	0	17983	17983	0	52538	17983	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
648	115	1373	Thursday	17:40:40	5299	4343	1167.80	51832	51832	0	18689	18689	0	51832	18689	37	Short Circuit / Overload	Central UA ground impact point below flight path
653	20	2062	Tuesday	07:59:53	4711	4374	199.83	59590	59590	5	10931	10931	1	59590	10931	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
668	111	2316	Wednesday	17:17:47	5070	3770	1129.64	51127	51127	0	19394	19394	0	51127	19394	24	Generator Failure	UA ground impact tangential to trajectory
686	118	2679	Sunday	18:01:16	5975	2615	1202.14	52185	52185	1	18336	18336	0	52185	18336	39	Short Circuit / Overload	Central UA ground impact point below flight path
688	53	1649	Tuesday	11:21:20	4799	4675	535.58	58179	58179	0	12342	12342	0	58179	12342	55	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
688	63	1536	Tuesday	12:22:24	4967	4589	637.36	58179	58179	0	12342	12342	0	58179	12342	29	Connection Failure	UA approaches Emergency landing site
695	75	2128	Tuesday	13:36:56	4776	4243	761.56	55006	55006	0	15515	15515	0	55006	15515	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
702	29	1015	Tuesday	08:53:15	6271	3407	288.75	59590	59590	0	10931	10931	0	59590	10931	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
703	7	3210	Wednesday	06:42:13	7427	1172	70.36	61705	61705	0	8816	8816	0	61705	8816	19	Engine Fire	Central UA ground impact point below flight path
703	86	1491	Wednesday	14:43:14	5049	4534	872.06	53948	53948	0	16573	16573	0	53948	16573	72	Degradation of altitude	UA approaches Emergency landing site
71	50	2165	Monday	11:03:51	4822	4161	506.42	57827	57827	0	12694	12694	0	57827	12694	35	Connection Failure	UA ground impact tangential to trajectory
710	92	1419	Wednesday	15:19:51	5196	4426	933.11	53948	53948	7	16573	16573	2	53948	16573	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
721	36	467	Sunday	09:35:11	7663	1676	358.67	63116	63116	0	7405	7405	0	63116	7405	72	Degradation of altitude	UA approaches Emergency landing site
725	115	3019	Thursday	17:43:29	6952	1587	1172.47	51832	51832	0	18689	18689	0	51832	18689	40	Short Circuit / Overload	Central UA ground impact point below flight path
726	136	1427	Friday	19:49:25	5178	4439	1382.36	63468	63468	0	7053	7053	0	63468	7053	50	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
74	63	2379	Thursday	12:23:51	5200	3585	639.75	58179	58179	0	12342	12342	0	58179	12342	10	Engine Anomaly	UA approaches Emergency landing site
744	108	2146	Tuesday	16:59:07	4797	4204	1098.53	52538	52538	0	17983	17983	0	52538	17983	51	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
749	131	866	Sunday	19:17:50	6704	2924	1329.72	62763	62763	1	7758	7758	0	62763	7758	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
750	66	110	Monday	12:38:22	7999	987	663.95	57827	57827	0	12694	12694	0	57827	12694	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
753	126	266	Thursday	18:46:10	7928	1215	1276.97	51832	51832	7	18689	18689	5	51832	18689	21	Engine Fire	UA structural desintegration - Debris Impact
756	125	653	Sunday	18:40:42	7272	2226	1267.86	52185	52185	0	18336	18336	0	52185	18336	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
76	23	1468	Saturday	08:17:15	5093	4503	228.78	62058	62058	6	8463	8463	1	62058	8463	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
760	90	59	Thursday	15:05:18	7995	941	908.83	54653	54653	0	15868	15868	0	54653	15868	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
763	62	2874	Sunday	12:18:34	6543	1994	630.94	51832	51832	0	18689	18689	0	51832	18689	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
764	27	301	Monday	08:39:47	7895	1283	266.31	58532	58532	0	11989	11989	0	58532	11989	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
772	122	3588	Tuesday	18:27:19	7969	901	1245.55	52538	52538	0	17983	17983	0	52538	17983	66	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
786	34	566	Tuesday	09:23:06	7470	1958	338.53	59590	59590	1	10931	10931	0	59590	10931	12	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
786	52	1723	Tuesday	11:15:20	4720	4692	525.58	58179	58179	0	12342	12342	0	58179	12342	12	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
788	40	2904	Thursday	10:03:50	6630	1904	406.42	58179	58179	2	12342	12342	2	58179	12342	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
793	4	2080	Tuesday	06:21:55	4727	4341	36.53	62411	62411	0	8110	8110	0	62411	8110	55	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
808	103	1614	Wednesday	16:27:34	4845	4656	1045.97	51127	51127	0	19394	19394	0	51127	19394	31	Connection Failure	UA ground impact tangential to trajectory
808	70	852	Wednesday	13:04:07	6744	2877	706.89	53948	53948	0	16573	16573	0	53948	16573	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
815	104	1991	Wednesday	16:34:20	4665	4492	1057.25	51127	51127	0	19394	19394	0	51127	19394	72	Degradation of altitude	UA approaches Emergency landing site
815	86	325	Wednesday	14:41:14	7869	1333	868.75	53948	53948	0	16573	16573	0	53948	16573	57	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
82	86	2343	Friday	14:44:41	5124	3692	874.47	53243	53243	15	17278	17278	8	53243	17278	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
829	31	328	Wednesday	09:04:20	7866	1339	307.22	59237	59237	0	11284	11284	0	59237	11284	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
841	100	3276	Monday	16:12:01	7564	1068	1020.06	53243	53243	14	17278	17278	0	53243	17278	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
841	119	3448	Monday	18:08:43	7842	907	1214.53	53243	53243	0	17278	17278	7	53243	17278	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
847	57	1099	Sunday	11:44:55	6027	3663	574.86	51832	51832	2	18689	18689	5	51832	18689	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
850	17	1853	Wednesday	07:41:09	4648	4646	168.61	61705	61705	0	8816	8816	0	61705	8816	6	Engine Out	UA approaches Emergency landing site
856	113	3137	Tuesday	17:31:25	7257	1311	1152.39	52538	52538	5	17983	17983	3	52538	17983	20	Engine Fire	UA structural desintegration - Debris Impact
869	6	766	Monday	06:31:55	6982	2592	53.22	62763	62763	0	7758	7758	0	62763	7758	35	Connection Failure	UA ground impact tangential to trajectory
875	102	2913	Sunday	16:23:40	6656	1878	1039.45	52185	52185	0	18336	18336	0	52185	18336	1	Engine Out	No Ground Effect
883	34	419	Monday	09:22:51	7743	1551	338.11	58532	58532	0	11989	11989	0	58532	11989	31	Connection Failure	UA ground impact tangential to trajectory
891	120	2277	Tuesday	18:12:51	4997	3879	1221.42	52538	52538	0	17983	17983	0	52538	17983	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
892	15	1844	Wednesday	07:28:53	4650	4652	148.17	61705	61705	0	8816	8816	0	61705	8816	9	Engine Out	UA ground impact tangential to trajectory
897	120	2708	Monday	18:13:35	6059	2520	1222.64	53243	53243	0	17278	17278	0	53243	17278	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
898	92	2281	Tuesday	15:21:19	5004	3868	935.56	55006	55006	0	15515	15515	0	55006	15515	50	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
900	84	2696	Thursday	14:33:01	6024	2559	855.05	54653	54653	0	15868	15868	0	54653	15868	74	Degradation of altitude	Central UA ground impact point below flight path
907	27	359	Thursday	08:39:52	7828	1407	266.47	59590	59590	1	10931	10931	0	59590	10931	35	Connection Failure	UA ground impact tangential to trajectory
908	64	101	Friday	12:26:06	7999	978	643.50	56769	56769	0	13752	13752	0	56769	13752	35	Connection Failure	UA ground impact tangential to trajectory
909	80	857	Saturday	14:05:24	6730	2894	809.00	53243	53243	0	17278	17278	0	53243	17278	23	Generator Failure	Central UA ground impact point below flight path
909	82	2433	Saturday	14:20:20	5323	3419	833.89	53243	53243	0	17278	17278	0	53243	17278	37	Short Circuit / Overload	Central UA ground impact point below flight path
912	25	448	Tuesday	08:27:46	7696	1626	246.30	59590	59590	0	10931	10931	0	59590	10931	67	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
923	136	1740	Saturday	19:49:56	4706	4692	1383.25	62763	62763	0	7758	7758	0	62763	7758	31	Connection Failure	UA ground impact tangential to trajectory
938	52	1527	Sunday	11:15:00	4982	4579	525.03	51832	51832	0	18689	18689	0	51832	18689	51	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
942	22	2012	Thursday	08:12:03	4676	4460	220.11	59590	59590	13	10931	10931	3	59590	10931	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
943	118	1749	Friday	17:59:41	4699	4691	1199.50	53243	53243	0	17278	17278	0	53243	17278	73	Degradation of altitude	Central UA ground impact point below flight path
951	65	2152	Saturday	12:35:42	4805	4190	659.53	49717	49717	0	20804	20804	0	49717	20804	17	Engine Fire	Central UA ground impact point below flight path
962	16	3337	Wednesday	07:37:33	7677	992	162.61	61705	61705	0	8816	8816	0	61705	8816	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
964	76	1016	Friday	13:41:10	6268	3410	768.61	53243	53243	0	17278	17278	0	53243	17278	10	Engine Anomaly	UA approaches Emergency landing site
973	65	3298	Sunday	12:37:39	7607	1038	662.78	51832	51832	0	18689	18689	0	51832	18689	36	Short Circuit / Overload	Central UA ground impact point below flight path
989	126	540	Tuesday	18:46:38	7524	1881	1277.75	52538	52538	0	17983	17983	0	52538	17983	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
993	77	1	Saturday	13:45:33	7975	906	775.94	53243	53243	0	17278	17278	1	53243	17278	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
995	113	3206	Monday	17:31:33	7418	1179	1152.58	53243	53243	2	17278	17278	7	53243	17278	20	Engine Fire	UA structural desintegration - Debris Impact

O.R.C.U.S. 02.00 - tTest of the Simulation

nProbes	200
nEvents	217
nEvents_cor	197
tMission	14
x_cross_ATB	2.805
x_cross_OTW	0.475
x_cross_TOT	3.28
s2ATB	7.1509753
sATB	2.6741308
tATB	14.781352
s2OTW	0.2058763
sOTW	0.453736
tOTW	14.493216
s2TOT	9.7077284
sTOT	3.1157228
tTOT	14.842393

UADay/Prot	HIT_TOT_ATB	HIT_TOT_OTW	UADay/Prot cor	HIT_TOT_mean_ATB	HIT_TOT_mean_OTW	HIT_TOT_mean_ATB/Fh	HIT_TOT_mean_OTW/Fh	x_i-x_cross ATB	x_i-x_cross OTW	(x_i-x_cross ATB)^2	(x_i-x_cross OTW)^2
5	0	0	5	0	0	0	0	-2.805	-0.475	7.868025	0.225625
12	0	0	12	0	0	0	0	-2.805	-0.475	7.868025	0.225625
19	26	5	19	26	5	1.857142857	0.357142857	-0.947857143	-0.117857143	0.898433163	0.013890306
24	0	0	24	0	0	0	0	-2.805	-0.475	7.868025	0.225625
48	0	0	48	0	0	0	0	-2.805	-0.475	7.868025	0.225625
53	5	0	53	5	0	0.357142857	0	-2.447857143	-0.475	5.992004592	0.225625
62	0	0	62	0	0	0	0	-2.805	-0.475	7.868025	0.225625
64	0	0	64	0	0	0	0	-2.805	-0.475	7.868025	0.225625
71	0	0	71	0	0	0	0	-2.805	-0.475	7.868025	0.225625
74	0	0	74	0	0	0	0	-2.805	-0.475	7.868025	0.225625
76	6	1	76	6	1	0.428571429	0.071428571	-2.376428571	-0.403571429	5.647412755	0.162869898
82	15	8	82	15	8	1.071428571	0.571428571	-1.733571429	0.096428571	3.005269898	0.009298469
104	0	0	104	0	0	0	0	-2.805	-0.475	7.868025	0.225625
107	0	0	107	0	0	0	0	-2.805	-0.475	7.868025	0.225625
113	0	0	113	0	0	0	0	-2.805	-0.475	7.868025	0.225625
127	0	0	127	0	0	0	0	-2.805	-0.475	7.868025	0.225625
134	18	0	134	18	0	1.285714286	0	-1.519285714	-0.475	2.308229082	0.225625
137	0	0	137	0	0	0	0	-2.805	-0.475	7.868025	0.225625
141	0	0	141	0	0	0	0	-2.805	-0.475	7.868025	0.225625
152	0	0	152	0	0	0	0	-2.805	-0.475	7.868025	0.225625
156	0	0	156	0	0	0	0	-2.805	-0.475	7.868025	0.225625
160	0	0	160	0	0	0	0	-2.805	-0.475	7.868025	0.225625
160	0	0	161	0	0	0	0	-2.805	-0.475	7.868025	0.225625
161	0	0	175	0	0	0	0	-2.805	-0.475	7.868025	0.225625
161	0	0	194	0	0	0	0	-2.805	-0.475	7.868025	0.225625
175	0	0	208	0	0	0	0	-2.805	-0.475	7.868025	0.225625
194	0	0	218	0	5	0	0.357142857	-2.805	-0.117857143	7.868025	0.013890306
208	0	0	229	16	1	1.142857143	0.071428571	-1.662142857	-0.403571429	2.762718878	0.162869898
218	0	5	231	33	0	2.357142857	0	-0.447857143	-0.475	0.20057602	0.225625
229	16	1	232	6	5	0.428571429	0.357142857	-2.376428571	-0.117857143	5.647412755	0.013890306
231	33	0	258	18	0	1.285714286	0	-1.519285714	-0.475	2.308229082	0.225625
232	6	5	263	0	0	0	0	-2.805	-0.475	7.868025	0.225625
258	18	0	264	41	0	2.928571429	0	0.123571429	-0.475	0.015269898	0.225625
263	0	0	268	0	0	0	0	-2.805	-0.475	7.868025	0.225625
264	41	0	291	3	0	0.214285714	0	-2.590714286	-0.475	6.71180051	0.225625
268	0	0	297	57	0	4.071428571	0	1.266428571	-0.475	1.603841327	0.225625
291	3	0	301	0	0	0	0	-2.805	-0.475	7.868025	0.225625
297	57	0	310	0	0	0	0	-2.805	-0.475	7.868025	0.225625
301	0	0	311	0	0	0	0	-2.805	-0.475	7.868025	0.225625
310	0	0	312	0	0	0	0	-2.805	-0.475	7.868025	0.225625
311	0	0	317	0	0	0	0	-2.805	-0.475	7.868025	0.225625
312	0	0	326	0	0	0	0	-2.805	-0.475	7.868025	0.225625
317	0	0	328	0	0	0	0	-2.805	-0.475	7.868025	0.225625
326	0	0	338	0	0	0	0	-2.805	-0.475	7.868025	0.225625
328	0	0	343	0	0	0	0	-2.805	-0.475	7.868025	0.225625
338	0	0	365	0	0	0	0	-2.805	-0.475	7.868025	0.225625
343	0	0	369	5	0	0.357142857	0	-2.447857143	-0.475	5.992004592	0.225625
365	0	0	375	0	0	0	0	-2.805	-0.475	7.868025	0.225625
369	5	0	382	0	1	0	0.071428571	-2.805	-0.403571429	7.868025	0.162869898
375	0	0	384	0	0	0	0	-2.805	-0.475	7.868025	0.225625
382	0	1	387	0	0	0	0	-2.805	-0.475	7.868025	0.225625
384	0	0	395	0	0	0	0	-2.805	-0.475	7.868025	0.225625
387	0	0	405	0	0	0	0	-2.805	-0.475	7.868025	0.225625
395	0	0	411	0	0	0	0	-2.805	-0.475	7.868025	0.225625
405	0	0	419	0	0	0	0	-2.805	-0.475	7.868025	0.225625
405	0	0	420	0	0	0	0	-2.805	-0.475	7.868025	0.225625
405	0	0	421	0	0	0	0	-2.805	-0.475	7.868025	0.225625
411	0	0	428	0	0	0	0	-2.805	-0.475	7.868025	0.225625
419	0	0	437	0	0	0	0	-2.805	-0.475	7.868025	0.225625
420	0	0	447	0	0	0	0	-2.805	-0.475	7.868025	0.225625
421	0	0	462	0	0	0	0	-2.805	-0.475	7.868025	0.225625
428	0	0	465	19	1	1.357142857	0.071428571	-1.447857143	-0.403571429	2.096290306	0.162869898
437	0	0	468	0	0	0	0	-2.805	-0.475	7.868025	0.225625
447	0	0	469	0	0	0	0	-2.805	-0.475	7.868025	0.225625
462	0	0	470	0	0	0	0	-2.805	-0.475	7.868025	0.225625
465	19	1	479	0	5	0	0.357142857	-2.805	-0.117857143	7.868025	0.013890306
465	0	0	485	0	0	0	0	-2.805	-0.475	7.868025	0.225625
468	0	0	489	6	0	0.428571429	0	-2.376428571	-0.475	5.647412755	0.225625
469	0	0	492	0	0	0	0	-2.805	-0.475	7.868025	0.225625
470	0	0	497	0	0	0	0	-2.805	-0.475	7.868025	0.225625
479	0	5	501	0	0	0	0	-2.805	-0.475	7.868025	0.225625
485	0	0	511	35	5	2.5	0.357142857	-0.305	-0.117857143	0.093025	0.013890306
489	6	0	514	0	0	0	0	-2.805	-0.475	7.868025	0.225625
492	0	0	515	0	0	0	0	-2.805	-0.475	7.868025	0.225625
497	0	0	517	0	0	0	0	-2.805	-0.475	7.868025	0.225625
501	0	0	526	6	0	0.428571429	0	-2.376428571	-0.475	5.647412755	0.225625
511	35	5	535	0	0	0	0	-2.805	-0.475	7.868025	0.225625
514	0	0	537	0	0	0	0	-2.805	-0.475	7.868025	0.225625
515	0	0	540	0	0	0	0	-2.805	-0.475	7.868025	0.225625
517	0	0	544	0	0	0	0	-2.805	-0.475	7.868025	0.225625
526	6	0	559	29	1	2.071428571	0.071428571	-0.733571429	-0.403571429	0.538127041	0.162869898
526	0	0	566	0	0	0	0	-2.805	-0.475	7.868025	0.225625
535	0	0	569	0	0	0	0	-2.805	-0.475	7.868025	0.225625
537	0	0	576	0	0	0	0	-2.805	-0.475	7.868025	0.225625
540	0	0	578	0	0	0	0	-2.805	-0.475	7.868025	0.225625
544	0	0	582	24	3	1.714285714	0.214285714	-1.090714286	-0.260714286	1.189657653	0.067971939
559	29	1	595	0	0	0	0	-2.805	-0.475	7.868025	0.225625
566	0	0	596	0	0	0	0	-2.805	-0.475	7.868025	0.225625
569	0	0	607	0	0	0	0	-2.805	-0.475	7.868025	0.225625
576	0	0	611	0	0	0	0	-2.805	-0.475	7.868025	0.225625
578	0	0	622	3	0	0.214285714	0	-2.590714286	-0.475	6.71180051	0.225625
582	24	3	625	0	0	0	0	-2.805	-0.475	7.868025	0.225625
595	0	0	638	0	0	0	0	-2.805	-0.475	7.868025	0.225625
596	0	0	646	0	0	0	0	-2.805	-0.475	7.868025	0.225625
607	0	0	648	0	0	0	0	-2.805	-0.475	7.868025	0.225625
611	0	0	653	5	1	0.357142857	0.071428571	-2.447857143	-0.403571429	5.992004592	0.162869898
622	3	0	668	0	0	0	0	-2.805	-0.475	7.868025	0.225625
625	0	0	686	1	0	0.071428571	0	-2.733571429	-0.475	7.472412755	0.225625
625	0	0	688	0	0	0	0	-2.805	-0.475	7.868025	0.225625
638	0	0	695	0	0	0	0	-2.805	-0.475	7.868025	0.225625
638	0	0	702	0	0	0	0	-2.805	-0.475	7.868025	0.225625
646	0	0	703	0	0	0	0	-2.805	-0.475	7.868025	0.225625
648	0	0	710	7	2	0.5	0.142857143	-2.305	-0.332142857	5.313025	0.110318878
653	5	1	721	0	0	0	0	-2.805	-0.475	7.868025	0.225625
668	0	0	725	0	0	0	0	-2.805	-0.475	7.868025	0.225625
686	1	0	726	0	0	0	0	-2.805	-0.475	7.868025	0.225625
688	0	0	744	0	0	0	0	-2.805	-0.475	7.868025	0.225625
688	0	0	749	1	0	0.071428571	0	-2.733571429	-0.475	7.472412755	0.225625
695	0	0	750	0	0	0	0	-2.805	-0.475	7.868025	0.225625
702	0	0	753	7	5	0.5	0.357142857	-2.305	-0.117857143	5.313025	0.013890306
703	0	0	756	0	0	0	0	-2.805	-0.475	7.868025	0.225625
703	0	0	760	0	0	0	0	-2.805	-0.475	7.868025	0.225625
710	7	2	763	0	0	0	0	-2.805	-0.475	7.868025	0.225625
721	0	0	764	0	0	0	0	-2.805	-0.475	7.868025	0.225625
725	0	0	772	0	0	0	0	-2.805	-0.475	7.868025	0.225625
726	0	0	786	1	0	0.071428571	0	-2.733571429	-0.475	7.472412755	0.225625
744	0	0	788	2	2	0.142857143	0.142857143	-2.662142857	-0.332142857	7.087004592	0.110318878
749	1	0	793	0	0	0	0	-2.805	-0.475	7.868025	0.225625
750	0	0	808	0	0	0	0	-2.805	-0.475	7.868025	0.225625
753	7	5	815	0	0	0	0	-2.805	-0.475	7.868025	0.225625
756	0	0	829	0	0	0	0	-2.805	-0.475	7.868025	0.225625
760	0	0	841	14	7	1	0.5	-1.805	0.025	3.258025	0.000625
763	0	0	847	2	5	0.142857143	0.357142857	-2.662142857	-0.117857143	7.087004592	0.013890306
764	0	0	850	0	0	0	0	-2.805	-0.475	7.868025	0.225625
772	0	0	856	5	3	0.357142857	0.214285714	-2.447857143	-0.260714286	5.992004592	0.067971939
786	1	0	869	0	0	0	0	-2.805	-0.475	7.868025	0.225625
786	0	0	875	0	0	0	0	-2.805	-0.475	7.868025	0.225625
788	2	2	883	0	0	0	0	-2.805	-0.475	7.868025	0.225625
793	0	0	891	0	0	0	0	-2.805	-0.475	7.868025	0.225625
808	0	0	892	0	0	0	0	-2.805	-0.475	7.868025	0.225625
808	0	0	897	0	0	0	0	-2.805	-0.475	7.868025	0.225625
815	0	0	898	0	0	0	0	-2.805	-0.475	7.868025	0.225625
815	0	0	900	0	0	0	0	-2.805	-0.475	7.868025	0.225625
829	0	0	907	1	0	0.071428571	0	-2.733571429	-0.475	7.472412755	0.225625
841	14	0	908	0	0	0	0	-2.805	-0.475	7.868025	0.225625
841	0	7	909	0	0	0	0	-2.805	-0.475	7.868025	0.225625
847	2	5	912	0	0	0	0	-2.805	-0.475	7.868025	0.225625
850	0	0	923	0	0	0	0	-2.805	-0.475	7.868025	0.225625
856	5	3	938	0	0	0	0	-2.805	-0.475	7.868025	0.225625
869	0	0	942	13	3	0.928571429	0.214285714	-1.876428571	-0.260714286	3.520984184	0.067971939
875	0	0	943	0	0	0	0	-2.805	-0.475	7.868025	0.225625
883	0	0	951	0	0	0	0	-2.805	-0.475	7.868025	0.225625
891	0	0	962	0	0	0	0	-2.805	-0.475	7.868025	0.225625
892	0	0	964	0	0	0	0	-2.805	-0.475	7.868025	0.225625
897	0	0	973	0	0	0	0	-2.805	-0.475	7.868025	0.225625
898	0	0	989	0	0	0	0	-2.805	-0.475	7.868025	0.225625
900	0	0	993	0	1	0	0.071428571	-2.805	-0.403571429	7.868025	0.162869898
907	1	0	995	2	7	0.142857143	0.5	-2.662142857	0.025	7.087004592	0.000625
908	0	0	1005	12	5	0.857142857	0.357142857	-1.947857143	-0.117857143	3.794147449	0.013890306
909	0	0	1010	0	0	0	0	-2.805	-0.475	7.868025	0.225625
909	0	0	1031	0	0	0	0	-2.805	-0.475	7.868025	0.225625
912	0	0	1038	0	0	0	0	-2.805	-0.475	7.868025	0.225625
923	0	0	1041	18	3	1.285714286	0.214285714	-1.519285714	-0.260714286	2.308229082	0.067971939
938	0	0	1045	0	0	0	0	-2.805	-0.475	7.868025	0.225625
942	13	3	1046	0	0	0	0	-2.805	-0.475	7.868025	0.225625
943	0	0	1055	0	0	0	0	-2.805	-0.475	7.868025	0.225625
951	0	0	1059	0	0	0	0	-2.805	-0.475	7.868025	0.225625
962	0	0	1072	0	0	0	0	-2.805	-0.475	7.868025	0.225625
964	0	0	1076	0	0	0	0	-2.805	-0.475	7.868025	0.225625
973	0	0	1082	0	0	0	0	-2.805	-0.475	7.868025	0.225625
989	0	0	1086	0	0	0	0	-2.805	-0.475	7.868025	0.225625
993	0	1	1094	0	0	0	0	-2.805	-0.475	7.868025	0.225625
995	2	7	1106	0	0	0	0	-2.805	-0.475	7.868025	0.225625
1005	12	5	1113	0	0	0	0	-2.805	-0.475	7.868025	0.225625
1005	0	0	1118	0	0	0	0	-2.805	-0.475	7.868025	0.225625
1010	0	0	1122	0	0	0	0	-2.805	-0.475	7.868025	0.225625
1031	0	0	1126	0	0	0	0	-2.805	-0.475	7.868025	0.225625
1038	0	0	1136	0	0	0	0	-2.805	-0.475	7.868025	0.225625
1038	0	0	1160	0	0	0	0	-2.805	-0.475	7.868025	0.225625
1041	18	3	1162	0	0	0	0	-2.805	-0.475	7.868025	0.225625
1041	0	0	1166	42	0	3	0	0.195	-0.475	0.038025	0.225625
1045	0	0	1183	0	0	0	0	-2.805	-0.475	7.868025	0.225625
1046	0	0	1212	0	0	0	0	-2.805	-0.475	7.868025	0.225625
1055	0	0	1213	0	0	0	0	-2.805	-0.475	7.868025	0.225625
1059	0	0	1214	1	0	0.071428571	0	-2.733571429	-0.475	7.472412755	0.225625
1072	0	0	1220	0	0	0	0	-2.805	-0.475	7.868025	0.225625
1076	0	0	1222	2	0	0.142857143	0	-2.662142857	-0.475	7.087004592	0.225625
1082	0	0	1228	0	0	0	0	-2.805	-0.475	7.868025	0.225625
1086	0	0	1233	0	0	0	0	-2.805	-0.475	7.868025	0.225625
1094	0	0	1239	0	0	0	0	-2.805	-0.475	7.868025	0.225625
1106	0	0	1249	11	2	0.785714286	0.142857143	-2.019285714	-0.332142857	4.077514796	0.110318878
1113	0	0	1265	0	0	0	0	-2.805	-0.475	7.868025	0.225625
1118	0	0	1272	15	0	1.071428571	0	-1.733571429	-0.475	3.005269898	0.225625
1122	0	0	1275	0	0	0	0	-2.805	-0.475	7.868025	0.225625
1126	0	0	1277	0	0	0	0	-2.805	-0.475	7.868025	0.225625
1136	0	0	1279	0	0	0	0	-2.805	-0.475	7.868025	0.225625
1160	0	0	1310	0	0	0	0	-2.805	-0.475	7.868025	0.225625
1162	0	0	1313	0	0	0	0	-2.805	-0.475	7.868025	0.225625
1162	0	0	1320	0	0	0	0	-2.805	-0.475	7.868025	0.225625
1166	42	0	1341	0	0	0	0	-2.805	-0.475	7.868025	0.225625
1183	0	0	1342	0	0	0	0	-2.805	-0.475	7.868025	0.225625
1212	0	0	1345	0	0	0	0	-2.805	-0.475	7.868025	0.225625
1213	0	0	1346	16	4	1.142857143	0.285714286	-1.662142857	-0.189285714	2.762718878	0.035829082
1214	1	0	1347	12	4	0.857142857	0.285714286	-1.947857143	-0.189285714	3.794147449	0.035829082
1220	0	0	1354	0	0	0	0	-2.805	-0.475	7.868025	0.225625
1222	2	0	1360	0	0	0	0	-2.805	-0.475	7.868025	0.225625
1222	0	0	1395	0	0	0	0	-2.805	-0.475	7.868025	0.225625
1228	0	0									
1233	0	0									
1239	0	0									
1249	11	2									
1265	0	0									
1272	15	0									
1275	0	0									
1277	0	0									
1279	0	0									
1310	0	0									
1313	0	0									
1320	0	0									
1341	0	0									
1342	0	0									
1345	0	0									
1346	16	4									
1347	12	4									
1354	0	0									
1360	0	0									
1395	0	0									

11.4.3 Gröbenzell – R73

11.4.3.1 Gröbenzell – R73 – Phase 1

O.R.C.U.S. 02.00 - Simulation Summary

[illegible]

Prot	cyc	k_UA	Day	Time of impact	UA X Pos	UA Y Pos	Travelled Distance [km]	PPL_TD_CITY_ATB	PPL_CITY_ATB_COUNT	HIT_CITY_ATB_COUNT	PPL_TD_CITY_OTW	PPL_CITY_OTW_COUNT	HIT_CITY_OTW_COUNT	PPL_TD_SURM_ATB	PPL_SURM_ATB_COUNT	HIT_SURM_ATB_COUNT	PPL_TD_SURM_OTW	PPL_SURM_OTW_COUNT	HIT_SURM_OTW_COUNT	PPL_ALL_ATB_COUNT	PPL_ALL_OTW_COUNT	E	Case	Outcome
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	18139	0	4969	4969	0	33610	9333	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	18255	0	4853	4853	0	33726	9217	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	22068	0	1040	1040	0	41208	1735	1	Engine Out	No Ground Effect
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	16868	0	6240	6240	0	31446	11497	35	Connection Failure	UA ground impact tangential to trajectory
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	18370	0	4738	4738	0	33742	9201	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	16868	0	6240	6240	0	31446	11497	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	19179	0	3929	3929	0	35840	7103	32	Connection Failure	UA approaches Emergency landing site
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	19757	0	3351	3351	0	36914	6029	9	Engine Out	UA ground impact tangential to trajectory
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	22299	0	809	809	0	41737	1206	78	Degradation of altitude	Central UA ground impact point below flight path
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	19526	0	3582	3582	0	36484	6459	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	17215	0	5893	5893	0	31694	11249	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	19872	0	3236	3236	0	37029	5914	57	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	19179	0	3929	3929	0	35443	7500	55	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	19988	0	3120	3120	0	36649	6294	36	Short Circuit / Overload	Central UA ground impact point below flight path
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	18139	0	4969	4969	0	33907	9036	30	Connection Failure	Central UA ground impact point below flight path
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	19064	0	4044	4044	0	35427	7516	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	18370	0	4738	4738	0	33742	9201	21	Engine Fire	UA structural desintegration - Debris Impact
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	19064	0	4044	4044	0	35427	7516	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	18255	0	4853	4853	0	33726	9217	10	Engine Anomaly	UA approaches Emergency landing site
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	18139	0	4969	4969	0	33610	9333	46	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	18255	0	4853	4853	0	33726	9217	35	Connection Failure	UA ground impact tangential to trajectory
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	17215	0	5893	5893	0	32190	10753	73	Degradation of altitude	Central UA ground impact point below flight path
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	20335	0	2773	2773	0	37888	5055	42	Partial Lock of Flight Control Surfaces	Central UA ground impact point below flight path
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	18948	0	4160	4160	1	35311	7632	78	Degradation of altitude	Central UA ground impact point below flight path
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	19526	0	3582	3582	0	36286	6657	10	Engine Anomaly	UA approaches Emergency landing site
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	19988	0	3120	3120	0	36649	6294	21	Engine Fire	UA structural desintegration - Debris Impact
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	16868	0	6240	6240	2	31446	11497	20	Engine Fire	UA structural desintegration - Debris Impact
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	17446	0	5662	5662	0	32421	10522	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	18948	0	4160	4160	0	35311	7632	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	17215	0	5893	5893	0	31694	11249	26	Generator Failure	Central UA ground impact point below flight path
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	18139	0	4969	4969	0	33907	9036	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	18139	0	4969	4969	0	33610	9333	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	17215	0	5893	5893	0	31694	11249	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	19526	0	3582	3582	0	36484	6459	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	17445	0	5662	5662	0	31924	11018	5	Engine Out	No Ground Effect
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	18139	0	4969	4969	0	33907	9036	47	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	20103	0	3005	3005	0	37359	5584	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	17446	0	5662	5662	0	32421	10522	55	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	19988	0	3120	3120	0	36649	6294	19	Engine Fire	Central UA ground impact point below flight path
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	19179	0	3929	3929	0	36435	6508	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	17215	0	5893	5893	0	32190	10753	35	Connection Failure	UA ground impact tangential to trajectory
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	20335	0	2773	2773	0	37888	5055	72	Degradation of altitude	UA approaches Emergency landing site
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	16637	0	6471	6471	0	31017	11926	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	16406	0	6702	6702	0	30488	12455	18	Engine Fire	UA structural desintegration - Debris Impact
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	16868	0	6240	6240	0	31446	11497	78	Degradation of altitude	Central UA ground impact point below flight path
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	18139	0	4969	4969	0	33907	9036	62	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	19526	0	3582	3582	0	36484	6459	78	Degradation of altitude	Central UA ground impact point below flight path
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	21143	0	1965	1965	0	39292	3651	68	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	19526	0	3582	3582	0	36484	6459	38	Short Circuit / Overload	Central UA ground impact point below flight path
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	17562	0	5546	5546	0	32934	10009	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1327	159	3523	Thursday	17:42:03	5963	1371	1170.08	14777	14777	0	5058	5058	0	17215	17215	0	5893	5893	0	31992	10951	73	Degradation of altitude	Central UA ground impact point below flight path
1327	62	2940	Thursday	10:32:58	4886	1456	454.97	16363	16363	0	3472	3472	0	18948	18948	0	4160	4160	0	35311	7632	36	Short Circuit / Overload	Central UA ground impact point below flight path
1327	72	3598	Thursday	11:17:56	5988	1401	529.92	16363	16363	0	3472	3472	0	18948	18948	0	4160	4160	0	35311	7632	17	Engine Fire	Central UA ground impact point below flight path
1341	95	2673	Thursday	12:58:23	4090	1657	697.31	16363	16363	15	3472	3472	6	18948	18947	0	4160	4160	0	35310	7632	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1353	100	2363	Tuesday	13:20:04	3220	1951	733.47	15471	15471	0	4364	4364	0	18255	18255	0	4853	4853	0	33726	9217	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
1380	58	1552	Monday	10:13:36	2702	2450	422.69	16661	16661	10	3174	3174	5	19179	19178	0	3929	3929	0	35839	7103	20	Engine Fire	UA structural desintegration - Debris Impact
1392	20	1546	Saturday	07:25:48	2711	2450	143.00	19140	19140	0	695	695	0	22068	22068	0	1040	1040	0	41208	1735	78	Degradation of altitude	Central UA ground impact point below flight path
1397	115	782	Thursday	14:24:23	4680	2048	840.64	15372	15372	0	4463	4463	1	18370	18370	0	4738	4738	0	33742	9201	27	Generator Failure	UA ground impact tangential to trajectory
145	83	2952	Friday	12:05:44	4920	1449	609.56	15868	15868	0	3967	3967	0	18601	18601	0	4507	4507	0	34469	8474	47	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
146	113	2628	Saturday	14:17:48	3955	1698	829.69	15272	15272	3	4563	4563	4	17793	17793	0	5315	5315	0	33065	9878	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
155	4	844	Monday	06:14:17	4495	2105	23.81	17157	17157	1	2678	2678	1	19872	19872	0	3236	3236	0	37029	5914	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
158	65	2562	Thursday	10:45:46	3759	1759	476.28	16363	16363	10	3472	3472	2	18948	18948	0	4160	4160	0	35311	7632	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
158	76	2160	Thursday	11:33:51	2797	2139	556.42	16363	16363	4	3472	3472	5	18948	18948	0	4160	4160	0	35311	7632	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
162	72	3027	Monday	11:17:14	5124	1409	528.75	16661	16661	0	3174	3174	0	19179	19179	0	3929	3929	0	35840	7103	37	Short Circuit / Overload	Central UA ground impact point below flight path
178	22	1166	Wednesday	07:34:09	3539	2347	156.94	17256	17256	0	2579	2579	0	19988	19988	0	3120	3120	0	37244	5699	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
187	130	1306	Friday	15:31:16	3175	2412	952.11	15372	15372	0	4463	4463	0	17562	17562	0	5546	5546	0	32934	10009	4	Engine Out	Central ground impact point below flight path with B/G Ratio.
190	33	126	Monday	08:21:28	5963	1470	235.78	16958	16958	0	2877	2877	0	19526	19526	0	3582	3582	0	36484	6459	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
204	149	596	Monday	16:54:17	5196	1869	1090.50	14479	14479	0	5356	5356	0	17446	17446	0	5662	5662	0	31925	11018	40	Short Circuit / Overload	Central UA ground impact point below flight path
21	156	2516	Sunday	17:27:34	3627	1803	1145.95	14578	14578	0	5257	5257	0	16868	16868	0	6240	6240	0	31446	11497	22	Generator Failure	UA approaches Emergency landing site
212	16	1475	Tuesday	07:08:02	2823	2449	113.42	17355	17355	11	2480	2480	1	19988	19988	0	3120	3120	0	37343	5600	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
248	12	1392	Wednesday	06:50:17	2982	2437	83.81	17256	17256	0	2579	2579	0	19988	19988	0	3120	3120	0	37244	5699	68	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
252	110	1594	Sunday	14:03:17	2648	2446	805.50	14380	14380	11	5455	5455	3	16637	16637	0	6471	6471	0	31017	11926	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
253	26	829	Monday	07:51:25	4540	2091	185.70	17157	17157	0	2678	2678	0	19872	19872	0	3236	3236	0	37029	5914	10	Engine Anomaly	UA approaches Emergency landing site
26	33	479	Friday	08:21:53	5472	1757	236.50	16661	16661	0	3174	3174	0	19988	19987	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
26	80	1483	Friday	11:50:41	2809	2450	584.47	15868	15868	0	3967	3967	0	18601	18601	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
265	122	2375	Saturday	14:57:15	3250	1939	895.42	15272	15272	0	4563	4563	0	17793	17793	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
272	30	1415	Saturday	08:09:47	2935	2441	216.33	17256	17256	0	2579	2579	0	19179	19179	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
279	16	2508	Saturday	07:09:18	3604	1810	115.53	19140	19140	0	695	695	0	22068	22068	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
281	33	2572	Monday	08:24:28	3789	1749	240.78	16958	16958	0	2877	2877	0	19526	19526	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
284	161	1526	Thursday	17:48:25	2740	2451	1180.72	14777	14777	15	5058	5058	7	17215	17215	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
293	36	19	Saturday	08:34:35	5990	1411	257.64	17256	17256	0	2579	2579	0	19179	19179	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
296	40	564	Tuesday	08:52:54	5276	1838	288.19	16760	16760	0	3075	3075	0	19526	19526	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3	54	3507	Wednesday	09:58:21	5953	1366	397.25	16958	16958	0	2877	2877	0	19526	19526	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
301	58	71	Sunday	10:11:47	5985	1438	419.67	14479	14479	0	5356	5356	0	17215	17215	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
306	158	1701	Friday	17:35:23	2549	2424	1159.00	15471	15471	0	4364	4364	0	18139	18139	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
323	31	2326	Monday	08:15:20	3131	1986	225.56	16958	16958	0	2877	2877	0	19526	19526	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
324	51	2160	Tuesday	09:43:26	2797	2139	372.42	16760	16760	9	3075	3075	0	19526	19526	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
33	129	1958	Friday	15:27:39	2554	2297	946.08	15372	15372	0	4463	4463	0	17562	17562	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
330	68	294	Monday	10:56:13	5802	1593	493.72	16661	16661	0	3174	3174	0	19179	19179	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
334	25	3600	Friday	07:50:24	5989	1402	184.00	17553	17553	0	2282	2282	0	20335	20334	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
339	24	2159	Wednesday	07:44:12	2795	2140	173.69	17256	17256	7	2579	2579	1	19988	19988	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
393	96	1288	Monday	13:01:06	3219	2405	701.83	15471	15471	0	4364	4364	0	18255	18255	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
399	31	1103	Sunday	08:13:49	3718	2309	223.06	17950	17950	0	1885	1885	0	20103	20103	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
408	122	2823	Tuesday	14:57:47	4545	1535	896.33	15471	15471	0	4364	4364	0	18255	18255	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
410	75	3314	Thursday	11:30:50	5740	1337	551.42	16363	16363	0	3472	3472	0	18948	18948	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
44	53	2623	Tuesday	09:52:50	3940	1702	388.08	16760	16760	0	3075	3075	0	19526	19526	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
448	136	2315	Sunday	15:59:00	3106	1997	998.33	14578	14578	0	5257	5257	0	16868	16868	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
451	4	3303	Wednesday	06:17:17	5722	1337	28.83	17256	17256	0	2579	2579	0	19988	19988	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
454	62	1296	Saturday	10:30:57	3199	2408	451.61	14082	14082	0	5753	5753	0	16406	16406	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
476	150	1099	Sunday	16:59:19	3729	2306	1098.89	14578	14578	0	5257	5257	0	16868	16868	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
479	40	1679	Wednesday	08:54:17	2564	2430	290.47	16958	16958	0	2877	2877	0	19526	19526	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
484	1	1630	Monday	06:01:59	2608	2441	3.33	17157	17157	0	2678	2678	0	19872	19872	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
496	95	1885	Saturday	12:57:25	2517	2343	695.69	14082	14082	1	5753	5753	0	16406	16406	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
509	106	138	Friday	13:43:50	5957	1478	773.08	15372	15372	0	4463	4463	0	17562	17562	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
510	25	787	Saturday	07:46:56	4665	2053	178.25	19140	19140	0	695	695	0	22068	22068	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
510	98	2416	Saturday	13:11:18	3354	1899	718.86	15272	15272	8	4563	4563	0	17793	17793	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
511	4	1646	Sunday	06:15:16	2592	2438	25.45	19438	19438	0	397	397	0	22299	22299	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
516	20	1926	Friday	07:26:16	2535	2318	143.78	17553	17553	0	2282	2282	0	20335	20335	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
521	165	2344	Wednesday	18:07:06	3174	1969	1211.83	14975	14975	0	4860	4860	0	17215	17215	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
525	106	410	Sunday	13:44:11	5612	1693	773.64	14380	14380	0	5455	5455	0	16637	16637	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
529	11	467	Thursday	06:44:43	5498	1746	74.55	17256	17256	0	2579	2579	0	20103	20103	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
529	72	1845	Thursday	11:15:47	2509	2364	526.33	16363	16363	0	3472	3472	0	18948	18948	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
53	123	1166	Thursday	15:00:10	3539	2347	900.30	15372	15372	0	4463	4463	0	18370	18370	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
54	37	2682	Friday	08:42:15	4118	1649	270.44	16661	16661	0	3174	3174	0	19988	19988	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
552	6	3033	Saturday	06:25:48	5140	1406	43.00	19140	19140	0	695	695	0	22068	22068	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
555	112	848	Tuesday	14:11:13	4483	2108	818.69	15471	15471	0	4364	4364	0	18255	18255	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
563	127	693	Wednesday	15:17:16	4936	1963	928.78	15471	15471	12	4364	4364	1	18139	18139	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
563	19	1749	Wednesday	07:21:38	2523	2408	136.06	17256	17256	0	2579	2579	0	19988	19988	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
563	44	2442	Wednesday	09:12:53	3423	1874	321.47	16958	16958	0	2877	2877	0	19526	19526	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
573	165	3295	Saturday	18:08:16	5709	1338	1213.78	15768	15768	0	4067	4067	0	18139	18139	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
598	120	118	Wednesday	14:45:38	5968	1465	876.08	15471	15471	0	4364	4364	0	18139	18139	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
608	140	863	Saturday	16:14:53	4438	2122	1024.81	15768	15768	1	4067	4067	2	18139	18139	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
636	23	1153	Saturday	07:38:33	3575	2340	164.28	19140	19140	1	695	695	0	22068	22068	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
638	36	182	Monday	08:34:47	5926	1507	257.97	16958	16958	0	2877	2877	0	19526	19526	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
642	46	1967	Friday	09:21:07	2561	2291	335.22	16661	16661	0	3174	3174	0	19988	19988	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
645	166	2548	Monday	18:11:45	3719	1772	1219.61	14479	14479	0	5356	5356	0	17446	17446	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
650	52	1495	Saturday	09:47:03	2789	2450	378.42	17256	17256	0	2579	2579	0	19179	19179	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
666	18	2169	Monday	07:17:43	2812	2132	129.55	17157	17157	1	2678	2678	0	19872	19872	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
67	70	24	Thursday	11:04:44	5990	1413	507.89	16363	16363	0	3472	3472	0	18948	18948	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
671	165	211	Saturday	18:04:29	5900	1528	1207.47	15768	15768	0	4067	4067	0	18139	18139	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
683	63	1202	Thursday	10:35:16	3440	2366	458.78	16363	16363	16	3472	3472	2	18948	18948	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
694	17	321	Monday	07:11:02	5763	1615	118.42	17157	17157	0	2678	2678	0	19872	19872	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
699	69	3216	Saturday	11:04:14	5565	1347	507.06	14082	14082	0	5753	5753	0	16406	16406	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
704	152	3098	Thursday	17:10:37	5303	1379	1117.70	14777	14777	0	5058	5058	0	17215	17215	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
716	145	2768	Tuesday	16:39:18	4379	1577	1065.50	14975	14975	0	4860	4860	0	17446	17446	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
72	74	787	Tuesday	11:23:20	4665	2053	538.89	16264	16264	0	3571	3571	0	19179	19179	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
720	133	2802	Saturday	15:46:20	4481	1551	977.25	15272	15272	13	4563	4563	1	17793	17793	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
721	33	1444	Sunday	08:23:05	2879	2446	238.47	17950	17950	29	1885	1885	0	20103	20103	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
723	92	2359	Tuesday	12:44:45	3210	1955	674.58	16264	16264	0	3571	3571	0	19179	19179	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
725	20	2388	Thursday	07:26:50	3282	1927	144.72	17256	17256	2	2579	2579	0	20103	20103	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
729	151	67	Monday	17:02:28	5986	1435	1104.14	14479	14479	0	5356	5356	0	17446	17446	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
735	22	473	Sunday	07:33:18	5485	1751	155.53	19438	19438	0	397	397	0	22299	22299	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
744	93	525	Tuesday	12:46:54	5369	1801	678.19	16264	16264	0	3571	3571	0	19179	19179	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
747	167	3296	Friday	18:17:06	5711	1338	1228.50	15471	15471	0	4364	4364	0	18139	18139	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
753	169	2237	Thursday	18:24:37	2938	2070	1241.06	14777	14777	0	5058	5058	0	17215	17215	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
755	91	1462	Saturday	12:39:14	2846	2448	665.39	14082	14082	0	5753	5753	0	16406	16406	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
757	87	590	Monday	12:20:30	5211	1863	634.17	16661	16661	0	3174	3174	0	19179	19179	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
768	172	1342	Friday	18:36:46	3091	2424	1261.31	15471	15471	0	4364	4364	0	18139	18139	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
773	126	1874	Wednesday	15:14:17	2514	2349	923.83	15471	15471	0	4364	4364	0	18139	18139	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
776	102	1427	Saturday	13:27:46	2912	2443	746.28	15272	15272	0	4563	4563	0	17793	17793	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
777	42	335	Sunday	09:01:28	5742	1627	302.45	17950	17950	0	1885	1885	0	20103	20103	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
793	119	1952	Tuesday	14:43:28	2550	2301	872.47	15471	15471	19	4364	4364	3	18255	18255	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
794	123	1180	Wednesday	15:00:12	3500	2355	900.33	15471	15471	0	4364	4364	0	18139	18139	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
795	24	1765	Thursday	07:43:43	2517	2401	172.89	17256	17256	0	2579	2579	0	20103	20103	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
806	125	216	Monday	15:07:50	5895	1532	913.08	15471	15471	0	4364	4364	0	18255	18255	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
815	68	2128	Wednesday	10:58:28	2745	2167	497.47	16363	16363	7	3472	3472	6	19064	19064	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
819	107	1579	Sunday	13:50:02	2666	2448	783.39	14380	14380	5	5455	5455	2	16637	16637	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
819	37	536	Sunday	08:39:38	5343	1811	266.06	17950	17950	0	1885	1885	0	20103	20103	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
824	26	1413	Friday	07:52:08	2939	2441	186.89	17553	17553	0	2282	2282	0	20335	20335	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
851	134	968	Thursday	15:48:30	4119	2211	980.86	15372	15372	0	4463	4463	0	18370	18370	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
854	35	2151	Sunday	08:32:46	2782	2147	254.64	17950	17950	0	1885	1885	0	20103	20103	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
861	175	2553	Sunday	18:51:31	3733	1767	1285.86	14578	14578	0	5257	5257	0	16868	16868	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
871	170	1518	Wednesday	18:28:10	2752	2451	1246.95	14975	14975	0	4860	4860	0	17215	17215	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
884	190	903	Tuesday	19:55:43	4317	2157	1392.89	18149	18149	0	1686	1686	0	21143	21143	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
890	78	2922	Monday	11:43:37	4835	1467	572.69	16661	16661	0	3174	3174	0	19179	19179	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
895	151	2608	Saturday	17:05:36	3895	1716	1109.33	15768	15768	0	4067	4067	0	18139	18139	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
895	177	570	Saturday	18:57:54	5261	1844	1296.53	17950	17950	0	1885	1885	0	20797	20797	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
898	85	847	Tuesday	12:11:59	4486	2108	619.97	16264	16264	0	3571	3571	0	19179	19179	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
90	33	2164	Saturday	08:23:58	2803	2136	239.94	17256	17256	0	2579	2579	0	19179	19179	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
901	126	3518	Friday	15:16:18	5960	1370	927.19	15372	15372	0	4463	4463	0	17562	17562	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
902	160	2885	Saturday	17:45:41	4728	1491	1176.14	15768	15768	0	4067	4067	0	18139	18139	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
912	34	3578	Tuesday	08:30:07	5984	1392	250.20	16760	16760	0	3075	3075	0	19526	19526	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
941	188	3171	Wednesday	19:49:40	5471	1356	1382.80	18049	18049	0	1786	1786	0	21028	21028	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
944	102	3084	Saturday	13:29:47	5269	1384	749.67	15272	15272	0	4563	4563	0	17793	17793	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
949	117	3065	Thursday	14:36:00	5222	1392	860.03	15372	15372	0	4463	4463	0	18370	18370	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
953	118	3229	Monday	14:40:38	5590	1344	867.72	15471	15471	0	4364	4364	0	18255	18255	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
955	7	3115	Wednesday	06:30:19	5344	1373	50.53	17256	17256	0	2579	2579	0	19988	19988	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
955	91	3513	Wednesday	12:41:44	5957	1368	669.58	16363	16363	0	3472	3472	0	19064	19064	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
956	163	373	Thursday	17:55:51	5679	1660	1193.08	14777	14777	0	5058	5058	0	17215	17215	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
960	189	2003	Monday	19:52:39	2591	2266	1387.78	18149	18149	0	1686	1686	0	21028	21028	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
963	67	1014	Thursday	10:52:42	3980	2246	487.83	16363	16363	0	3472	3472	0	18948	18948	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
971	10	2084	Friday	06:42:18	2682	2203	70.50	17553	17553	10	2282	2282	2	20335	20335	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
984	157	505	Thursday	17:29:30	5415	1782	1149.19	14777	14777	0	5058	5058	0	17215	17215	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

991	161	2980	Thursday	17:50:12	4998	1433	1183.69	14777	14777	0	5058	5058	0	17215	17215	0	5893	5893	0	31992	10951	24	Generator Failure	UA ground impact tangential to trajectory
997	4	803	Wednesday	06:14:13	4618	2067	23.72	17256	17256	1	2579	2579	0	19988	19988	0	3120	3120	0	37244	5699	9	Engine Out	UA ground impact tangential to trajectory

O.R.C.U.S. 02.00 - tTest of the Simulation

nProbes	1400
nEvents	185
nEvents_cor	174
tMission	14
x_cross_ATB	0.2528571
x_cross_OTW	0.0607143
x_cross_TOT	0.3135714
s2ATB	0.0742291
sATB	0.2724502
tATB	33.352451
s2OTW	0.0043544
sOTW	0.065988
tOTW	28.756039
s2TOT	0.1117545
sTOT	0.334297
tTOT	33.977583

UADay/Prot	HIT_TOT_ATB	HIT_TOT_OTW	UADay/Prot cor	HIT_TOT_mean_ATB	HIT_TOT_mean_OTW	HIT_TOT_mean_ATB/Fh	HIT_TOT_mean_OTW/Fh	x_i-x_cross ATB	x_i-x_cross OTW	(x_i-x_cross ATB)^2	(x_i-x_cross OTW)^2
3	0	0	3	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
21	0	0	21	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
26	0	0	26	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
26	0	0	33	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
33	0	0	44	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
44	0	0	53	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
53	0	0	54	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
54	0	0	67	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
67	0	0	72	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
72	0	0	90	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
90	0	0	105	16	3	1.142857143	0.214285714	0.89	0.153571429	0.7921	0.023584184
105	16	3	113	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
113	0	0	124	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
124	0	0	145	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
145	0	0	146	3	4	0.214285714	0.285714286	-0.038571429	0.225	0.001487755	0.050625
146	3	4	155	1	1	0.071428571	0.071428571	-0.181428571	0.010714286	0.032916327	0.000114796
155	1	1	158	14	7	1	0.5	0.747142857	0.439285714	0.558222449	0.192971939
158	10	2	162	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
158	4	5	178	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
162	0	0	187	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
178	0	0	190	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
187	0	0	204	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
190	0	0	212	11	1	0.785714286	0.071428571	0.532857143	0.010714286	0.283936735	0.000114796
204	0	0	248	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
212	11	1	252	11	3	0.785714286	0.214285714	0.532857143	0.153571429	0.283936735	0.023584184
248	0	0	253	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
252	11	3	265	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
253	0	0	272	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
265	0	0	279	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
272	0	0	281	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
279	0	0	284	15	7	1.071428571	0.5	0.818571429	0.439285714	0.670059184	0.192971939
281	0	0	293	0	2	0	0.142857143	-0.252857143	0.082142857	0.063936735	0.006747449
284	15	7	296	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
293	0	2	301	0	1	0	0.071428571	-0.252857143	0.010714286	0.063936735	0.000114796
296	0	0	306	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
301	0	1	323	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
306	0	0	324	9	0	0.642857143	0	0.39	-0.060714286	0.1521	0.003686224
323	0	0	330	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
324	9	0	334	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
330	0	0	339	7	1	0.5	0.071428571	0.247142857	0.010714286	0.061079592	0.000114796
334	0	0	393	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
339	7	1	399	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
393	0	0	408	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
399	0	0	410	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
408	0	0	448	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
410	0	0	451	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
448	0	0	454	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
451	0	0	476	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
454	0	0	479	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
476	0	0	484	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
479	0	0	496	1	0	0.071428571	0	-0.181428571	-0.060714286	0.032916327	0.003686224
484	0	0	509	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
496	1	0	510	8	0	0.571428571	0	0.318571429	-0.060714286	0.101487755	0.003686224
509	0	0	511	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
510	0	0	516	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
510	8	0	521	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
511	0	0	525	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
516	0	0	529	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
521	0	0	552	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
525	0	0	555	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
529	0	0	563	12	1	0.857142857	0.071428571	0.604285714	0.010714286	0.365161224	0.000114796
529	0	0	573	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
552	0	0	598	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
555	0	0	608	1	2	0.071428571	0.142857143	-0.181428571	0.082142857	0.032916327	0.006747449
563	12	1	636	1	0	0.071428571	0	-0.181428571	-0.060714286	0.032916327	0.003686224
563	0	0	638	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
563	0	0	642	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
573	0	0	645	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
598	0	0	650	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
608	1	2	666	1	0	0.071428571	0	-0.181428571	-0.060714286	0.032916327	0.003686224
636	1	0	671	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
638	0	0	683	16	2	1.142857143	0.142857143	0.89	0.082142857	0.7921	0.006747449
642	0	0	694	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
645	0	0	699	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
650	0	0	704	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
666	1	0	716	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
671	0	0	720	13	1	0.928571429	0.071428571	0.675714286	0.010714286	0.456589796	0.000114796
683	16	2	721	29	0	2.071428571	0	1.818571429	-0.060714286	3.307202041	0.003686224
694	0	0	723	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
699	0	0	725	2	0	0.142857143	0	-0.11	-0.060714286	0.0121	0.003686224
704	0	0	729	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
716	0	0	735	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
720	13	1	744	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
721	29	0	747	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
723	0	0	753	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
725	2	0	755	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
729	0	0	757	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
735	0	0	768	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
744	0	0	773	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
747	0	0	776	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
753	0	0	777	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
755	0	0	793	19	3	1.357142857	0.214285714	1.104285714	0.153571429	1.219446939	0.023584184
757	0	0	794	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
768	0	0	795	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
773	0	0	806	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
776	0	0	815	7	6	0.5	0.428571429	0.247142857	0.367857143	0.061079592	0.135318878
777	0	0	819	5	2	0.357142857	0.142857143	0.104285714	0.082142857	0.01087551	0.006747449
793	19	3	824	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
794	0	0	851	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
795	0	0	854	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
806	0	0	861	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
815	7	6	871	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
819	5	2	884	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
819	0	0	890	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
824	0	0	895	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
851	0	0	898	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
854	0	0	901	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
861	0	0	902	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
871	0	0	912	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
884	0	0	941	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
890	0	0	944	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
895	0	0	949	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
895	0	0	953	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
898	0	0	955	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
901	0	0	956	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
902	0	0	960	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
912	0	0	963	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
941	0	0	971	10	2	0.714285714	0.142857143	0.461428571	0.082142857	0.212916327	0.006747449
944	0	0	984	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
949	0	0	991	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
953	0	0	997	1	0	0.071428571	0	-0.181428571	-0.060714286	0.032916327	0.003686224
955	0	0	1004	12	2	0.857142857	0.142857143	0.604285714	0.082142857	0.365161224	0.006747449
955	0	0	1017	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
956	0	0	1028	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
960	0	0	1029	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
963	0	0	1040	13	2	0.928571429	0.142857143	0.675714286	0.082142857	0.456589796	0.006747449
971	10	2	1058	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
984	0	0	1061	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
991	0	0	1064	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
997	1	0	1081	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
1004	12	2	1092	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
1017	0	0	1093	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
1028	0	0	1094	0	1	0	0.071428571	-0.252857143	0.010714286	0.063936735	0.000114796
1029	0	0	1097	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
1040	13	2	1105	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
1058	0	0	1109	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
1061	0	0	1110	21	2	1.5	0.142857143	1.247142857	0.082142857	1.555365306	0.006747449
1064	0	0	1116	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
1081	0	0	1121	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
1092	0	0	1125	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
1093	0	0	1130	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
1094	0	1	1139	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
1097	0	0	1152	0	1	0	0.071428571	-0.252857143	0.010714286	0.063936735	0.000114796
1105	0	0	1157	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
1109	0	0	1160	7	0	0.5	0	0.247142857	-0.060714286	0.061079592	0.003686224
1110	21	2	1162	0	2	0	0.142857143	-0.252857143	0.082142857	0.063936735	0.006747449
1116	0	0	1164	14	3	1	0.214285714	0.747142857	0.153571429	0.558222449	0.023584184
1121	0	0	1180	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
1125	0	0	1190	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
1130	0	0	1196	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
1139	0	0	1207	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
1152	0	1	1211	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
1157	0	0	1214	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
1160	7	0	1219	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
1162	0	2	1224	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
1164	14	3	1229	0	1	0	0.071428571	-0.252857143	0.010714286	0.063936735	0.000114796
1180	0	0	1234	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
1190	0	0	1245	25	3	1.785714286	0.214285714	1.532857143	0.153571429	2.34965102	0.023584184
1196	0	0	1249	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
1207	0	0	1258	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
1211	0	0	1274	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
1214	0	0	1280	13	4	0.928571429	0.285714286	0.675714286	0.225	0.456589796	0.050625
1219	0	0	1295	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
1224	0	0	1301	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
1229	0	1	1305	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
1234	0	0	1311	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
1245	25	3	1319	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
1249	0	0	1321	11	3	0.785714286	0.214285714	0.532857143	0.153571429	0.283936735	0.023584184
1258	0	0	1327	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
1274	0	0	1341	15	6	1.071428571	0.428571429	0.818571429	0.367857143	0.670059184	0.135318878
1280	13	4	1353	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
1295	0	0	1380	10	5	0.714285714	0.357142857	0.461428571	0.296428571	0.212916327	0.087869898
1301	0	0	1392	0	0	0	0	-0.252857143	-0.060714286	0.063936735	0.003686224
1305	0	0	1397	0	1	0	0.071428571	-0.252857143	0.010714286	0.063936735	0.000114796
1311	0	0									
1319	0	0									
1321	11	3									
1327	0	0									
1327	0	0									
1327	0	0									
1341	15	6									
1353	0	0									
1380	10	5									
1392	0	0									
1397	0	1									

11.4.3.2 Gröbenzell – R73 – Phase 2

O.R.C.U.S. 02.00 - Simulation Summary

UA Parameters

MTOW [kg]	Wingspan [m]	Length [m]	L/D
90	5	4	8

v [km/h]	Alt [m]	CCF [m]
100	100	7360.009599

P_CumCat [1/Fh]	Engine [%]	ESys [%]	FCS [%]	NavSys [%]	Struct [%]
0.01	20	20	20	20	20

General map parameters

	Name	Area [km2]	PPL	PPL/km2
City	Groebenzell	6.36	19835	3119
County	Fuerstenfeldbruck	434.8	217831	501
FS	BY	70542.03	12997204	184

Mission specific map parameters

	Area [km2]	PPL	Tourists	Total PPL
City-SMP	20.7327	19835	0	19835
SurM	46.1228	23108	0	23108
Map total	66.8555	42943	0	42943

PPL MOD NA

Sim FH [Fh] 19600 Ev/Fh [1/Fh] 0.010306122
Events total 202

Hits due to UA impacts		Hits/Fh [1/Fh]
City-SMP ATB	429	0.021887755
SurM ATB	13	0.000663265
Total ATB	442	0.02255102
City-SMP OTW	73	0.00372449
SurM OTW	3	0.000153061
Total OTW	76	0.003877551
Total	518	0.026428571

Prot	cyc	k_UA	Day	Time of impact	UA X Pos	UA Y Pos	Travelled Distanc	PPL_TD_CITY_A	PPL_CITY_ATB_	HIT_CITY_ATB_C	PPL_TD_CITY_O	PPL_CITY_OTW_	HIT_CITY_OTW_	PPL_TD_SURM_	PPL_SURM_ATB	HIT_SURM_ATB_	PPL_TD_SURM_	PPL_SURM_OTV	HIT_SURM_OTW	PPL_ALL_ATB_C	PPL_ALL_OTW_(E	Case	Outcome
	1001	161	2953 Sunday	17:50:10	4923	1448	1183.64	14578	14578	0	5257	5257	0	16868	16868	0	6240	6240	0	31446	11497	23 Generator Failure	Central UA ground impact point below flight path
	1005	22	2403 Thursday	07:35:41	3320	1912	159.47	17256	17256	3	2579	2579	0	20103	20103	0	3005	3005	0	37359	5584	15 Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
	1013	12	6 Friday	06:48:35	5989	1404	80.97	17553	17553	0	2282	2282	0	20335	20334	0	2773	2773	0	37887	5055	1 Engine Out	No Ground Effect
	1017	153	1047 Tuesday	17:12:31	3882	2271	1120.86	14975	14975	0	4860	4860	0	17446	17446	0	5662	5662	0	32421	10522	25 Generator Failure	UA approaches Emergency landing site
	102	38	699 Thursday	08:44:14	4919	1969	273.75	17157	17157	0	2678	2678	0	19757	19757	0	3351	3351	0	36914	6029	37 Short Circuit / Ove	Central UA ground impact point below flight path
	1023	171	3393 Monday	18:34:52	5849	1341	1258.14	14479	14479	0	5356	5356	0	17446	17446	0	5662	5662	0	31925	11018	17 Engine Fire	Central UA ground impact point below flight path
	1024	20	1219 Tuesday	07:25:23	3395	2375	142.33	17355	17355	0	2480	2480	0	19988	19988	0	3120	3120	0	37343	5600	14 Engine Anomaly	Central UA ground impact point below flight path
	103	149	1017 Friday	16:54:48	3971	2249	1091.36	15471	15471	3	4364	4364	3	18139	18139	0	4969	4969	0	33610	9333	83 Separation of ess	UA structural desintegration - Debris Impact
	1044	57	3563 Monday	10:11:40	5980	1386	419.44	16661	16661	0	3174	3174	0	19179	19179	0	3929	3929	0	35840	7103	72 Degradation of alt	UA approaches Emergency landing site
	1053	150	1303 Wednesday	16:59:34	3182	2411	1099.31	14975	14975	0	4860	4860	0	17215	17215	0	5893	5893	0	32190	10753	59 GCS Override Wr	Central UA ground impact point on a random Map coordinate
	1054	137	2234 Thursday	16:03:19	2932	2073	1005.53	14777	14777	0	5058	5058	0	17215	17215	0	5893	5893	0	31992	10951	23 Generator Failure	Central UA ground impact point below flight path
	1056	107	2326 Saturday	13:50:56	3131	1986	784.92	15272	15272	8	4563	4563	3	17793	17793	0	5315	5315	0	33065	9878	64 Wrong commands	UA structural desintegration - Debris Impact
	1056	162	100 Saturday	17:51:05	5975	1454	1185.17	15768	15768	0	4067	4067	0	18139	18139	0	4969	4969	0	33907	9036	34 Connection Failur	UA ground impact tangential to trajectory
	106	165	1705 Monday	18:06:18	2546	2423	1210.53	14479	14479	0	5356	5356	0	17446	17446	0	5662	5662	0	31925	11018	71 Degradation of lat	Central UA ground impact point on a random Map coordinate
	1068	114	1202 Thursday	14:20:28	3440	2366	834.14	15372	15372	16	4463	4463	2	18370	18370	0	4738	4738	0	33742	9201	82 Separation of ess	UA structural desintegration - Debris Impact
	1077	106	1184 Saturday	13:45:07	3489	2357	775.22	15272	15272	0	4563	4563	0	17793	17793	0	5315	5315	0	33065	9878	78 Degradation of alt	Central UA ground impact point below flight path
	1079	113	1229 Monday	14:16:06	3369	2380	826.83	15471	15471	0	4364	4364	0	18255	18255	0	4853	4853	0	33726	9217	55 GCS Override Wr	Central UA ground impact point below flight path
	1085	68	226 Sunday	10:56:08	5885	1539	493.58	14479	14479	0	5356	5356	0	17215	17215	0	5893	5893	0	31694	11249	62 Wrong commands	Central UA ground impact point below flight path
	1091	151	1969 Saturday	17:04:48	2562	2289	1108.03	15768	15768	1	4067	4067	0	18139	18139	0	4969	4969	0	33907	9036	79 Separation of ess	Central UA ground impact point below flight path
	1096	158	1647 Thursday	17:35:19	2591	2438	1158.89	14777	14777	0	5058	5058	0	17215	17215	0	5893	5893	0	31992	10951	49 Wrong commands	Central UA ground impact point below flight path
	1096	158	845 Thursday	17:34:20	4492	2106	1157.25	14777	14777	0	5058	5058	0	17215	17215	0	5893	5893	0	31992	10951	1 Engine Out	No Ground Effect
	11	152	2133 Thursday	17:09:26	2753	2163	1115.72	14777	14777	0	5058	5058	0	17215	17215	0	5893	5893	0	31992	10951	79 Separation of ess	Central UA ground impact point below flight path
	1106	105	858 Sunday	13:40:19	4453	2117	767.20	14380	14380	0	5455	5455	0	16637	16637	0	6471	6471	0	31017	11926	48 Wrong commands	UA approaches Emergency landing site
	1108	29	2434 Tuesday	08:06:38	3401	1882	211.06	16760	16760	0	3075	3075	0	19526	19526	0	3582	3582	0	36286	6657	22 Generator Failure	UA approaches Emergency landing site
	1110	44	431 Thursday	09:10:25	5572	1712	317.36	17157	17157	0	2678	2678	0	19757	19757	0	3351	3351	0	36914	6029	9 Engine Out	UA ground impact tangential to trajectory
	1113	75	665 Sunday	11:27:36	5013	1936	546.00	14479	14479	0	5356	5356	0	17215	17215	0	5893	5893	0	31694	11249	35 Connection Failur	UA ground impact tangential to trajectory
	1119	27	2093 Saturday	07:57:23	2694	2196	195.64	19140	19140	0	695	695	0	22068	22068	0	1040	1040	0	41208	1735	24 Generator Failure	UA ground impact tangential to trajectory
	1126	45	1668 Saturday	09:16:21	2573	2433	327.25	17256	17256	0	2579	2579	0	19179	19179	0	3929	3929	0	36435	6508	78 Degradation of alt	Central UA ground impact point below flight path
	1126	46	3543 Saturday	09:23:03	5972	1378	338.44	17256	17256	0	2579	2579	0	19179	19179	0	3929	3929	0	36435	6508	2 Engine Out	UA approaches Emergency landing site
	1134	159	2870 Sunday	17:41:14	4684	1501	1168.75	14578	14578	0	5257	5257	0	16868	16868	0	6240	6240	0	31446	11497	67 Degradation of lat	Central UA ground impact point on a random Map coordinate
	1134	69	295 Sunday	11:00:39	5801	1594	501.08	14479	14479	0	5356	5356	0	17215	17215	0	5893	5893	0	31694	11249	83 Separation of ess	UA structural desintegration - Debris Impact
	1137	108	2435 Wednesday	13:55:29	3404	1881	792.50	15471	15471	6	4364	4364	0	18139	18139	0	4969	4969	0	33610	9333	18 Engine Fire	UA structural desintegration - Debris Impact
	1147	132	3264 Saturday	15:42:30	5655	1340	970.83	15272	15272	0	4563	4563	0	17793	17793	0	5315	5315	0	33065	9878	31 Connection Failur	UA ground impact tangential to trajectory
	1153	148	3503 Friday	16:53:26	5951	1365	1089.08	15471	15471	0	4364	4364	0	18139	18139	0	4969	4969	0	33610	9333	37 Short Circuit / Ove	Central UA ground impact point below flight path
	1154	186	1418 Saturday	19:38:42	2929	2442	1364.50	17950	17950	0	1885	1885	0	20797	20797	0	2311	2311	0	38747	4196	48 Wrong commands	UA approaches Emergency landing site
	1188	12	155 Friday	06:48:45	5946	1489	81.28	17553	17553	0	2282	2282	0	20335	20335	0	2773	2773	0	37888	5055	29 Connection Failur	UA approaches Emergency landing site
	1194	82	125 Thursday	11:57:50	5964	1470	596.42	16363	16363	0	3472	3472	0	18948	18948	0	4160	4160	0	35311	7632	38 Short Circuit / Ove	Central UA ground impact point below flight path
	1204	27	734 Sunday	07:55:42	4820	2003	192.86	19438	19438	0	397	397	0	22299	22299	0	809	809	0	41737	1206	14 Engine Anomaly	Central UA ground impact point below flight path
	1221	83	2191 Wednesday	12:04:48	2851	2112	608.00	16363	16363	0	3472	3472	1	19064	19064	0	4044	4044	0	35427	7516	9 Engine Out	UA ground impact tangential to trajectory
	1244	39	2575 Friday	08:50:58	3797	1747	284.94	16661	16661	0	3174	3174	0	19988	19988	0	3120	3120	0	36649	6294	56 GCS Override Wr	Central UA ground impact point on a random Map coordinate
	1247	150	2662 Monday	17:01:15	4057	1667	1102.08	14479	14479	15	5356	5356	3	17446	17446	0	5662	5662	0	31925	11018	83 Separation of ess	UA structural desintegration - Debris Impact
	1252	166	1257 Saturday	18:10:10	3296	2393	1216.97	15768	15768	0	4067	4067	0	18139	18139	0	4969	4969	0	33907	9036	62 Wrong commands	Central UA ground impact point below flight path
	1257	155	1686 Thursday	17:22:07	2559	2428	1136.89	14777	14777	15	5058	5058	3	17215	17215	0	5893	5893	0	31992	10951	80 Separation of ess	UA structural desintegration - Debris Impact
	1268	41	2834 Monday	09:00:06	4577	1527	300.19	16958	16958	0	2877	2877	0	19526	19526	0	3582	3582	0	36484	6459	66 Degradation of lat	Central UA ground impact point below flight path
	1268	72	405 Monday	11:14:01	5622	1689	523.39	16661	16661	0	3174	3174	0	19179	19179	0	3929	3929	0	35840	7103	28 Generator Failure	UA ground impact tangential to trajectory
	1273	27	2052 Saturday	07:57:19	2642	2229	195.56	19140	19140	0	695	695	0	22068	22068	0	1040	1040	0	41208	1735	78 Degradation of alt	Central UA ground impact point below flight path
	1278	148	3082 Thursday	16:52:56	5264	1385	1088.22	14777	14777	0	5058	5058	0	17215	17215	0	5893	5893	0	31992	10951	21 Engine Fire	UA structural desintegration - Debris Impact
	1282	73	2647 Monday	11:21:11	4012	1680	535.33	16661	16661	0	3174	3174	0	19179	19179	0	3929	3929	0	35840	7103	19 Engine Fire	Central UA ground impact point below flight path
	1283	121	2877 Tuesday	14:53:26	4705	1497	889.08	15471	15471	12	4364	4364	2	18255	18255	0	4853	4853	0	33726	9217	83 Separation of ess	UA structural desintegration - Debris Impact
	1283	37	2791 Tuesday	08:42:23	4448	1559	270.67	16760	16760	0	3075	3075	0	19526	19526	0	3582	3582	0	36286	6657	38 Short Circuit / Ove	Central UA ground impact point below flight path
	1284	20	146 Wednesday	07:24:04	5952	1483	140.14	17256	17256	0	2579	2579	0	19988	19988	0	3120	3120	0	37244	5699	46 Partial Lock of Flig	UA ground impact in flight direction with deviating trajectory.
	129	18	308 Wednesday	07:15:26	5783	1604	125.75	17256	17256	0	2579	2579	0	19988	19988	0	3120	3120	0	37244	5699	64 Wrong commands	UA structural desintegration - Debris Impact
	1292	168	3555 Thursday	18:21:50	5977	1383	1236.39	14777	14777	0	5058	5058	0	17215	17215	0	5893	5893	0	31992	10951	17 Engine Fire	Central UA ground impact point below flight path
	1294	117	3011 Saturday	14:35:57	5082	1417	859.92	15272	15272	0	4563	4563	0	17793	17793	0	5315	5315	0	33065	9878	26 Generator Failure	Central UA ground impact point below flight path
	1297	45	866 Tuesday	09:15:21	4429	2124	325.61	16760	16760	0	3075	3075	0	19526	19526	0	3582	3582	0	36286	6657	17 Engine Fire	Central UA ground impact point below flight path
	1305	148	596 Wednesday	16:49:53	5196	1869	1083.14	14975	14975	0	4860	4860	0	17215	17215	0	5893	5893	0	32190	10753	66 Degradation of lat	Central UA ground impact point below flight path
	1312	139	3023 Wednesday	16:13:07	5114	1411	1021.86	14975	14975	0	4860	4860	0	17215	17215	0	5893	5893	0	32190	10753	21 Engine Fire	UA structural desintegration - Debris Impact
	1312	80	1904 Wednesday	11:51:12	2524	2331	585.33	16363	16363	19	3472	3472	3	19064	19064	0	4044	4044	0	35427	7516	83 Separation of ess	UA structural desintegration - Debris Impact
	1317	183	451 Monday	19:24:15	5531	1731	1340.44	18149	18149	1	1686	1686	0	21028	21028	0	2080	2080	0	39177	3766	28 Generator Failure	UA ground impact tangential to trajectory
	1318	38	862 Tuesday	08:44:26	4441	2121	274.08	16760	16760	7	3075	3075	2	19526	19526	0	3582	3582	0	36286	6657	21 Engine Fire	UA structural desintegration - Debris Impact
	1335	32	2177 Friday	08:19:33	2826	2125	232.61	16661	16661	0	3174	3174	0	19988	19988	0	3120	3120	0	36649	6294	22 Generator Failure	UA approaches Emergency landing site
	1338	21	2402 Monday	07:31:15	3318	1913	152.11	17157	17157	2	2678	2678	0	19872	19872	0	3236	3236	0	37029	5914	73 Degradation of alt	Central UA ground impact point below flight path
	1346	184	2014 Tuesday	19:30:35	2601	2258	1351.00	18149	18149	1	1686	1686	0	21143	21143	0	1965	1965	0	39292	3651	54 Wrong commands	Central UA ground impact point below flight path
	135	142	1081 Tuesday	16:23:58	3782	2294	1039.97	14975	14975	0	4860	4860	0	17446	17446	0	5662	5662	0	32421	10522	10 Engine Anomaly	UA approaches Emergency landing site
	1370	7	900 Friday	06:27:36	4326	2154	46.00	17553	17553	0	2282	2282	0	20335	20335	0	2773	2773	0	37888	5055	79 Separation of ess	Central UA ground impact point below flight path
	1390	138	699 Thursday	16:05:51	4919	1969	1009.75	14777	14777	0	5058	5058	0	17215	17215	0	5893	5893	0	31992	10951	81 Separation of ess	Central UA ground impact point below flight path
	146	106	2326 Saturday	13:46:32	3131	1986	777.56	15272	15272	0	4563	4563	0	17793	17793	0	5315	5315	0	33065	9878	70 Degradation of lat	Central UA ground impact point on a random Map coordinate
	163	5	355 Tuesday	06:18:05	5710	1644	30.17	17355	17355	0	2480	2480	0	19988	19988	0	3120	3120	0	37343	5600	65 Degradation of lat	UA approaches Emergency landing site
	163	80	2149 Tuesday	11:51:30	2778	2149	585.83	16264	16264	0	3571	3571	0	19179	19179	0	3929	3929	0	35443	7500	60 Wrong commands	Central UA ground impact point below flight path
	165	183	3087 Thursday	19:27:29	5277	1383	1345.83	18049	18049	0	1786	1786	0	20912	20912	0	2196	2196	0	38961	3982	80 Separation of ess	UA structural desintegration - Debris Impact
	168	137	1486 Sunday	16:02:23	2804	2450	1004.00	14578	14578	0	5257	5257	0	16868	16868	0	6240	6240	0	31446	11497	17 Engine Fire	Central UA ground impact point below flight path
	171	91	1529 Wednesday	12:39:18	2735	2451	665.53	16363	16363	17	3472	3472	1	19064	19064	0	4044	4044	0	35427	7516	83 Separation of ess	UA structural desintegration - Debris Impact
	176	184	221 Monday	19:28:24	5890	1536	1347.33	18149	18149	0	1686	1686	0	21028	21028	0	2080	2080	0	39177	3766	9 Engine Out	UA ground impact tangential to trajectory
	182	174	881 Sunday	18:45:02	4383	2138	1275.08	14578	14578	18	5257	5257	1	16868	16868	0	6240	6240	0	31446	11497	80 Separation of ess	UA structural desintegration - Debris Impact
	196	118	2305 Sunday	14:39:30	3083	2006	865.83	14380	14380	0	5455	5455	0	16637	16637	0	6471	6471	0	31017	11926	41 Partial Lock of Flig	UA approaches Emergency landing site
	199	70	3420 Wednesday	11:08:53	5880	1345	514.83	16363	16363	0	3472	3472	0	19064	19064	0	4044	4044	0	35427	7516	35 Connection Failur	UA ground impact tangential to trajectory
	202	107	1647 Saturday	13:50:07	2591	2438	783.53	15272	15272	20	4563	4563	2	17793	17793	0	5315	5315	0	33065	9878	21 Engine Fire	UA structural desintegration - Debris Impact
	209	183	1267 Saturday	19:25:16	3271	2397	1342.11	17950	17950	0	1885	1885	0	20797	20797	0	2311	2311	0	38747	4196	68 Degradation of lat	UA approaches Emergency landing site
	227	106	2679 Wednesday	13:46:58	4108	1652	778.28	15471	15471	0	4364	4364	0	18139	18139	0	4969	4969	0	33610	9333	17 Engine Fire	Central UA ground impact point below flight path
	237	190	292 Saturday	19:54:58	5805	1591	1391.64	17950	17950	0	1885	1885	0	20797	20797	0	2311	2311	0	38747	4196	44 Partial Lock of Flig	UA approaches Emergency landing site
	242	37	2655 Thursday	08:42:13	4036	1673	270.39	17157	17157	0	2678	2678	0	19757	19757	0	3351	3351	0	36914	6029	57 GCS Override Wr	Central UA ground impact point below flight path
	249	32	3576 Thursday	08:21:16	5984	1391	235.47	17157	17157	0	2678	2678	0	19757	19757	0	3351	3351	3	36914	6029	83 Separation of ess	UA structural desintegration - Debris Impact
	275	58	1077 Tuesday	10:13:02	3793	2291	421.72	16264	16264	0	3571	3571	0	19179	19179	0	3929	3929	0	35443	7500	19 Engine Fire	Central UA ground impact point below flight path
	286	75	230 Saturday	11:27:03	5880	1542	545.11	14082	14082	0	5753	5753	0	16406	16406	0	6702	6702	0	30488	12455	79 Separation of ess	Central UA ground impact point below flight path
	295	31	220 Monday	08:12:45	5891	1535	221.25	16958	16958	0	2877	2877	0	19526	19526	0	3582	3582	0	36484	6459	79 Separation of ess	Central UA ground impact point below flight path
	295	76	1087 Monday	11:32:32	3764	2298	554.22	16661	16661	1	3174	3174	0	19179	19179	0	3929	3929	0	35840	7103	12 Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
	321	30	84 Saturday	08:08:10	5981	1445	213.61	17256	17256	0	2579	2579	0	19179	19179	0	3929	3929	0	36435	6508	80 Separation of ess	UA structural desintegration - Debris Impact
	326	162	1636 Thursday	17:52:59	2602	2440	1188.31	14777	14777	0	5058	5058	0	17215	17215	0	5893	5893	0	31992	10951	73 Degradation of alt	Central UA ground impact point below flight path
	329	164	3009 Sunday	18:03:29	5076	1418	1205.83	14578	14578	0	5257	5257	0	16868	16868	0	6240	6240	0	31446	11497	78 Degradation of alt	Central UA ground impact point below flight path
	332	4	3249 Wednesday	06:17:14	5628	1342	28.72	17256	17256	0	2579	2579	0	19988	19988	13	3120	3120	0	37244	5699	82 Separation of ess	UA structural desintegration - Debris Impact
	333	118	783 Thursday	14:37:37	4677	2049	862.72	15372	15372	1	4463	4463	0	18370	18370	0	4738	4738	0	33742	9201	28 Generator Failure	UA ground impact tangential to trajectory
	334	160	1254 Friday	17:43:40	3304	2391	1172.81	15471	15471	24	4364	4364	3	18139	18139	0	4969	4969	0	33610	9333	83 Separation of ess	UA structural desintegration - Debris Impact
	337	146	391 Monday	16:40:48	5647	1676	1068.00	14479	14479	0	5356	5356	0	17446	17446	0	5662	5662	0	31925	11018	82 Separation of ess	UA structural desintegration - Debris Impact
	345	54	2719 Tuesday	09:57:23	4230	1618	395.64	16760	16760	0	3075	3075	2	19526	19526	0	3582	3582	0	36286	6657	81 Separation of ess	Central UA ground impact point below flight path
	346	128	2011 Wednesday	15:23:17	2598	2260	938.83	15471	15471	1	4364	4364	0	18139	18139	0	4969	4969	0	33610	9333	31 Connection Failur	UA ground impact tangential to trajectory
	349	140	3010 Saturday	16:17:31	5079	1417	1029.20	15768	15768	0	4067	4067	0	18139	18139	0	4969	4969	0	33907	9036	82 Separation of ess	UA structural desintegration - Debris Impact
	349	32	2313 Saturday	08:19:44	3101	1999	232.89	17256	17256	7	2579	2579	4	19179	19179	0	3929	3929	0	36435	6508	21 Engine Fire	UA structural desintegration - Debris Impact
	350	111	2179 Sunday	14:08:26	2829	2123	814.06	14380	14380	0	5455	5455	0	16637	16637	0	6471	6471	0	31017	11926	32 Connection Failur	UA approaches Emergency landing site
	351	17	3147 Monday	07:14:30	5418	1363	124.19	17157	17157	0	2678	2678	0	19872	19871	0	3236	3236	0	37028	5914	17 Engine Fire	Central UA ground impact point below flight path
	355	185	3048 Friday	19:36:17	5179	1399	1360.47	18049	18049	0	1786	1786	0	21143	21143	0	1965	1965	0	39192	3751	83 Separation of ess	UA structural desintegration - Debris Impact
	360	142	429 Wednesday	16:23:10	5576	1710	1038.64	14975	14975	0	4860	4860	0	17215	17215	0	5893	5893	0	32190	10753	79 Separation of ess	Central UA ground impact point below flight path
	366	166	3526 Tuesday	18:12:57	5964	1372	1221.61	14975	14975	0	4860	4860	0	17446	17446	0	5662	5662	0	32421	10522	33 Connection Failur	Central UA ground impact point below flight path
	369	9	2993 Friday	06:38:59	5033	1426	65.00	17553	17553	0	2282	2282	0	20335	20335	0	2773	2773	0	37888	5055	61 Wrong commands	UA structural desintegration - Debris Impact
	371	62	2614 Sunday	10:32:34	3913	1710	454.30	14479	14479	0	5356	5356	0	17215	17215	0	5893	5893	0	31694	11249	62 Wrong commands	Central UA ground impact point below flight path
	377	175	2784 Saturday	18:51:48	4427	1565	1286.33	15768	15768	0	4067	4067	0	18139	18139	0	4969	4969	0	33907	9036	67 Degradation of lat	Central UA ground impact point on a random Map coordinate
	379	177	1277 Monday	18:58:47	3246	2401	1297.97	18149	18149	21	1686	1686	1	21028	21028	0	2080	2080	0	39177	3766	80 Separation of ess	UA structural desintegration - Debris Impact
	381	148	2348 Wednesday	16:52:01	3183	1965	1086.72	14975	14975	12	4860	4860	2	17215	17215	0	5893	5893	0	32190	10753	83 Separation of ess	UA structural desintegration - Debris Impact
	393	73	1574 Monday	11:19:52	2673	2449	533.14	16661	16661	6	3174	3174	5	19179	19179	0	3929	3929	0	35840	7103	83 Separation of ess	UA structural desintegration - Debris Impact
	397	168	1938 Friday	18:19:51	2541	2310	1233.08	15471	15471	0	4364	4364	0	18139	18139	0	4969	4969	0	33610	9333	12 Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
	40	140	972 Friday	16:15:01	4107	2214	1025.03	15471	15471	0	4364	4364	0	18139	18139	0	4969	4969	0	33610	9333	36 Short Circuit / Ove	Central UA ground impact point below flight path
	406	99	2865 Sunday	13:16:16	4669	1505	727.14	14380	14380	0	5455	5455	0	16637	16637	0	6471	6471	0	31017	11926	53 Wrong commands	Central UA ground impact point below flight path
	412	138	3158 Saturday	16:08:51	5443	1360	1014.78	15768	15768	0	4067	4067	0	18139	18139	0	4969	4969	0	33907	9036	78 Degradation of alt	Central UA ground impact point below flight path
	414	181	1836 Monday	19:17:07	2508	2369	1328.56	18149	18149	0	1686	1686	0	21028	21028	0	2080	2080	0	39177	3766	29 Connection Failur	UA approaches Emergency landing site
	419	177	1807 Saturday	18:59:26	2509	2383	1299.06	17950	17950	0	1885	1885	0	20797	20797	0	2311	2311	0	38747	4196	2 Engine Out	UA approaches Emergency landing site
	442	37	2071 Monday	08:41:30	2665	2214	269.19	16958	16958	17	2877	2877	2	19526	19526	0	3582	3582	0	36484	6459	64 Wrong commands	UA structural desintegration - Debris Impact
	445	50	1467 Thursday	09:38:11	2837	2448	363.64	17157	17157	0	2678	2678	0	19757	19757	0	3351	3351	0	36914	6029	3 Engine Out	Central UA ground impact point below flight path
	446	59	2260 Friday	10:18:54	2985	2049	431.50	15868	15868	0	3967	3967	0	18601	18601	0	4507	4507	0	34469	8474	37 Short Circuit / Ove	Central UA ground impact point below flight path
	452	102	1019 Thursday	13:27:15	3965	2250	745.44	15372	15372	0	4463	4463	0	18370	18370	0	4738	4738	0	33742	9201	32 Connection Failur	UA approaches Emergency landing site
	458	185	1621 Wednesday	19:34:32	2617	2442	1357.56	18049	18049	0	1786	1786	0	21028	21028	0	2080	2080	0	39077	3866	72 Degradation of alt	UA approaches Emergency landing site
	460	65	3105 Friday	10:46:25	5320	1376	477.39	15868	15868	0	3967	3967	0	18601	18601	0	4507	4507	0	34469	8474	75 Degradation of alt	UA approaches Emergency landing site
	462	29	586 Sunday	08:04:22	5221	1859	207.28	17950	17950	0	1885	1885	0	20103	20103	0	3005	3005	0	38053	4890	72 Degradation of alt	UA approaches Emergency landing site
	462	74	528 Sunday	11:23:00	5362	1803	538.36	14479	14479	0	5356	5356	0	17215	17215	0	5893	5893	0	31694	11249	59 GCS Override Wr	Central UA ground impact point on a random Map coordinate
	468	177	1059 Saturday	18:58:30	3846	2279	1297.53	17950	17950	33	1885	1885	0	20797	20797	0	2311	2311	0	38747	4196	80 Separation of ess	UA structural desintegration - Debris Impact
	475	58	1158 Saturday	10:13:07	3561	2342	421.89	14082	14082	0	5753	5753	0	16406	16406	0	6702	6702	0	30488	12455	38 Short Circuit / Ove	Central UA ground impact point below flight path
	487	87	1881 Thursday	12:22:05	2516	2345	636.81	16363	16363	0	3472	3472	0	18948	18948	0	4160	4160	0	35311	7632	59 GCS Override Wr	Central UA ground impact point on a random Map coordinate
	490	177	2921 Sunday	19:00:48	4832	1468	1301.33	17851	17851	0	1984	1984	0	20335	20335	0	2773	2773	0	38186	4757	17 Engine Fire	Central UA ground impact point below flight path
	497	82	1090 Sunday	11:59:02	3755	2300	598.39	14479	14479	0	5356	5356	0	17215	17215	0	5893	5893	0	31694	11249	6 Engine Out	UA approaches Emergency landing site
	5	7	2829 Friday	06:29:57	4562	1531	49.94	17553	17553	0	2282	2282	0	20335	20335	0	2773	2773	0	37888	5055	78 Degradation of alt	Central UA ground impact point below flight path
	52	15	266 Wednesday	07:02:09	5839	1570	103.58	17256	17256	0	2579	2579	0	19988	19988	0	3120	3120	0	37244	5699	71 Degradation of lat	Central UA ground impact point on a random Map coordinate
	53	63	2139 Thursday	10:36:24	2762	2158	460.69	16363	16363	3	3472	3472	5	18948	18948	0	4160	4160	0	35311	7632	83 Separation of ess	UA structural desintegration - Debris Impact
	530	151	3532 Friday	17:06:44	5967	1374	1111.22	15471	15471	0	4364	4364	0	18139	18139	0	4969	4969	0	33610	9333	13 Engine Anomaly	UA approaches Emergency landing site
	532	180	1455 Sunday	19:12:14	2859	2447	1320.42	17851	17851	0	1984	1984	0	20335	20335	0	2773	2773	0	38186	4757	36 Short Circuit / Ove	Central UA ground impact point below flight path
	532	56	3399 Sunday	10:07:02	5856	1342	411.75	14479	14479	0	5356	5356	0	17215	17214	0	5893	5893	0	31693	11249	78 Degradation of alt	Central UA ground impact point below flight path
	533	175	2336 Monday	18:51:15	3155	1977	1285.42	14479	14479	0	5356	5356	0	17446	17446	0	5662	5662	0	31925	11018	5 Engine Out	No Ground Effect
	548	35	1065 Tuesday	08:31:27	3829	2283	252.42	16760	16760	0	3075	3075	0	19526	19526	0	3582	3582	0	36286	6657	10 Engine Anomaly	UA approaches Emergency landing site
	550	93	1395 Thursday	12:47:59	2976	2437	679.97	16363	16363	0	3472	3472	0	18948	18948	0	4160	4160	0	35311	7632	60 Wrong commands	Central UA ground impact point below flight path
	566	55	641 Saturday	09:59:15	5078	1913	398.75	14082	14082	0	5753	5753	0	16406	16406	0	6702	6702	0	30488	12455	11 Engine Anomaly	Central UA ground impact point below flight path
	575	162	454 Monday	17:51:32	5525	1733	1185.89	14479	14479	0	5356	5356	0	17446	17446	0	5662	5662	0	31925	11018	1 Engine Out	No Ground Effect
	575	48	2811 Monday	09:31:00	4509	1544	351.67	16958	16958	0	2877	2877	0	19526	19526	0	3582	3582	0	36484	6459	1 Engine Out	No Ground Effect
	579	15	2236 Friday	07:04:34	2936	2071	107.61	17553	17553	0	2282	2282	0	20335	20335	0	2773	2773	0	37888	5055	78 Degradation of alt	Central UA ground impact point below flight path
	583	186	358 Tuesday	19:37:24	5705	1647	1362.33	18149	18149	0	1686	1686	0	21143	21143	0	1965	1965	0	39292	3651	20 Engine Fire	UA structural desintegration - Debris Impact
	584	21	2253 Wednesday	07:31:05	2971	2055	151.81	17256	17256	0	2579	2579	0	19988	19988	0	3120	3120	0	37244	5699	40 Short Circuit / Ove	Central UA ground impact point below flight path
	586	98	378 Friday	13:08:48	5671	1664	714.69	15372	15372	0	4463	4463	0	17562	17562	0	5546	5546	0	32934	10009	26 Generator Failure	Central UA ground impact point below flight path
	587	34	2626 Saturday	08:28:56	3949	1699	248.25	17256	17256	0	2579	2579	0	19179	19179	0	3929	3929	0	36435	6508	11 Engine Anomaly	Central UA ground impact point below flight path
	596	16	3011 Monday	07:09:56	5082	1417	116.56	17157	17157	0	2678	2678	0	19872	19872	0	3236	3236	0	37029	5914	10 Engine Anomaly	UA approaches Emergency landing site
	627	66	2997 Thursday	10:50:43	5044	1424	484.53	16363	16363	0	3472	3472	0	18948	18948	0	4160	4160	0	35311	7632	18 Engine Fire	UA structural desintegration - Debris Impact
	633	97	1845 Wednesday	13:06:11	2509	2364	710.33	15471	15471	0	4364	4364	0	18139	18138	0	4969	4969	0	33609	9333	72 Degradation of alt	UA approaches Emergency landing site
	643	1	2079 Saturday	06:02:33	2676	2207	4.25	19140	19140	1	695	695	0	22068	22068	0	1040	1040	0	41208	1735	78 Degradation of alt	Central UA ground impact point below flight path
	650	84	412 Saturday	12:07:02	5608	1695	611.72	14082	14082	0	5753	5753	1	16406	16406	0	6702	6702	0	30488	12455	71 Degradation of lat	Central UA ground impact point on a random Map coordinate
	667	133	1702 Tuesday	15:45:00	2548	2423	975.00	15471	15471	1	4364	4364	0	18255	18255	0	4853	4853	0	33726	9217	23 Generator Failure	Central UA ground impact point below flight path
	67	70	3597 Thursday	11:09:07	5988	1400	515.19	16363	16363	0	3472	3472	0	18948	18948	0	4160	4160	0	35311	7632	79 Separation of ess	Central UA ground impact point below flight path

670	130	1768	Friday	15:31:50	2516	2400	953.06	15372	15372	0	4463	4463	0	17562	17562	0	5546	5546	0	32934	10009	75	Degradation of alt	UA approaches Emergency landing site
691	97	1777	Friday	13:06:06	2514	2396	710.19	15372	15372	0	4463	4463	0	17562	17562	0	5546	5546	0	32934	10009	28	Generator Failure	UA ground impact tangential to trajectory
692	27	3193	Saturday	07:58:43	5518	1351	197.89	19140	19140	0	695	695	0	22068	22068	0	1040	1040	0	41208	1735	65	Degradation of lat	UA approaches Emergency landing site
700	186	2640	Sunday	19:40:11	3991	1687	1367.00	17851	17851	1	1984	1984	0	20335	20335	0	2773	2773	0	38186	4757	9	Engine Out	UA ground impact tangential to trajectory
708	88	373	Monday	12:24:39	5679	1660	641.08	16661	16661	0	3174	3174	0	19179	19179	0	3929	3929	0	35840	7103	28	Generator Failure	UA ground impact tangential to trajectory
712	120	893	Friday	14:46:36	4347	2148	877.67	15372	15372	0	4463	4463	0	17562	17562	0	5546	5546	0	32934	10009	9	Engine Out	UA ground impact tangential to trajectory
714	51	204	Sunday	09:41:03	5906	1523	368.42	17950	17950	0	1885	1885	0	20103	20103	0	3005	3005	0	38053	4890	59	GCS Override Wr	Central UA ground impact point on a random Map coordinate
718	148	3367	Thursday	16:53:16	5816	1339	1088.81	14777	14777	0	5058	5058	0	17215	17214	0	5893	5893	0	31991	10951	35	Connection Failur	UA ground impact tangential to trajectory
720	41	2956	Saturday	09:00:15	4931	1447	300.44	17256	17256	0	2579	2579	0	19179	19179	0	3929	3929	0	36435	6508	58	GCS Override Wr	Central UA ground impact point on a random Map coordinate
721	35	2627	Sunday	08:33:21	3952	1699	255.61	17950	17950	15	1885	1885	2	20103	20103	0	3005	3005	0	38053	4890	61	Wrong commands	UA structural desintegration - Debris Impact
723	99	1479	Tuesday	13:14:34	2816	2449	724.30	15471	15471	10	4364	4364	7	18255	18255	0	4853	4853	0	33726	9217	20	Engine Fire	UA structural desintegration - Debris Impact
729	179	2324	Monday	19:08:53	3127	1988	1314.83	18149	18149	0	1686	1686	0	21028	21028	0	2080	2080	0	39177	3766	17	Engine Fire	Central UA ground impact point below flight path
734	129	3425	Saturday	15:29:27	5885	1346	949.08	15272	15272	0	4563	4563	0	17793	17793	0	5315	5315	0	33065	9878	81	Separation of ess	Central UA ground impact point below flight path
744	71	2076	Tuesday	11:11:40	2672	2210	519.44	16264	16264	0	3571	3571	0	19179	19179	0	3929	3929	0	35443	7500	79	Separation of ess	Central UA ground impact point below flight path
750	141	1923	Monday	16:20:35	2533	2320	1034.33	14479	14479	0	5356	5356	0	17446	17446	0	5662	5662	0	31925	11018	70	Degradation of lat	Central UA ground impact point on a random Map coordinate
758	168	905	Tuesday	18:18:34	4311	2158	1230.97	14975	14975	9	4860	4860	3	17446	17446	0	5662	5662	0	32421	10522	64	Wrong commands	UA structural desintegration - Debris Impact
761	131	111	Friday	15:34:13	5971	1461	957.03	15372	15372	0	4463	4463	0	17562	17562	0	5546	5546	0	32934	10009	8	Engine Out	UA ground impact tangential to trajectory
763	160	3550	Sunday	17:46:29	5975	1381	1177.50	14578	14578	0	5257	5257	0	16868	16868	0	6240	6240	0	31446	11497	13	Engine Anomaly	UA approaches Emergency landing site
77	4	341	Sunday	06:13:39	5733	1632	22.78	19438	19438	0	397	397	0	22299	22298	0	809	809	0	41736	1206	65	Degradation of lat	UA approaches Emergency landing site
77	75	787	Sunday	11:27:44	4665	2053	546.25	14479	14479	0	5356	5356	0	17215	17215	0	5893	5893	0	31694	11249	81	Separation of ess	Central UA ground impact point below flight path
770	13	373	Sunday	06:53:26	5679	1660	89.08	19438	19438	0	397	397	0	22299	22299	0	809	809	0	41737	1206	23	Generator Failure	Central UA ground impact point below flight path
774	47	1913	Thursday	09:25:28	2528	2326	342.47	17157	17157	0	2678	2678	0	19757	19757	0	3351	3351	0	36914	6029	79	Separation of ess	Central UA ground impact point below flight path
780	186	3184	Wednesday	19:40:52	5499	1353	1368.11	18049	18049	0	1786	1786	0	21028	21028	0	2080	2080	0	39077	3866	1	Engine Out	No Ground Effect
795	63	2547	Thursday	10:36:55	3716	1773	461.53	16363	16363	0	3472	3472	0	18948	18947	0	4160	4160	0	35310	7632	11	Engine Anomaly	Central UA ground impact point below flight path
80	92	1598	Wednesday	12:43:49	2643	2446	673.03	16363	16363	0	3472	3472	0	19064	19064	0	4044	4044	0	35427	7516	2	Engine Out	UA approaches Emergency landing site
802	17	389	Thursday	07:11:07	5651	1674	118.56	17256	17256	1	2579	2579	0	20103	20103	0	3005	3005	0	37359	5584	31	Connection Failur	UA ground impact tangential to trajectory
804	37	2112	Saturday	08:41:34	2721	2180	269.28	17256	17256	0	2579	2579	0	19179	19179	0	3929	3929	0	36435	6508	17	Engine Fire	Central UA ground impact point below flight path
812	32	2068	Sunday	08:19:25	2662	2216	232.39	17950	17950	1	1885	1885	0	20103	20103	0	3005	3005	0	38053	4890	42	Partial Lock of Flig	Central UA ground impact point below flight path
815	30	1537	Wednesday	08:09:56	2724	2451	216.58	16958	16958	0	2877	2877	0	19526	19526	0	3582	3582	0	36484	6459	72	Degradation of alt	UA approaches Emergency landing site
823	26	2894	Thursday	07:53:57	4754	1485	189.92	17256	17256	0	2579	2579	0	20103	20103	0	3005	3005	0	37359	5584	40	Short Circuit / Ove	Central UA ground impact point below flight path
85	113	210	Monday	14:14:51	5901	1528	824.75	15471	15471	0	4364	4364	0	18255	18255	0	4853	4853	0	33726	9217	74	Degradation of alt	Central UA ground impact point below flight path
858	159	819	Thursday	17:38:44	4570	2082	1164.56	14777	14777	7	5058	5058	3	17215	17215	0	5893	5893	0	31992	10951	83	Separation of ess	UA structural desintegration - Debris Impact
861	104	1863	Sunday	13:37:08	2512	2355	761.89	14380	14380	0	5455	5455	0	16637	16637	0	6471	6471	0	31017	11926	25	Generator Failure	UA approaches Emergency landing site
876	68	2767	Monday	10:59:15	4376	1578	498.78	16661	16661	0	3174	3174	0	19179	19179	0	3929	3929	0	35840	7103	59	GCS Override Wr	Central UA ground impact point on a random Map coordinate
885	133	1389	Wednesday	15:44:36	2989	2436	974.36	15471	15471	29	4364	4364	2	18139	18139	0	4969	4969	0	33610	9333	18	Engine Fire	UA structural desintegration - Debris Impact
885	48	514	Wednesday	09:28:10	5394	1790	346.97	16958	16958	0	2877	2877	0	19526	19526	0	3582	3582	0	36484	6459	32	Connection Failur	UA approaches Emergency landing site
886	35	1757	Thursday	08:32:17	2520	2404	253.83	17157	17157	32	2678	2678	2	19757	19757	0	3351	3351	0	36914	6029	80	Separation of ess	UA structural desintegration - Debris Impact
886	37	264	Thursday	08:39:18	5841	1569	265.50	17157	17157	0	2678	2678	0	19757	19757	0	3351	3351	0	36914	6029	28	Generator Failure	UA ground impact tangential to trajectory
898	31	1986	Tuesday	08:14:54	2576	2278	224.86	16760	16760	0	3075	3075	0	19526	19526	0	3582	3582	0	36286	6657	65	Degradation of lat	UA approaches Emergency landing site
901	190	2235	Friday	19:57:22	2934	2072	1395.61	18049	18049	0	1786	1786	0	21143	21143	0	1965	1965	0	39192	3751	47	Partial Lock of Flig	UA ground impact in flight direction with deviating trajectory.
903	170	2632	Sunday	18:29:32	3967	1694	1249.22	14578	14578	0	5257	5257	0	16868	16868	0	6240	6240	0	31446	11497	66	Degradation of lat	Central UA ground impact point below flight path
906	142	2685	Wednesday	16:25:57	4127	1647	1043.25	14975	14975	11	4860	4860	0	17215	17215	0	5893	5893	0	32190	10753	18	Engine Fire	UA structural desintegration - Debris Impact
937	107	1742	Saturday	13:50:14	2526	2410	783.72	15272	15272	0	4563	4563	0	17793	17793	0	5315	5315	0	33065	9878	49	Wrong commands	Central UA ground impact point below flight path
950	135	31	Friday	15:51:46	5990	1416	986.30	15372	15372	0	4463	4463	0	17562	17562	0	5546	5546	0	32934	10009	22	Generator Failure	UA approaches Emergency landing site
959	117	1897	Sunday	14:34:35	2521	2336	857.64	14380	14380	21	5455	5455	3	16637	16636	0	6471	6471	0	31016	11926	18	Engine Fire	UA structural desintegration - Debris Impact
966	110	2124	Sunday	14:03:57	2739	2170	806.58	14380	14380	0	5455	5455	0	16637	16637	0	6471	6471	0	31017	11926	56	GCS Override Wr	Central UA ground impact point on a random Map coordinate
973	111	888	Sunday	14:06:50	4362	2144	811.42	14380	14380	0	5455	5455	0	16637	16637	0	6471	6471	0	31017	11926	23	Generator Failure	Central UA ground impact point below flight path
976	1	1766	Wednesday	06:02:09	2517	2401	3.61	17256	17256	0	2579	2579	0	19988	19988	0	3120	3120	0	37244	5699	49	Wrong commands	Central UA ground impact point below flight path
990	119	1110	Wednesday	14:42:27	3697	2313	870.75	15471	15471	0	4364	4364	0	18139	18139	0	4969	4969	0	33610	9333	79	Separation of ess	Central UA ground impact point below flight path
991	6	1049	Thursday	06:23:22	3876	2272	38.94	17256	17256	0	2579	2579	0	20103	20103	0	3005	3005	0	37359	5584	48	Wrong commands	UA approaches Emergency landing site
997	24	963	Wednesday	07:42:44	4134	2207	171.25	17256	17256	0	2579	2579	0	19988	19988	0	3120	3120	0	37244	5699	77	Degradation of alt	Central UA ground impact point below flight path

O.R.C.U.S. 02.00 - tTest of the Simulation

nProbes	200
nEvents	202
nEvents_cor	186
tMission	14
x_cross_ATB	2.21
x_cross_OTW	0.38
x_cross_TOT	2.59
s2ATB	4.414823095
sATB	2.101148042
tATB	14.8074756
s2OTW	0.130802995
sOTW	0.361666966
tOTW	14.46797929
s2TOT	6.037743821
sTOT	2.45718209
tTOT	14.84900532

UADay/Prot	HIT_TOT_ATB	HIT_TOT_OTW
5	0	0
11	0	0
40	0	0
52	0	0
53	3	5
67	0	0
77	0	0
77	0	0
80	0	0
85	0	0
102	0	0
103	3	3
106	0	0
129	0	0
135	0	0
146	0	0
163	0	0
163	0	0
165	0	0
168	0	0
171	17	1
176	0	0
182	18	1
196	0	0
199	0	0
202	20	2
209	0	0
227	0	0
237	0	0
242	0	0
249	0	3
275	0	0
286	0	0
295	0	0
295	1	0
321	0	0
326	0	0
329	0	0
332	13	0
333	1	0
334	24	3
337	0	0
345	0	2
346	1	0
349	0	0
349	7	4
350	0	0
351	0	0
355	0	0
360	0	0
366	0	0
369	0	0
371	0	0
377	0	0
379	21	1
381	12	2
393	6	5
397	0	0
406	0	0
412	0	0
414	0	0
419	0	0
442	17	2
445	0	0
446	0	0
452	0	0
458	0	0
460	0	0
462	0	0
462	0	0
468	33	0
475	0	0
487	0	0
490	0	0
497	0	0
530	0	0
532	0	0
532	0	0
533	0	0
548	0	0
550	0	0
566	0	0
575	0	0
575	0	0
579	0	0
583	0	0
584	0	0
586	0	0
587	0	0
596	0	0
627	0	0
633	0	0
643	1	0
650	0	1
667	1	0
670	0	0
691	0	0
692	0	0
700	1	0
708	0	0
712	0	0
714	0	0
718	0	0
720	0	0
721	15	2
723	10	7
729	0	0
734	0	0
744	0	0
750	0	0
758	9	3
761	0	0
763	0	0
770	0	0
774	0	0
780	0	0
795	0	0
802	1	0
804	0	0
812	1	0
815	0	0
823	0	0
858	7	3
861	0	0
876	0	0
885	29	2
885	0	0
886	32	2
886	0	0
898	0	0
901	0	0
903	0	0
906	11	0
937	0	0
950	0	0
959	21	3
966	0	0
973	0	0
976	0	0
990	0	0
991	0	0
997	0	0
1001	0	0
1005	3	0
1013	0	0
1017	0	0
1023	0	0
1024	0	0
1044	0	0
1053	0	0
1054	0	0
1056	8	3
1056	0	0
1068	16	2
1077	0	0
1079	0	0
1085	0	0
1091	1	0
1096	0	0
1096	0	0
1106	0	0
1108	0	0
1110	0	0
1113	0	0
1119	0	0
1126	0	0
1126	0	0
1134	0	0
1134	0	0
1137	6	0
1147	0	0
1153	0	0
1154	0	0
1188	0	0
1194	0	0
1204	0	0
1221	0	1
1244	0	0
1247	15	3
1252	0	0
1257	15	3
1268	0	0
1268	0	0
1273	0	0
1278	0	0
1282	0	0
1283	12	2
1283	0	0
1284	0	0
1292	0	0
1294	0	0
1297	0	0
1305	0	0
1312	0	0
1312	19	3
1317	1	0
1318	7	2
1335	0	0
1338	2	0
1346	1	0
1370	0	0
1390	0	0

UADay/Prot cor	HIT_TOT_mean_ATB	HIT_TOT_mean_OTW	HIT_TOT_mean_ATB/Fh	HIT_TOT_mean_OTW/Fh	x_i-x_cross ATB	x_i-x_cross OTW	(x_i-x_cross ATB)^2	(x_i-x_cross OTW)^2
5	0	0	0	0	-2.21	-0.38	4.8841	0.1444
11	0	0	0	0	-2.21	-0.38	4.8841	0.1444
40	0	0	0	0	-2.21	-0.38	4.8841	0.1444
52	0	0	0	0	-2.21	-0.38	4.8841	0.1444
53	3	5	0.214285714	0.357142857	-1.995714286	-0.022857143	3.98287551	0.000522449
67	0	0	0	0	-2.21	-0.38	4.8841	0.1444
77	0	0	0	0	-2.21	-0.38	4.8841	0.1444
80	0	0	0	0	-2.21	-0.38	4.8841	0.1444
85	0	0	0	0	-2.21	-0.38	4.8841	0.1444
102	0	0	0	0	-2.21	-0.38	4.8841	0.1444
103	3	3	0.214285714	0.214285714	-1.995714286	-0.165714286	3.98287551	0.027461224
106	0	0	0	0	-2.21	-0.38	4.8841	0.1444
129	0	0	0	0	-2.21	-0.38	4.8841	0.1444
135	0	0	0	0	-2.21	-0.38	4.8841	0.1444
146	0	0	0	0	-2.21	-0.38	4.8841	0.1444
163	0	0	0	0	-2.21	-0.38	4.8841	0.1444
165	0	0	0	0	-2.21	-0.38	4.8841	0.1444
168	0	0	0	0	-2.21	-0.38	4.8841	0.1444
171	17	1	1.214285714	0.071428571	-0.995714286	-0.308571429	0.991446939	0.095216327
176	0	0	0	0	-2.21	-0.38	4.8841	0.1444
182	18	1	1.285714286	0.071428571	-0.924285714	-0.308571429	0.854304082	0.095216327
196	0	0	0	0	-2.21	-0.38	4.8841	0.1444
199	0	0	0	0	-2.21	-0.38	4.8841	0.1444
202	20	2	1.428571429	0.142857143	-0.781428571	-0.237142857	0.610630612	0.056236735
209	0	0	0	0	-2.21	-0.38	4.8841	0.1444
227	0	0	0	0	-2.21	-0.38	4.8841	0.1444
237	0	0	0	0	-2.21	-0.38	4.8841	0.1444
242	0	0	0	0	-2.21	-0.38	4.8841	0.1444
249	0	3	0	0.214285714	-2.21	-0.165714286	4.8841	0.027461224
275	0	0	0	0	-2.21	-0.38	4.8841	0.1444
286	0	0	0	0	-2.21	-0.38	4.8841	0.1444
295	1	0	0.071428571	0	-2.138571429	-0.38	4.573487755	0.1444
321	0	0	0	0	-2.21	-0.38	4.8841	0.1444
326	0	0	0	0	-2.21	-0.38	4.8841	0.1444
329	0	0	0	0	-2.21	-0.38	4.8841	0.1444
332	13	0	0.928571429	0	-1.281428571	-0.38	1.642059184	0.1444
333	1	0	0.071428571	0	-2.138571429	-0.38	4.573487755	0.1444
334	24	3	1.714285714	0.214285714	-0.495714286	-0.165714286	0.245732653	0.027461224
337	0	0	0	0	-2.21	-0.38	4.8841	0.1444
345	0	2	0	0.142857143	-2.21	-0.237142857	4.8841	0.056236735
346	1	0	0.071428571	0	-2.138571429	-0.38	4.573487755	0.1444
349	7	4	0.5	0.285714286	-1.71	-0.094285714	2.9241	0.008889796
350	0	0	0	0	-2.21	-0.38	4.8841	0.1444
351	0	0	0	0	-2.21	-0.38	4.8841	0.1444
355	0	0	0	0	-2.21	-0.38	4.8841	0.1444
360	0	0	0	0	-2.21	-0.38	4.8841	0.1444
366	0	0	0	0	-2.21	-0.38	4.8841	0.1444
369	0	0	0	0	-2.21	-0.38	4.8841	0.1444
371	0	0	0	0	-2.21	-0.38	4.8841	0.1444
377	0	0	0	0	-2.21	-0.38	4.8841	0.1444
379	21	1	1.5	0.071428571	-0.71	-0.308571429	0.5041	0.095216327
381	12	2	0.857142857	0.142857143	-1.352857143	-0.237142857	1.830222449	0.056236735
393	6	5	0.428571429	0.357142857	-1.781428571	-0.022857143	3.173487755	0.000522449
397	0	0	0	0	-2.21	-0.38	4.8841	0.1444
406	0	0	0	0	-2.21	-0.38	4.8841	0.1444
412	0	0	0	0	-2.21	-0.38	4.8841	0.1444
414	0	0	0	0	-2.21	-0.38	4.8841	0.1444
419	0	0	0	0	-2.21	-0.38	4.8841	0.1444
442	17	2	1.214285714	0.142857143	-0.995714286	-0.237142857	0.991446939	0.056236735
445	0	0	0	0	-2.21	-0.38	4.8841	0.1444
446	0	0	0	0	-2.21	-0.38	4.8841	0.1444
452	0	0	0	0	-2.21	-0.38	4.8841	0.1444
458	0	0	0	0	-2.21	-0.38	4.8841	0.1444
460	0	0	0	0	-2.21	-0.38	4.8841	0.1444
462	0	0	0	0	-2.21	-0.38	4.8841	0.1444
468	33	0	2.357142857	0	0.147142857	-0.38	0.02165102	0.1444
475	0	0	0	0	-2.21	-0.38	4.8841	0.1444
487	0	0	0	0	-2.21	-0.38	4.8841	0.1444
490	0	0	0	0	-2.21	-0.38	4.8841	0.1444
497	0	0	0	0	-2.21	-0.38	4.8841	0.1444
530	0	0	0	0	-2.21	-0.38	4.8841	0.1444
532	0	0	0	0	-2.21	-0.38	4.8841	0.1444
533	0	0	0	0	-2.21	-0.38	4.8841	0.1444
548	0	0	0	0	-2.21	-0.38	4.8841	0.1444
550	0	0	0	0	-2.21	-0.38	4.8841	0.1444
566	0	0	0	0	-2.21	-0.38	4.8841	0.1444
575	0	0	0	0	-2.21	-0.38	4.8841	0.1444
579	0	0	0	0	-2.21	-0.38	4.8841	0.1444
583	0	0	0	0	-2.21	-0.38	4.8841	0.1444
584	0	0	0	0	-2.21	-0.38	4.8841	0.1444
586	0	0	0	0	-2.21	-0.38	4.8841	0.1444
587	0	0	0	0	-2.21	-0.38	4.8841	0.1444
596	0	0	0	0	-2.21	-0.38	4.8841	0.1444
627	0	0	0	0	-2.21	-0.38	4.8841	0.1444
633	0	0	0	0	-2.21	-0.38	4.8841	0.1444
643	1	0	0.071428571	0	-2.138571429	-0.38	4.573487755	0.1444
650	0	1	0	0.071428571	-2.21	-0.308571429	4.8841	0.095216327
667	1	0	0.071428571	0	-2.138571429	-0.38	4.573487755	0.1444
670	0	0	0	0	-2.21	-0.38	4.8841	0.1444
691	0	0	0	0	-2.21	-0.38	4.8841	0.1444
692	0	0	0	0	-2.21	-0.38	4.8841	0.1444
700	1	0	0.071428571	0	-2.138571429	-0.38	4.573487755	0.1444
708	0	0	0	0	-2.21	-0.38	4.8841	0.1444
712	0	0	0	0	-2.21	-0.38	4.8841	0.1444
714	0	0	0	0	-2.21	-0.38	4.8841	0.1444
718	0	0	0	0	-2.21	-0.38	4.8841	0.1444
720	0	0	0	0	-2.21	-0.38	4.8841	0.1444
721	15	2	1.071428571	0.142857143	-1.138571429	-0.237142857	1.296344898	0.056236735
723	10	7	0.714285714	0.5	-1.495714286	0.12	2.237161224	0.0144
729	0	0	0	0	-2.21	-0.38	4.8841	0.1444
734	0	0	0	0	-2.21	-0.38	4.8841	0.1444
744	0	0	0	0	-2.21	-0.38	4.8841	0.1444
750	0	0	0	0	-2.21	-0.38	4.8841	0.1444
758	9	3	0.642857143	0.214285714	-1.567142857	-0.165714286	2.455936735	0.027461224
761	0	0	0	0	-2.21	-0.38	4.8841	0.1444
763	0	0	0	0	-2.21	-0.38	4.8841	0.1444
770	0	0	0	0	-2.21	-0.38	4.8841	0.1444
774	0	0	0	0	-2.21	-0.38	4.8841	0.1444
780	0	0	0	0	-2.21	-0.38	4.8841	0.1444
795	0	0	0	0	-2.21	-0.38	4.8841	0.1444
802	1	0	0.071428571	0	-2.138571429	-0.38	4.573487755	0.1444
804	0	0	0	0	-2.21	-0.38	4.8841	0.1444
812	1	0	0.071428571	0	-2.138571429	-0.38	4.573487755	0.1444
815	0	0	0	0	-2.21	-0.38	4.8841	0.1444
823	0	0	0	0	-2.21	-0.38	4.8841	0.1444
858	7	3	0.5	0.214285714	-1.71	-0.165714286	2.9241	0.027461224
861	0	0	0	0	-2.21	-0.38	4.8841	0.1444
876	0	0	0	0	-2.21	-0.38	4.8841	0.1444
885	29	2	2.071428571	0.142857143	-0.138571429	-0.237142857	0.019202041	0.056236735
886	32	2	2.285714286	0.142857143	0.075714286	-0.237142857	0.005732653	0.056236735
898	0	0	0	0	-2.21	-0.38	4.8841	0.1444
901	0	0	0	0	-2.21	-0.38	4.8841	0.1444
903	0	0	0	0	-2.21	-0.38	4.8841	0.1444
906	11	0	0.785714286	0	-1.424285714	-0.38	2.028589796	0.1444
937	0	0	0	0	-2.21	-0.38	4.8841	0.1444
950	0	0	0	0	-2.21	-0.38	4.8841	0.1444
959	21	3	1.5	0.214285714	-0.71	-0.165714286	0.5041	0.027461224
966	0	0	0	0	-2.21	-0.38	4.8841	0.1444
973	0	0	0	0	-2.21	-0.38	4.8841	0.1444
976	0	0	0	0	-2.21	-0.38	4.8841	0.1444
990	0	0	0	0	-2.21	-0.38	4.8841	0.1444
991	0	0	0	0	-2.21	-0.38	4.8841	0.1444
997	0	0	0	0	-2.21	-0.38	4.8841	0.1444
1001	0	0	0	0	-2.21	-0.38	4.8841	0.1444
1005	3	0	0.214285714	0	-1.995714286	-0.38	3.98287551	0.1444
1013	0	0	0	0	-2.21	-0.38	4.8841	0.1444
1017	0	0	0	0	-2.21	-0.38	4.8841	0.1444
1023	0	0	0	0	-2.21	-0.38	4.8841	0.1444
1024	0	0	0	0	-2.21	-0.38	4.8841	0.1444
1044	0	0	0	0	-2.21	-0.38	4.8841	0.1444
1053	0	0	0	0	-2.21	-0.38	4.8841	0.1444
1054	0	0	0	0	-2.21	-0.38	4.8841	0.1444
1056	8	3	0.571428571	0.214285714	-1.638571429	-0.165714286	2.684916327	0.027461224
1068	16	2	1.142857143	0.142857143	-1.067142857	-0.237142857	1.138793878	0.056236735
1077	0	0	0	0	-2.21	-0.38	4.8841	0.1444
1079	0	0	0	0	-2.21	-0.38	4.8841	0.1444
1085	0	0	0	0	-2.21	-0.38	4.8841	0.1444
1091	1	0	0.071428571	0	-2.138571429	-0.38	4.573487755	0.1444
1096	0	0	0	0	-2.21	-0.38	4.8841	0.1444
1106	0	0	0	0	-2.21	-0.38	4.8841	0.1444
1108	0	0	0	0	-2.21	-0.38	4.8841	0.1444
1110	0	0	0	0	-2.21	-0.38	4.8841	0.1444
1113	0	0	0	0	-2.21	-0.38	4.8841	0.1444
1119	0	0	0	0	-2.21	-0.38	4.8841	0.1444
1126	0	0	0	0	-2.21	-0.38	4.8841	0.1444
1134	0	0	0	0	-2.21	-0.38	4.8841	0.1444
1137	6	0	0.428571429	0	-1.781428571	-0.38	3.173487755	0.1444
1147	0	0	0	0	-2.21	-0.38	4.8841	0.1444
1153	0	0	0	0	-2.21	-0.38	4.8841	0.1444
1154	0	0	0	0	-2.21	-0.38	4.8841	0.1444
1188	0	0	0	0	-2.21	-0.38	4.8841	0.1444
1194	0	0	0	0	-2.21	-0.38	4.8841	0.1444
1204	0	0	0	0	-2.21	-0.38	4.8841	0.1444
1221	0	1	0	0.071428571	-2.21	-0.308571429	4.8841	0.095216327
1244	0	0	0	0	-2.21	-0.38	4.8841	0.1444
1247	15	3	1.071428571	0.214285714	-1.138571429	-0.165714286	1.296344898	0.027461224
1252	0	0	0	0	-2.21	-0.38	4.8841	0.1444
1257	15	3	1.071428571	0.214285714	-1.138571429	-0.165714286	1.296344898	0.027461224
1268	0	0	0	0	-2.21	-0.38	4.8841	0.1444
1273	0	0	0	0	-2.21	-0.38	4.8841	0.1444
1278	0	0	0	0	-2.21	-0.38	4.8841	0.1444
1282	0	0	0	0	-2.21	-0.38	4.8841	0.1444
1283	12	2	0.857142857	0.142857143	-1.352857143	-0.237142857	1.830222449	0.056236735
1284	0	0	0	0	-2.21	-0.38	4.8841	0.1444
1292	0	0	0	0	-2.21	-0.38	4.8841	0.1444
1294	0	0	0	0	-2.21	-0.38	4.8841	0.1444
1297	0	0	0	0	-2.21	-0.38	4.8841	0.1444
1305	0	0	0	0	-2.21	-0.38	4.8841	0.1444
1312	19	3	1.357142857	0.214285714	-0.852857143	-0.165714286	0.727365306	0.027461224
1317	1	0	0.071428571	0	-2.138571429	-0.38	4.573487755	0.1444
1318	7	2	0.5	0.142857143	-1.71	-0.237142857	2.9241	0.056236735
1335	0	0	0	0	-2.21	-0.38	4.8841	0.1444
1338	2	0	0.142857143	0	-2.067142857	-0.38	4.273079592	0.1444
1346	1	0	0.071428571	0	-2.138571429	-0.38	4.573487755	0.1444
1370	0	0	0	0	-2.21	-0.38	4.8841	0.1444
1390	0	0	0	0	-2.21	-0.38	4.8841	0.1444

11.4.4 Arnstein – R74

11.4.4.1 Arnstein – R74 – Phase 1

O.R.C.U.S. 02.00 - Simulation Summary

UA Parameters

MTOW [kg]	Wingspan [m]	Length [m]	L/D
90	5	4	8

v [km/h]	Alt [m]	CCF [m]
100	100	12575.862

P_CumCat [1/Fh]	Engine [%]	ESys [%]	FCS [%]	NavSys [%]	Struct [%]
0.01	20	20	20	20	20

General map parameters

	Name	Area [km2]	PPL	PPL/km2
City	Arnstein, Stadt	112.1	8168	73
County	Main-Spessart	1321.19	126523	96
FS	BY	70542.03	12997204	184

Mission specific map parameters

	Area [km2]	PPL	Tourists	Total PPL
City-SMP	10.7276	8168	0	8168
SurM	56.1279	5389	0	5389
Map total	66.8555	13557	0	13557

PPL MOD NA

Sim FH [Fh] 19600 Ev/Fh [1/Fh] 0.00959184
Events total 188

Hits due to UA impacts		Hits/Fh [1/Fh]
City-SMP ATB	160	0.0081633
SurM ATB	26	0.0013265
Total ATB	186	0.0094898
City-SMP OTW	40	0.0020408
SurM OTW	4	0.0002041
Total OTW	44	0.0022449
Total	230	0.0117347

Prot	cyc	k_UA	Day	Time of impact	UA X Pos	UA Y Pos	Travelled Distance [km]	PPL_TD_CITY_ATB	PPL_CITY_ATB_COUNT	HIT_CITY_ATB_COUNT	PPL_TD_CITY_OTW	PPL_CITY_OTW_COUNT	HIT_CITY_OTW_COUNT	PPL_TD_SURM_ATB	PPL_SURM_ATB_COUNT	HIT_SURM_ATB_COUNT	PPL_TD_SURM_OTW	PPL_SURM_OTW_COUNT	HIT_SURM_OTW_COUNT	PPL_ALL_ATB_COUNT	PPL_ALL_OTW_COUNT	E	Case	Outcome
1017	33	1436	Tuesday	10:04:27	2026	2989	407.44	6738	6738	0	1430	1430	1	4472	4472	0	917	917	0	11210	2347	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1026	7	633	Thursday	06:46:35	5344	4920	77.67	7106	7106	0	1062	1062	0	4688	4688	0	701	701	0	11794	1763	34	Connection Failure	UA ground impact tangential to trajectory
104	70	2239	Saturday	14:45:20	2611	2407	875.56	6493	6493	0	1675	1675	0	4149	4149	0	1240	1240	0	10642	2915	72	Degradation of altitude	UA approaches Emergency landing site
1045	106	2316	Tuesday	19:17:08	2906	2498	1328.56	7555	7555	0	613	613	0	4930	4930	0	459	459	1	12485	1072	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1045	25	2405	Tuesday	09:06:07	3279	2632	310.22	6901	6901	0	1267	1267	0	4553	4553	0	836	836	0	11454	2103	17	Engine Fire	Central UA ground impact point below flight path
1045	55	2358	Tuesday	12:52:24	3078	2558	687.33	6738	6738	0	1430	1430	0	4472	4472	0	917	917	0	11210	2347	71	Degradation of lateral and horizontal navigation data accuracy.	Central UA ground impact point on a random Map coordinate
1049	42	2449	Saturday	11:14:29	3474	2709	524.17	6003	6003	0	2165	2165	0	3826	3826	0	1563	1563	0	9829	3728	73	Degradation of altitude	Central UA ground impact point below flight path
1057	68	803	Sunday	14:27:13	4557	4574	845.39	6044	6044	0	2124	2124	0	3880	3880	0	1509	1509	0	9924	3633	14	Engine Anomaly	Central UA ground impact point below flight path
1058	95	1728	Monday	17:52:54	1648	2471	1188.17	6166	6166	0	2002	2002	0	4068	4068	0	1321	1321	0	10234	3323	73	Degradation of altitude	Central UA ground impact point below flight path
1064	68	3491	Sunday	14:32:52	7088	5080	854.78	6044	6044	0	2124	2124	0	3880	3880	0	1509	1509	0	9924	3633	17	Engine Fire	Central UA ground impact point below flight path
1068	43	1521	Thursday	11:20:05	1847	2810	533.50	6575	6575	0	1593	1593	0	4418	4418	0	971	971	0	10993	2564	47	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
107	63	840	Tuesday	13:49:34	4381	4489	782.64	6248	6248	0	1920	1920	0	4257	4257	0	1132	1132	0	10505	3052	36	Short Circuit / Overload	Central UA ground impact point below flight path
1074	70	2183	Wednesday	14:45:12	2417	2357	875.36	6248	6248	0	1920	1920	0	4230	4230	0	1159	1159	0	10478	3079	2	Engine Out	UA approaches Emergency landing site
1078	75	2623	Sunday	15:23:51	4284	3071	939.78	6044	6044	0	2124	2124	0	3880	3880	0	1509	1509	0	9924	3633	73	Degradation of altitude	Central UA ground impact point below flight path
109	4	1605	Thursday	06:26:00	1724	2654	43.33	7106	7106	0	1062	1062	0	4688	4688	0	701	701	0	11794	1763	5	Engine Out	No Ground Effect
1091	96	808	Saturday	17:58:31	4533	4563	1197.53	6411	6411	0	1757	1757	0	4230	4230	0	1159	1159	0	10641	2916	42	Partial Lock of Flight Control Surfaces	Central UA ground impact point below flight path
1096	66	2143	Thursday	14:14:57	2289	2329	824.92	6411	6411	0	1757	1757	0	4284	4284	0	1105	1105	0	10695	2862	49	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
1099	80	2022	Sunday	16:00:20	1967	2290	1000.56	6207	6207	0	1961	1961	0	3933	3933	0	1456	1456	1	10140	3417	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
110	100	2685	Friday	18:32:38	4579	3219	1254.39	6411	6411	0	1757	1757	0	4230	4230	0	1159	1159	0	10641	2916	66	Degradation of lateral and horizontal navigation data accuracy.	Central UA ground impact point below flight path
1100	53	1479	Monday	12:35:28	1928	2896	659.11	6779	6779	0	1389	1389	0	4472	4472	0	917	917	0	11251	2306	37	Short Circuit / Overload	Central UA ground impact point below flight path
1101	81	2247	Tuesday	16:08:21	2640	2416	1013.92	5962	5962	0	2206	2206	0	4068	4068	0	1321	1321	0	10030	3527	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
1103	93	2964	Thursday	17:40:24	5827	3938	1167.33	6126	6126	2	2042	2042	4	4014	4014	0	1375	1375	0	10140	3417	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1123	107	1308	Wednesday	19:22:33	2391	3292	1337.61	7473	7473	0	695	695	0	4903	4903	0	486	486	0	12376	1181	24	Generator Failure	UA ground impact tangential to trajectory
1128	54	2260	Monday	12:44:38	2689	2430	674.42	6779	6779	0	1389	1389	0	4472	4472	0	917	917	0	11251	2306	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1131	32	2635	Thursday	09:59:26	4341	3099	399.06	6575	6575	0	1593	1593	0	4418	4418	0	971	971	0	10993	2564	38	Short Circuit / Overload	Central UA ground impact point below flight path
1139	56	141	Friday	12:55:17	6936	5299	692.16	6330	6330	0	1838	1838	0	4095	4095	0	1294	1294	0	10425	3132	47	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
1144	85	1659	Wednesday	16:37:18	1675	2566	1062.17	6126	6126	0	2042	2042	0	4014	4014	0	1375	1375	0	10140	3417	22	Generator Failure	UA approaches Emergency landing site
1152	86	2854	Thursday	16:47:21	5360	3649	1078.92	6126	6126	0	2042	2042	0	4014	4014	0	1375	1375	0	10140	3417	40	Short Circuit / Overload	Central UA ground impact point below flight path
1155	43	2475	Sunday	11:22:05	3591	2758	536.83	5840	5840	0	2328	2328	0	4014	4014	0	1375	1375	0	9854	3703	65	Degradation of lateral and horizontal navigation data accuracy.	Central UA ground impact point below flight path
1166	83	2243	Thursday	16:23:26	2626	2411	1039.06	6126	6126	0	2042	2042	0	4014	4014	0	1375	1375	0	10140	3417	55	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
1174	8	2933	Friday	06:58:57	5700	3857	98.28	7024	7024	0	1144	1144	0	4742	4742	0	647	647	0	11766	1791	1	Engine Out	No Ground Effect
1178	109	724	Tuesday	19:36:26	4929	4745	1360.72	7555	7555	0	613	613	0	4930	4930	0	459	459	0	12485	1072	21	Engine Fire	UA structural desintegration - Debris Impact
1200	6	408	Wednesday	06:38:34	6245	5222	64.30	6942	6942	0	1226	1226	0	4661	4661	0	728	728	0	11603	1954	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1213	48	2542	Tuesday	11:59:58	3901	2892	599.95	6738	6738	0	1430	1430	0	4472	4472	0	917	917	0	11210	2347	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
1217	36	2731	Saturday	10:29:49	4796	3332	449.70	6003	6003	0	2165	2165	0	3826	3826	0	1563	1563	0	9829	3728	13	Engine Anomaly	UA approaches Emergency landing site
1226	14	1229	Monday	07:40:40	2667	3492	167.78	6983	6983	0	1185	1185	0	4634	4634	0	755	755	0	11617	1940	49	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
1236	46	1456	Thursday	11:42:36	1979	2945	571.00	6575	6575	0	1593	1593	0	4418	4418	0	971	971	0	10993	2564	22	Generator Failure	UA approaches Emergency landing site
1253	69	3350	Sunday	14:40:07	6948	4846	866.86	6044	6044	0	2124	2124	0	3880	3880	0	1509	1509	0	9924	3633	68	Degradation of lateral and horizontal navigation data accuracy.	UA approaches Emergency landing site
1254	92	1475	Monday	17:29:44	1937	2905	1149.56	6166	6166	0	2002	2002	0	4068	4068	0	1321	1321	0	10234	3323	68	Degradation of lateral and horizontal navigation data accuracy.	UA approaches Emergency landing site
1261	29	2239	Monday	09:35:58	2611	2407	359.95	6861	6861	0	1307	1307	0	4553	4553	0	836	836	0	11414	2143	81	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1266	60	86	Saturday	13:25:21	7013	5274	742.28	6493	6493	0	1675	1675	0	4149	4149	0	1240	1240	1	10642	2915	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
127	35	2514	Monday	10:21:49	3771	2834	436.36	6779	6779	6	1389	1389	2	4472	4472	0	917	917	0	11251	2306	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1275	32	2205	Monday	09:58:31	2491	2375	397.55	6779	6779	0	1389	1389	0	4472	4472	0	917	917	0	11251	2306	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
1276	4	1907	Tuesday	06:26:38	1760	2315	44.39	6779	6779	0	1389	1389	0	4661	4661	0	728	728	0	11440	2117	78	Degradation of altitude	Central UA ground impact point below flight path
1281	49	79	Sunday	12:02:21	7021	5270	603.92	5840	5840	0	2328	2328	0	4014	4014	0	1375	1375	0	9854	3703	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1284	33	2239	Wednesday	10:06:08	2611	2407	410.25	6738	6738	0	1430	1430	0	4445	4445	0	944	944	0	11183	2374	32	Connection Failure	UA approaches Emergency landing site
1287	74	3289	Saturday	15:17:42	6838	4725	929.53	6493	6493	0	1675	1675	0	4149	4149	0	1240	1240	0	10642	2915	55	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
1287	87	478	Saturday	16:49:54	5989	5150	1083.19	6411	6411	0	1757	1757	0	4230	4230	0	1159	1159	0	10641	2916	71	Degradation of lateral and horizontal navigation data accuracy.	Central UA ground impact point on a random Map coordinate
1297	36	3502	Tuesday	10:31:25	7092	5095	452.39	6738	6738	0	1430	1430	0	4472	4472	0	917	917	0	11210	2347	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
1299	91	1091	Thursday	17:21:22	3224	3854	1135.64	6126	6126	0	2042	2042	0	4014	4014	0	1375	1375	0	10140	3417	68	Degradation of lateral and horizontal navigation data accuracy.	UA approaches Emergency landing site
1301	2	750	Saturday	06:09:07	4807	4691	15.20	7800	7800	0	368	368	0	5146	5146	0	243	243	0	12946	611	55	GCS Override Wrong commands to the flight control surfaces.	UA ground impact tangential to trajectory
1311	71	3474	Tuesday	14:55:28	7080	5056	892.45	6248	6248	0	1920	1920	0	4257	4257	0	1132	1132	0	10505	3052	34	Connection Failure	UA ground impact tangential to trajectory
1319	11	825	Wednesday	07:17:11	4452	4524	128.64	6942	6942	0	1226	1226	0	4661	4661	0	728	728	0	11603	1954	47	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
132	13	3326	Saturday	07:37:31	6908	4800	162.53	7800	7800	0	368	368	0	5146	5146	0	243	243	0	12946	611	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
1320	30	1772	Thursday	09:42:32	1651	2420	370.89	6983	6983	0	1185	1185	0	4607	4607	0	782	782	0	11590	1967	28	Generator Failure	UA ground impact tangential to trajectory
1320	48	2502	Thursday	11:59:53	3715	2810	599.81	6575	6575	0	1593	1593	0	4418	4418	0	971	971	0	10993	2564	5	Engine Out	No Ground Effect
1332	56	2463	Tuesday	13:00:09	3537	2735	700.28	6248	6248	0	1920	1920	0	4257	4257	0	1132	1132	0	10505	3052	23	Generator Failure	Central UA ground impact point below flight path
1333	86	587	Wednesday	16:42:35	5545	4997	1071.00	6126	6126	0	2042	2042	0	4014	4014	0	1375	1375	0	10140	3417	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1334	27	1535	Thursday	09:19:24	1822	2782	332.33	6983	6983	0	1185	1185	4	4607	4607	0	782	782	0	11590	1967	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1334	48	3599	Thursday	12:02:10	7085	5208	603.64	6575	6575	0	1593	1593	0	4418	4418	0	971	971	0	10993	2564	67	Degradation of lateral and horizontal navigation data accuracy.	Central UA ground impact point on a random Map coordinate
1345	91	2268	Monday	17:23:51	2719	2439	1139.75	6166	6166	0	2002	2002	0	4068	4068	0	1321	1321	0	10234	3323	41	Separation of essential UA parts (tail or main wing).	UA approaches Emergency landing site
1354	108	1636	Wednesday	19:30:47	1693	2602	1351.33	7473	7473	0	695	695	0	4903	4903	0	486	486	0	12376	1181	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
1360	99	233	Tuesday	18:19:56	6754	5309	1233.25	5962	5962	0	2206	2206	0	4068	4068	0	1321	1321	0	10030	3527	30	Connection Failure	Central UA ground impact point below flight path
1367	25	2652	Tuesday	09:06:39	4422	3139	311.08	6901	6901	0	1267	1267	0	4553	4553	0	836	836	0	11454	2103	36	Short Circuit / Overload	Central UA ground impact point below flight path
1372	72	3420	Sunday	15:02:53	7038	4971	904.83	6044	6044	0	2124	2124	0	3880	3880	0	1509	1509	0	9924	3633	23	Generator Failure	Central UA ground impact point below flight path
1386	84	464	Sunday	16:27:15	6042	5166	1045.42	6207	6207	0	1961	1961	0	3933	3933	26	1456	1456	0	10140	3417	63	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
15	93	2956	Monday	17:40:22	5795	3917	1167.31	6166	6166	0	2002	2002	0	4068	4068	0	1321	1321	0	10234	3323	81	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
150	80	1608	Wednesday	15:59:27	1721	2649	999.11	6126	6126	0	2042	2042	0	4014	4014	0	1375	1375	0	10140	3417	22	Generator Failure	UA approaches Emergency landing site
151	20	3094	Thursday	08:29:50	6308	4273	249.75	6983	6983	0	1185	1185	0	4607	4607	0	782	782	0	11590	1967	37	Short Circuit / Overload	Central UA ground impact point below flight path
151	87	1480	Thursday	16:52:00	1926	2894	1086.69	6126	6126	0	2042	2042	0	4014	4014	0	1375	1375	0	10140	3417	10	Engine Anomaly	Central UA ground impact point below flight path
160	55	2938	Saturday	12:53:36	5721	3870	689.36	6003	6003	0	2165	2165	0	3826	3826	0	1563	1563	0	9829	3728	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
168	13	3151	Sunday	07:37:09	6490	4413	161.92	7963	7963	30	205	205	0	5200	5200	0	189	189	0	13163	394	21	Engine Fire	UA approaches Emergency landing site
172	3	1523	Thursday	06:18:16	1843	2806	30.47	7106	7106	0	1062	1062	0	4688	4688	0	701	701	0	11794	1763	22	Generator Failure	UA approaches Emergency landing site
175	26	2662	Sunday	09:14:13	4470	3163	323.70	7147	7147	6	1021	1021	0	4688	4688	0	701	701	0	11835	1722	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
182	27	3030	Sunday	09:22:32	6082	4110	337.56	7147	7147	0	1021	1021	0	4688	4688	0	701	701	0	11835	1722	22	Connection Failure	UA approaches Emergency landing site
189	69	1847	Sunday	14:36:57	1693	2351	861.61	6044	6044	0	2124	2124	0	3880	3880	0	1509	1509	0	9924	3633	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
210	55	2056	Sunday	12:51:46	2047	2294	686.28	5840	5840	0	2328	2328	0	4014	4014	0	1375	1375	0	9854	3703	31	Connection Failure	UA approaches Emergency landing site
218	100	220	Monday	18:27:28	6783	5310	1245.78	6166	6166	0	2002	2002	0	4068	4068	0	1321	1321	0	10234	3323	77	Degradation of altitude	Central UA ground impact point below flight path
22	72	3460	Monday	15:02:59	7071	5035	904.97	6330	6330	0	1838	1838	0	4257	4257	0	1132	1132	0	10587	2970	73	Degradation of altitude	Central UA ground impact point below flight path
222	71	1788	Friday	14:51:56	1656	2403	886.53	6330	6330	0	1838	1838	2	4095	4095	0	1294	1294	0	10425	3132	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
223	86	2528	Saturday	16:46:40	3836	2863	1077.78	6411	6411	0	1757	1757	0	4230	4230	0	1159	1159	0	10641	2916	78	Degradation of altitude	Central UA ground impact point below flight path
225	106	3119	Monday	19:18:49	6390	4335	1331.36	7514	7514	5	654	654	0	4903	4903	0	486	486	0	12417	1140	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
225	44	140	Monday	11:24:45	6937	5299	541.25	6779	6779	0	1389	1389	0	4472	4472	0	917	917	0	11251	2306	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
228	3	306	Thursday	06:15:43	6566	5290	26.22	7106	7106	0	1062	1062	0	4688	4688	0	701	701	0	11794	1763	24	Generator Failure	UA ground impact tangential to trajectory
237	65	741	Saturday	14:04:27	4849	4710	807.44	6493	6493	1	1675	1675	0	4149	4149	0	1240	1240	0	10642	2915	35	Connection Failure	UA ground impact tangential to trajectory
273	81	2946	Sunday	16:09:48	5754	3891	1016.36	6207	6207	0	1961	1961	0	3933	3933	0	1456	1456	0	10140	3417	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
28	87	589	Sunday	16:50:08	5536	4994	1083.58	6207	6207	0	1961	1961	0	3933	3933	0	1456	1456	0	10140	3417	47	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
281	59	1659	Monday	13:21:07	1675	2566	735.20	6330	6330	0	1838	1838	0	4257	4257	0	1132	1132	0	10587	2970	72	Degradation of altitude	UA approaches Emergency landing site
283	87	574	Wednesday	16:50:07	5601	5018	1083.53	6126	6126	0	2042	2042	0	4014	4014	0	1375	1375	0	10140	3417	21	Engine Fire	UA approaches Emergency landing site
290	111	1929	Wednesday	19:54:03	1792	2305	1390.08	7473	7473	0	695	695	0	4903	4903	0	486	486	0	12376	1181	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
292	96	959	Friday	17:58:50	3819	4197	1198.06	6411	6411	0	1757	1757	0	4230	4230	0	1159	1159	0	10641	2916	20	Engine Fire	UA approaches Emergency landing site
294	5	2633	Sunday	06:35:42	4332	3095	59.50	7963	7963	0	205	205	0	5200	5200	0	189	189	0	13163	394	36	Short Circuit / Overload	Central UA ground impact point below flight path
307	2	1736	Saturday	06:11:11	1647	2461	18.64	7800	7800	0	368	368	1	5146	5146	0	243	243	0	12946	611	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
310	14	1022	Tuesday	07:40:14	3529	4035	167.06	6779	6779	23	1389	1389	0	4661	4661	0	728	728	0	11440	2117	21	Engine Fire	UA approaches Emergency landing site
312	64	3013	Thursday	14:01:40	6019	4066	802.80	6411	6411	0	1757	1757	0	4284	4284	0	1105	1105	0	10695	2862	29	Connection Failure	UA approaches Emergency landing site
317	55	3471	Tuesday	12:54:43	7078	5052	691.22	6738	6738	0	1430	1430	0	4472	4472	0	917	917	0	11210	2347	25	Generator Failure	Central UA ground impact point below flight path
319	98	2983	Thursday	18:18:10	5903	3988	1230.28	6126	6126	0	2042	2042	0	4014	4014	0	1375	1375	0	10140	3417	28	Generator Failure	UA ground impact tangential to trajectory
323	52	3035	Monday	12:31:10	6101	4123	651.97	6779	6779	0	1389	1389	0	4472	4472	0	917	917	0	11251	2306	38	Short Circuit / Overload	Central UA ground impact point below flight path
330	111	331	Monday	19:50:42	6493	5278	1384.50	7514	7514	0	654	654	0	4903	4903	0	486	486	0	12417	1140	29	Connection Failure	UA approaches Emergency landing site
331	29	1428	Tuesday	09:34:16	2045	3007	357.11	6901	6901	0	1267	1267	0	4553	4553	0	836	836	0	11454	2103	75	Degradation of altitude	Central UA ground impact point below flight path
340	102	2029	Thursday	18:46:20	1983	2290	1277.25	6126	6126	0	2042	2042	0	4014	4014	0	1375	1375	0	10140	3417	62	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
350	41	1247	Sunday	11:04:26	2601	3446	507.39	5840	5840	0	2328	2328	3	4014	4014	0	1375	1375	0	9854	3703	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
354	12	2178	Thursday	07:27:33	2400	2353	145.94	7106	7106	0	1062	1062	0	4688	4688	0	701	701	0	11794	1763	40	Short Circuit / Overload	Central UA ground impact point below flight path
359	92	2429	Sunday	17:31:43	3384	2673	1152.89	5962	5962	0	2206	2206	0	4068	4068	0	1321	1321	0	10030	3527	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
368	91	89	Thursday	17:19:16	7009	5276	1132.14	6126	6126	0	2042	2042	0	4014	4014	0	1375	1375	0	10140	3417	75	Degradation of altitude	UA approaches Emergency landing site
378	67	2702	Sunday	14:23:40	4660	3260	839.45	6044	6044	0	2124	2124	2	3880	3880	0	1509	1509	0	9924	3633	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
380	2	2101	Tuesday	06:11:56	2166	2308	19.92	6779	6779	0	1389	1389	0	4661	4661	0	728	728	0	11440	2117	67	Degradation of lateral and horizontal navigation data accuracy.	Central UA ground impact point on a random Map coordinate
385	94	620	Sunday	17:43:01	5401	4942	1171.72	6207	6207	0	1961	1961	0	3933	3933	0	1456	1456	0	10140	3417	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
4	62	2023	Thursday	13:44:31	1969	2290	774.19	6411	6411	0	1757	1757	0	4284	4284	0	1105	1105	0	10695	2862	35	Connection Failure	UA ground impact tangential to trajectory
413	106	1513	Sunday	19:15:27	1861	2826	1325.75	7351	7351	0	817	817	1	4742	4742	0	647	647	0	12093	1464	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
413	99	1609	Sunday	18:22:49	1720	2647	1238.06	6207	6207	0	1961	1961	0	3933	3933	0	1456	1456	0	10140	3417	41	Partial Lock of Flight Control Surfaces	Central UA ground impact point below flight path
429	82	1167	Tuesday	16:13:37	2907	3654	1022.72	5962	5962	0	2206	2206	0	4068	4068	0	1321	1321	0	10030	3527	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
444	26	2137	Wednesday	09:13:07	2271	2326	321.86	6983	6983	0	1185	1185	0	4553	4553	0	836	836	0	11536	2021	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
445	61	128	Thursday	13:32:59	6956	5294	755.00	6411	6411	0	1757	1757	0	4284	4284	0	1105	1105	0	10695	2862	71	Degradation of lateral and horizontal navigation data accuracy.	Central UA ground impact point on a random Map coordinate
457	73	1561	Tuesday	15:06:32	1781	2733	910.92	6248	6248	0	1920	1920	0	4257	4257	0	1132	1132	0	10505	3052	3	Engine Out	UA approaches Emergency landing site
482	32	1863	Saturday	09:57:48	1708	2340	396.36	6003	6003	0	2165	2165	0	3826	3826	0	1563	1563	0	9829	3728	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
483	88	894	Sunday	16:58:20	4124	4359	1097.22	6207	6207	0	1961	1961	0	3933	3933	0	1456	1456	0	10140	3417	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
486	31	2887	Wednesday	09:52:24	5505	3736	387.36	6983	6983	0	1185	1185	0	4553	4553	0	836	836	0	11536	2021	75	Degradation of altitude	Central UA ground impact point below flight path
487	48	1285	Thursday	11:57:19	2468	3349	595.55	6575	6575	0	1593	1593	1	4418	4418	0	971	971	0	10993	2564	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
491	79	1391	Monday	15:51:27	2142	3092	985.78	6330	6330	0	1838	1838	0	4257	4257	0	1132	1132	0	10587	2970	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
51	23	2138	Tuesday	08:50:28	2274	2326	284.14	6901	6901	0	1267	1267	0	4553	4553	0	836	836	0	11454	2103	53	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
519	95	3032	Monday	17:55:38	6090	4116	1192.72	6166	6166	0	2002	2002	0	4068	4068	0	1321	1321	0	10234	3323	22	Generator Failure	UA approaches Emergency landing site
524	84	2674	Saturday	16:31:52	4527	3192	1053.14	6411	6411	0	1757	1757	0	4230	4230	0	1159	1159	0	10641	2916	73	Degradation of altitude	Central UA ground impact point below flight path
532	32	1124	Sunday	09:56:16	3083	3767	393.78	5840	5840	0	2328	2328	0	4014	4014	0	1375	1375	0	9854	3703	78	Degradation of altitude	Central UA ground impact point below flight path
547	109	2108	Monday	19:39:20	2186	2311	1365.56	7514	7514	0	654	654	0	4903	4903	0	486	486	0	12417	1140	72	Degradation of altitude	UA approaches Emergency landing site
569	10	1148	Tuesday	07:10:18	2984	3704	117.19	6779	6779	0	1389	1389	0	4661	4661	0	728	728	0	11440	2117	47	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
569	56	1008	Tuesday	12:57:06	3593	4071	695.19	6248	6248	0	1920	1920	0	4257	4257	0	1132	1132	0	10505	3052	77	Degradation of altitude	Central UA ground impact point below flight path
579	78	2312	Friday	15:45:51	2890	2493	976.42	6330	6330	0	1838	1838	0	4095	4095	0	1294	1294	0	10425	3132	78	Degradation of altitude	Central UA ground impact point below flight path
586	18	195	Sunday	08:08:40	6837	5310	214.47	7147	7147	0	1021	1021	0	4688	4688	0	701	701	0	11835	1722	76	Degradation of altitude	Central UA ground impact point below flight path
588	66	1443	Sunday	14:13:28	2009	2974	822.47	6044	6044	0	2124	2124	0	3880	3880	0	1509	1509	0	9924	3633	77	Degradation of altitude	Central UA ground impact point below flight path
588	77	3423	Sunday	15:40:38	7041	4976	967.72	6044	6044	0	2124	2124	0	3880	3880	0	1509	1509	0	9924	3633	44	Partial Lock of Flight Control Surfaces	Central UA ground impact point below flight path
604	65	1258	Tuesday	14:05:32	2562	3418	809.25	6248	6248	0	1920	1920	3	4257	4257	0	1132	1132	0	10505	3052	21	Engine Fire	UA structural desintegration - Debris Impact
610	27	231	Monday	09:16:40	6759	5309	327.78	6861	6861	0	1307	1307	1	4553	4553	0	836	836	0	11414	2143	18	Engine Fire	UA structural desintegration - Debris Impact
613	69	26	Thursday	14:33:08	7069	5232	855.25	6411	6411	0	1757	1757	0	4284	4284	0	1105	1105	0	10695	2862	81	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
622	96	1921	Saturday	18:00:51	1780	2308	1201.42	6411	6411	0	1757	1757	0	4230	4230	0	1159	1159	0	10641	2916	27	Generator Failure	UA ground impact tangential to trajectory
631	3	2589	Monday	06:20:31	4123	2994	34.20	6983	6983	0	1185	1185	0	4634	4634	0	755	755	0	11617	1940	71	Degradation of lateral and horizontal navigation data accuracy.	Central UA ground impact point on a random Map coordinate
642	32	869	Friday	09:55:43	4243	4420	392.89	6616	6616	0	1552	1552	0	4338	4338	0	1051	1051	0	10954	2603	5	Engine Out	No Ground Effect
653	12	3037	Tuesday	07:29:21	6108	4128	148.94	6779	6779	0	1389	1389	0	4661	4661	0	728	728	0	11440	2117	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
653	33	553	Tuesday	10:02:36	5689	5050	404.36	6738	6738	0	1430	1430	0	4472	4472	0	917	917	0	11210	2347	29	Connection Failure	UA approaches Emergency landing site
656	98	2474	Friday	18:17:06	3587	2756	1228.50	6411	6411	0	1757	1757	2	4230	4230	0	1159	1159	0	10641	2916	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
658	55	1849	Sunday	12:51:20	1695	2350	685.56	5840	5840	0	2328	2328	0	4014	4014	0	1375	1375	0	9854	3703	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
668	73	3502	Wednesday	15:10:37	7092	5095	917.70	6248	6248	0	1920	1920	0	4230	4230	0	1159	1159	0	10478	3079	11	Engine Anomaly	Central UA ground impact point below flight path
668	92	1348	Wednesday	17:29:28	2265	3194	1149.11	6126	6126	0	2042	2042	0	4014	4014	0	1375	1375	0	10140	3417	22	Generator Failure	UA approaches Emergency landing site
69	83	2426	Saturday	16:23:49	3371	2668	1039.70	6411	6411	0	1757	1757	0	4230	4230	0	1159	1159	0	10641	2916	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
701	17	3080	Monday	08:07:11	6261	4238	211.97	6861	6861	0	1307	1307	0	4553	4553	0	836	836	0	11414	2143	29	Connection Failure	UA approaches Emergency landing site
705	25	974	Friday	09:03:08	3749	4159	305.22	7106	7106	0	1062	1062	0	4661	4661	0	728	728	0	11767	1790	34	Connection Failure	UA ground impact tangential to trajectory
720	89	2518	Saturday	17:09:16	3789	2843	1115.47	6411	6411	0	1757	1757	0	4230	4230	0	1159	1159	0	10641	2916	10	Engine Anomaly	Central UA ground impact point below flight path
741	53	1248	Saturday	12:34:58	2598	3443	658.30	6003	6003	0	2165	2165	0	3826	3826	0	1563	1563	0	9829	3728	53	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
743	32	3008	Monday	10:00:12	6000	4053	400.36	6779	6779	0	1389	1389	0	4472	4472	0	917	917	0	11251	2306	40	Short Circuit / Overload	Central UA ground impact point below flight path
749	90	3276	Sunday	17:18:25	6811	4698	1130.70	6207	6207	52	1961	1961	0	3933	3933	0	1456	1456	0	10140	3417	18	Engine Fire	UA structural desintegration - Debris Impact
752	63	840	Wednesday	13:49:34	4381	4489	782.64	6248	6248	0	1920	1920	0	4230	4230	0	1159	1159	0	10478	3079	12	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
753	98	1074	Thursday	18:14:06	3403	3962	1223.53	6126	6126	1	2042	2042	0	4014	4014	0	1375	1375	0	10140	3417	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
756	100	1826	Sunday	18:30:50	1677	2368	1251.39	6207	6207	0	1961	1961	0	3933	3933	0	1456	1456	0	10140	3417	12	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
767	15	2376	Thursday	07:50:37	3154	2585	184.36	7106	7106	0	1062	1062	0	4688	4688	0	701	701	0	11794	1763	78	Degradation of altitude	Central UA ground impact point below flight path
785	27	215	Monday	09:16:38	6794	5310	327.72	6861	6861	0	1307	1307	0	4553	4553	0	836	836	0	11414	2143	70	Degradation of lateral and horizontal navigation data accuracy.	Central UA ground impact point on a random Map coordinate
791	10	2182	Sunday	07:12:28	2413	2356	120.81	7963	7963	0	205	205	0	5200	5200	0	189	189	0	13163	394	41	Partial Lock of Flight Control Surfaces	Central UA ground impact point below flight path
796	17	1736	Friday	08:04:22	1647	2461	207.28	7106	7106	0	1062	1062	0	4661	4661	0	728	728	0	11767	1790	11	Engine Anomaly	Central UA ground impact point below flight path
8	30	2909	Monday	09:44:55	5599	3794	374.86	6861	6861	0	1307	1307	0	4553	4553	0	836	836	0	11414	2143	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
801	10	1148	Wednesday	07:10:18	2984	3704	117.19	6942	6942	0	1226	1226	0	4661	4661	0	728	728	0	11603	1954	73	Degradation of altitude	Central UA ground impact point below flight path
811	78	3170	Saturday	15:47:38	6545	4459	979.42	6493	6493	0	1675	1675	0	4149	4149	0	1240	1240	0	10642	2915	29	Connection Failure	UA approaches Emergency landing site
811	8	31	Saturday	06:52:53	7066	5236	88.14	7800	7800	0	368	368	0	5146	5146	0	243	243	0	12946	611	63	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
813	70	171	Monday	14:40:59	6883	5307	868.33	6330	6330	0	1838	1838	0	4257	4257	0	1132	1132	0	10587	2970	72	Degradation of altitude	UA approaches Emergency landing site
822	4	1541	Wednesday	06:25:53	1813	2771	43.11	6942	6942	0	1226	1226	0	4661	4661	0	728	728	0	11603	1954	22	Generator Failure	UA approaches Emergency landing site
832	32	1148	Thursday	09:56:19	2984	3704	393.86	6575	6575	0	1593	1593	0	4418	4418	0	971	971	0	10993	2564	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
837	110	1998	Thursday	19:46:38	1915	2290	1377.75	7555	7555	0	613	613	0	4877	4877	0	512	512	0	12432	1125	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
839	7	2979	Saturday	06:51:31	5887	3978	85.86	7800	7800	0	368	368	0	5146	5146	0	243	243	0	12946	611	42	Partial Lock of Flight Control Surfaces	Central UA ground impact point below flight path
85	105	628	Monday	19:06:03	5366	4928	1310.08	7514	7514	0	654	654	0	4903	4903	0	486	486	0	12417	1140	19	Engine Fire	UA approaches Emergency landing site
867	75	627	Saturday	15:19:40	5370	4930	932.80	6493	6493	0	1675	1675	0	4149	4149	0	1240	1240	0	10642	2915	81	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
880	27	2155	Friday	09:20:42	2326	2337	334.50	7106	7106	0	1062	1062	0	4661	4661	0	728	728	0	11767	1790	66	Degradation of lateral and horizontal navigation data accuracy.	Central UA ground impact point below flight path
883	57	2998	Monday	13:08:49	5961	4027	714.72	6330	6330	0	1838	1838	4	4257	4257	0	1132	1132	0	10587	2970	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
886	30	1764	Thursday	09:42:31	1649	2428	370.86	6983	6983	0	1185	1185	0	4607	4607	0	782	782	0	11590	1967	36	Short Circuit / Overload	Central UA ground impact point below flight path
893	104	2383	Thursday	19:02:10	3184	2596	1303.64	7555	7555	0	613	613	0	4877	4877	0	512	512	0	12432	1125	42	Partial Lock of Flight Control Surfaces	Central UA ground impact point below flight path
9	68	56	Tuesday	14:25:40	7045	5255	842.78	6248	6248	0	1920	1920	0	4257	4257	0	1132	1132	0	10505	3052	39	Short Circuit / Overload	Central UA ground impact point below flight path
91	71	659	Sunday	14:49:34	5227	4872	882.61	6044	6044	0	2124	2124	0	3880	3880	0	1509	1509	0	9924	3633	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
937	9	3166	Saturday	07:07:00	6534	4449	111.67	7800	7800	0	368	368	0	5146	5146	0	243	243	0	12946	611	32	Connection Failure	UA approaches Emergency landing site
938	72	2299	Sunday	15:00:33	2838	2476	900.92	6044	6044	0	2124	2124	0	3880	3880	0	1509	1509	0	9924	3633	75	Degradation of altitude	UA approaches Emergency landing site

938	72	534	Sunday	14:56:51	5767	5077	894.75	6044	6044	0	2124	2124	0	3880	3880	0	1509	1509	0	9924	3633	1	Engine Out	No Ground Effect
939	88	1085	Monday	16:58:44	3250	3870	1097.89	6166	6166	26	2002	2002	0	4068	4068	0	1321	1321	0	10234	3323	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
961	82	2336	Tuesday	16:16:04	2987	2526	1026.81	5962	5962	0	2206	2206	0	4068	4068	0	1321	1321	0	10030	3527	40	Short Circuit / Overload	Central UA ground impact point below flight path
967	71	1637	Monday	14:51:37	1692	2601	886.03	6330	6330	0	1838	1838	2	4257	4257	0	1132	1132	0	10587	2970	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
97	21	464	Saturday	08:31:52	6042	5166	253.14	6861	6861	0	1307	1307	0	4472	4472	0	917	917	0	11333	2224	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
975	17	1855	Tuesday	08:04:36	1700	2346	207.69	6901	6901	0	1267	1267	0	4553	4553	0	836	836	0	11454	2103	69	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
977	7	1619	Thursday	06:48:39	1709	2630	81.11	7106	7106	0	1062	1062	0	4688	4688	0	701	701	0	11794	1763	72	Degradation of altitude	UA approaches Emergency landing site
980	111	1070	Sunday	19:52:14	3315	3909	1387.08	7351	7351	1	817	817	0	4742	4742	0	647	647	0	12093	1464	40	Short Circuit / Overload	Central UA ground impact point below flight path
980	63	944	Sunday	13:49:48	3889	4235	783.00	6044	6044	0	2124	2124	1	3880	3880	0	1509	1509	0	9924	3633	63	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
989	8	2178	Tuesday	06:57:23	2400	2353	95.64	6779	6779	0	1389	1389	0	4661	4661	0	728	728	0	11440	2117	62	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
995	63	1262	Monday	13:50:28	2548	3408	784.11	6330	6330	0	1838	1838	4	4257	4257	0	1132	1132	0	10587	2970	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
996	2	2626	Tuesday	06:13:02	4299	3078	21.75	6779	6779	0	1389	1389	0	4661	4661	0	728	728	0	11440	2117	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.

O.R.C.U.S. 02.00 - tTest of the Simulation

nProbes	1400
nEvents	188
nEvents_cor	172
tMission	14
x_cross_ATB	0.132857143
x_cross_OTW	0.031428571
x_cross_TOT	0.164285714
s2ATB	0.035621362
sATB	0.188736224
tATB	24.35617958
s2OTW	0.001263001
sOTW	0.035538729
tOTW	22.56084404
s2TOT	0.044310076
sTOT	0.210499586
tTOT	27.42448541

UADay/Prot	HIT_TOT_ATB	HIT_TOT_OTW	UADay/Prot cor	HIT_TOT_mean_ATB	HIT_TOT_mean_OTW	HIT_TOT_mean_ATB/Fh	HIT_TOT_mean_OTW/Fh	x_i-x_cross ATB	x_i-x_cross OTW	(x_i-x_cross ATB)^2	(x_i-x_cross OTW)^2
4	0	0	4	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
8	0	0	8	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
9	0	0	9	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
15	0	0	15	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
22	0	0	22	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
28	0	0	28	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
51	0	0	51	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
69	0	0	69	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
85	0	0	85	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
91	0	0	91	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
97	0	0	97	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
104	0	0	104	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
107	0	0	107	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
109	0	0	109	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
110	0	0	110	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
127	6	2	127	6	2	0.428571429	0.142857143	0.295714286	0.111428571	0.087446939	0.012416327
132	0	0	132	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
150	0	0	150	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
151	0	0	151	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
151	0	0	160	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
160	0	0	168	30	0	2.142857143	0	2.01	-0.031428571	4.0401	0.000987755
168	30	0	172	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
172	0	0	175	6	0	0.428571429	0	0.295714286	-0.031428571	0.087446939	0.000987755
175	6	0	182	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
182	0	0	189	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
189	0	0	210	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
210	0	0	218	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
218	0	0	222	0	2	0	0.142857143	-0.132857143	0.111428571	0.01765102	0.012416327
222	0	2	223	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
223	0	0	225	5	1	0.357142857	0.071428571	0.224285714	0.04	0.050304082	0.0016
225	5	1	228	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
225	0	0	237	1	0	0.071428571	0	-0.061428571	-0.031428571	0.003773469	0.000987755
228	0	0	273	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
237	1	0	281	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
273	0	0	283	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
281	0	0	290	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
283	0	0	292	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
290	0	0	294	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
292	0	0	307	0	1	0	0.071428571	-0.132857143	0.04	0.01765102	0.0016
294	0	0	310	23	0	1.642857143	0	1.51	-0.031428571	2.2801	0.000987755
307	0	1	312	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
310	23	0	317	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
312	0	0	319	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
317	0	0	323	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
319	0	0	330	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
323	0	0	331	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
330	0	0	340	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
331	0	0	350	0	3	0	0.214285714	-0.132857143	0.182857143	0.01765102	0.033436735
340	0	0	354	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
350	0	3	359	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
354	0	0	368	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
359	0	0	378	5	2	0.357142857	0.142857143	0.224285714	0.111428571	0.050304082	0.012416327
368	0	0	380	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
378	5	2	385	0	1	0	0.071428571	-0.132857143	0.04	0.01765102	0.0016
380	0	0	413	0	1	0	0.071428571	-0.132857143	0.04	0.01765102	0.0016
385	0	1	429	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
413	0	1	444	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
413	0	0	445	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
429	0	0	457	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
444	0	0	482	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
445	0	0	483	1	0	0.071428571	0	-0.061428571	-0.031428571	0.003773469	0.000987755
457	0	0	486	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
482	0	0	487	0	1	0	0.071428571	-0.132857143	0.04	0.01765102	0.0016
483	1	0	491	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
486	0	0	519	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
487	0	1	524	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
491	0	0	532	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
519	0	0	547	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
524	0	0	569	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
532	0	0	579	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
547	0	0	588	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
569	0	0	604	0	3	0	0.214285714	-0.132857143	0.182857143	0.01765102	0.033436735
569	0	0	610	0	1	0	0.071428571	-0.132857143	0.04	0.01765102	0.0016
579	0	0	613	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
588	0	0	622	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
588	0	0	631	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
588	0	0	642	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
604	0	3	653	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
610	0	1	656	0	2	0	0.142857143	-0.132857143	0.111428571	0.01765102	0.012416327
613	0	0	658	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
622	0	0	668	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
631	0	0	701	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
642	0	0	705	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
653	0	0	720	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
653	0	0	741	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
656	0	2	743	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
658	0	0	749	52	0	3.714285714	0	3.581428571	-0.031428571	12.82663061	0.000987755
668	0	0	752	1	0	0.071428571	0	-0.061428571	-0.031428571	0.003773469	0.000987755
668	0	0	753	1	0	0.071428571	0	-0.061428571	-0.031428571	0.003773469	0.000987755
701	0	0	756	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
705	0	0	767	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
720	0	0	785	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
741	0	0	791	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
743	0	0	796	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
749	52	0	801	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
752	1	0	811	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
753	1	0	813	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
756	0	0	822	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
767	0	0	823	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
785	0	0	837	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
791	0	0	839	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
796	0	0	867	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
801	0	0	880	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
811	0	0	883	0	4	0	0.285714286	-0.132857143	0.254285714	0.01765102	0.064661224
811	0	0	886	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
813	0	0	893	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
822	0	0	937	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
823	0	0	938	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
837	0	0	939	26	0	1.857142857	0	1.724285714	-0.031428571	2.973161224	0.000987755
839	0	0	961	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
867	0	0	967	0	2	0	0.142857143	-0.132857143	0.111428571	0.01765102	0.012416327
880	0	0	975	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
883	0	4	977	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
886	0	0	980	1	1	0.071428571	0.071428571	-0.061428571	0.04	0.003773469	0.0016
893	0	0	989	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
937	0	0	995	0	4	0	0.285714286	-0.132857143	0.254285714	0.01765102	0.064661224
938	0	0	996	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
938	0	0	1017	0	1	0	0.071428571	-0.132857143	0.04	0.01765102	0.0016
939	26	0	1026	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
961	0	0	1045	0	1	0	0.071428571	-0.132857143	0.04	0.01765102	0.0016
967	0	2	1049	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
975	0	0	1057	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
977	0	0	1058	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
980	1	0	1064	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
980	0	1	1068	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
989	0	0	1074	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
995	0	4	1078	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
996	0	0	1091	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
1017	0	1	1096	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
1026	0	0	1099	0	1	0	0.071428571	-0.132857143	0.04	0.01765102	0.0016
1045	0	1	1100	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
1045	0	0	1101	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
1045	0	0	1103	2	4	0.142857143	0.285714286	0.01	0.254285714	1E-04	0.064661224
1049	0	0	1123	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
1057	0	0	1128	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
1058	0	0	1131	0	1	0	0.071428571	-0.132857143	0.04	0.01765102	0.0016
1064	0	0	1139	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
1068	0	0	1144	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
1074	0	0	1152	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
1078	0	0	1155	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
1091	0	0	1166	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
1096	0	0	1174	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
1099	0	1	1178	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
1100	0	0	1200	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
1101	0	0	1213	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
1103	2	4	1217	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
1123	0	0	1226	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
1128	0	0	1236	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
1131	0	1	1253	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
1139	0	0	1254	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
1144	0	0	1261	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
1152	0	0	1266	0	1	0	0.071428571	-0.132857143	0.04	0.01765102	0.0016
1155	0	0	1275	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
1166	0	0	1276	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
1174	0	0	1281	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
1178	0	0	1284	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
1200	0	0	1287	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
1213	0	0	1297	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
1217	0	0	1299	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
1226	0	0	1301	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
1236	0	0	1311	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
1253	0	0	1319	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
1254	0	0	1320	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
1261	0	0	1332	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
1266	0	1	1333	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
1275	0	0	1334	0	4	0	0.285714286	-0.132857143	0.254285714	0.01765102	0.064661224
1276	0	0	1345	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
1281	0	0	1354	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
1284	0	0	1360	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
1287	0	0	1367	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
1287	0	0	1372	0	0	0	0	-0.132857143	-0.031428571	0.01765102	0.000987755
1297	0	0	1386	26	0	1.857142857	0	1.724285714	-0.031428571	2.973161224	0.000987755
1299	0	0									
1301	0	0									
1311	0	0									
1319	0	0									
1320	0	0									
1320	0	0									
1332	0	0									
1333	0	0									
1334	0	4									
1334	0	0									
1345	0	0									
1354	0	0									
1360	0	0									
1367	0	0									
1372	0	0									
1386	26	0									

11.4.4.2 Arnstein – R74 – Phase 2

O.R.C.U.S. 02.00 - Simulation Summary

UA Parameters

MTOW [kg]	Wingspan [m]	Length [m]	L/D		
90	5	4	8		
v [km/h]	Alt [m]	CCF [m]			
100	100	12575.862			
P_CumCat [1/Fh]	Engine [%]	ESys [%]	FCS [%]	NavSys [%]	Struct [%]
0.01	20	20	20	20	20

General map parameters

	Name	Area [km2]	PPL	PPL/km2
City	Arnstein, Stadt	112.1	8168	73
County	Main-Spessart	1321.19	126523	96
FS	BY	70542.03	12997204	184

Mission specific map parameters

	Area [km2]	PPL	Tourists	Total PPL
City-SMP	10.7276	8168	0	8168
SurM	56.1279	5389	0	5389
Map total	66.8555	13557	0	13557

PPL MOD NA

Sim FH [Fh]	19600	Ev/Fh [1/Fh]	0.00994898
Events total	195		

Hits due to UA impacts		Hits/Fh [1/Fh]
City-SMP ATB	182	0.0092857
SurM ATB	0	0
Total ATB	182	0.0092857
City-SMP OTW	38	0.0019388
SurM OTW	9	0.0004592
Total OTW	47	0.002398
Total	229	0.0116837

Prot	cyc	k_UA	Day	Time of impact	UA X Pos	UA Y Pos	Travelled Distance [km]	PPL_TD_CITY_ATB	PPL_CITY_ATB_COUNT	HIT_CITY_ATB_COUNT	PPL_TD_CITY_OTW	PPL_CITY_OTW_COUNT	HIT_CITY_OTW_COUNT	PPL_TD_SURM_ATB	PPL_SURM_ATB_COUNT	HIT_SURM_ATB_COUNT	PPL_TD_SURM_OTW	PPL_SURM_OTW_COUNT	HIT_SURM_OTW_COUNT	PPL_ALL_ATB_COUNT	PPL_ALL_OTW_COUNT	E	Case	Outcome
10	8	2424	Wednesday	06:57:53	3362	2665	96.50	6942	6942	0	1226	1226	0	4661	4661	0	728	728	0	11603	1954	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
1003	75	3092	Tuesday	15:24:50	6302	4268	941.42	6248	6248	0	1920	1920	0	4257	4257	0	1132	1132	0	10505	3052	76	Degradation of altitude	Central UA ground impact point below flight path
1006	17	130	Friday	08:01:00	6953	5295	201.67	7106	7106	0	1062	1062	0	4661	4661	0	728	728	0	11767	1790	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
1017	101	2774	Tuesday	18:40:21	4997	3441	1267.28	5962	5962	0	2206	2206	0	4068	4068	0	1321	1321	0	10030	3527	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
103	92	195	Friday	17:27:03	6837	5310	1145.08	6411	6411	0	1757	1757	0	4230	4230	0	1159	1159	0	10641	2916	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
1032	31	1519	Wednesday	09:49:32	1850	2814	382.58	6983	6983	0	1185	1185	0	4553	4553	0	836	836	0	11536	2021	78	Degradation of altitude	Central UA ground impact point below flight path
1037	21	35	Monday	08:30:59	7063	5239	251.64	6861	6861	0	1307	1307	0	4553	4553	0	836	836	1	11414	2143	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1042	40	266	Saturday	10:54:49	6674	5303	491.39	6003	6003	0	2165	2165	0	3826	3826	0	1563	1563	0	9829	3728	23	Generator Failure	Central UA ground impact point below flight path
105	61	3078	Sunday	13:39:10	6254	4233	765.30	6044	6044	0	2124	2124	0	3880	3879	0	1509	1509	0	9923	3633	36	Short Circuit / Overload	Central UA ground impact point below flight path
1050	93	2368	Sunday	17:39:09	3120	2573	1165.25	6207	6207	0	1961	1961	0	3933	3933	0	1456	1456	0	10140	3417	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
1052	29	2461	Monday	09:36:25	3528	2731	[illegible]	6901	6901	0	1267	1267	0	4553	4553	0	836	836	0	11454	2103	55	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
1054	38	389	Thursday	10:39:59	6309	5238	466.67	6575	6575	0	1593	1593	0	4418	4418	0	971	971	0	10993	2564	17	Engine Fire	Central UA ground impact point below flight path
1061	58	2579	Thursday	13:15:30	4076	2972	725.83	6411	6411	0	1757	1757	0	4284	4284	0	1105	1105	0	10695	2862	77	Degradation of altitude	Central UA ground impact point below flight path
1068	24	3357	Thursday	09:00:34	6959	4860	300.97	6983	6983	0	1185	1185	0	4607	4607	0	782	782	0	11590	1967	29	Connection Failure	UA approaches Emergency landing site
1072	78	2375	Monday	15:45:58	3150	2584	976.64	6330	6330	0	1838	1838	0	4257	4257	0	1132	1132	0	10587	2970	67	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
1076	62	2421	Friday	13:45:21	3349	2659	775.58	6330	6330	0	1838	1838	0	4095	4095	0	1294	1294	1	10425	3132	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1089	99	2746	Thursday	18:25:12	4867	3370	1242.03	6126	6126	0	2042	2042	0	4014	4014	0	1375	1375	0	10140	3417	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
1102	57	1996	Wednesday	13:06:43	1911	2290	711.22	6248	6248	0	1920	1920	0	4230	4230	0	1159	1159	0	10478	3079	22	Generator Failure	UA approaches Emergency landing site
111	57	2513	Saturday	13:07:48	3766	2832	713.03	6493	6493	0	1675	1675	0	4149	4149	0	1240	1240	0	10642	2915	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1113	7	1818	Sunday	06:49:05	1671	2375	81.81	7963	7963	0	205	205	0	5200	5200	0	189	189	0	13163	394	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1114	94	2282	Monday	17:46:30	2772	2455	1177.53	6166	6166	0	2002	2002	0	4068	4068	0	1321	1321	0	10234	3323	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
1126	88	1808	Saturday	17:00:14	1665	2384	1100.42	6411	6411	0	1757	1757	0	4230	4230	0	1159	1159	0	10641	2916	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
1129	18	2748	Tuesday	08:14:02	4876	3375	223.39	6901	6901	0	1267	1267	0	4553	4553	0	836	836	0	11454	2103	70	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
1134	108	1461	Sunday	19:30:25	1968	2935	1350.72	7351	7351	0	817	817	0	4742	4742	0	647	647	0	12093	1464	75	Degradation of altitude	UA approaches Emergency landing site
1137	79	1590	Wednesday	15:51:52	1742	2680	986.47	6248	6248	0	1920	1920	0	4230	4230	0	1159	1159	0	10478	3079	9	Engine Out	UA ground impact tangential to trajectory
1148	21	1204	Sunday	08:33:26	2762	3557	255.72	7147	7147	0	1021	1021	0	4688	4688	0	701	701	0	11835	1722	47	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
1152	48	2923	Thursday	12:00:45	5658	3831	601.28	6575	6575	10	1593	1593	0	4418	4418	0	971	971	0	10993	2564	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1157	67	2407	Tuesday	14:23:02	3288	2636	838.42	6248	6248	0	1920	1920	0	4257	4257	0	1132	1132	0	10505	3052	72	Degradation of altitude	UA approaches Emergency landing site
1166	32	599	Thursday	09:55:09	5493	4978	391.94	6575	6575	0	1593	1593	0	4418	4418	0	971	971	0	10993	2564	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
1171	45	213	Tuesday	11:32:26	6799	5310	554.08	6738	6738	0	1430	1430	0	4472	4472	0	917	917	0	11210	2347	73	Degradation of altitude	Central UA ground impact point below flight path
1180	55	1237	Thursday	12:50:03	2638	3472	683.42	6575	6575	0	1593	1593	0	4418	4418	0	971	971	0	10993	2564	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
1191	87	1544	Monday	16:52:09	1808	2765	1086.92	6166	6166	0	2002	2002	0	4068	4068	0	1321	1321	0	10234	3323	24	Generator Failure	UA ground impact tangential to trajectory
1203	71	1939	Saturday	14:52:15	1807	2302	887.08	6493	6493	0	1675	1675	0	4149	4149	0	1240	1240	0	10642	2915	9	Engine Out	UA ground impact tangential to trajectory
1206	28	1251	Tuesday	09:26:21	2587	3436	343.92	6901	6901	0	1267	1267	0	4553	4553	0	836	836	0	11454	2103	58	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
1210	19	3569	Saturday	08:23:17	7096	5177	238.83	6861	6861	0	1307	1307	0	4472	4472	0	917	917	0	11333	2224	9	Engine Out	UA ground impact tangential to trajectory
1213	19	102	Tuesday	08:16:01	6993	5283	226.72	6901	6901	0	1267	1267	0	4553	4553	0	836	836	0	11454	2103	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1231	84	3151	Saturday	16:32:52	6490	4413	1054.80	6411	6411	1	1757	1757	0	4230	4230	0	1159	1159	0	10641	2916	78	Degradation of altitude	Central UA ground impact point below flight path
1241	64	2520	Tuesday	14:00:38	3799	2847	801.08	6248	6248	0	1920	1920	0	4257	4257	0	1132	1132	0	10505	3052	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1241	91	407	Tuesday	17:19:56	6248	5223	1133.25	5962	5962	0	2206	2206	0	4068	4068	0	1321	1321	0	10030	3527	43	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
1242	93	3568	Wednesday	17:41:39	7096	5176	1169.44	6126	6126	0	2042	2042	0	4014	4014	0	1375	1375	0	10140	3417	37	Short Circuit / Overload	Central UA ground impact point below flight path
1264	18	855	Thursday	08:10:03	4309	4454	216.78	6983	6983	4	1185	1185	0	4607	4607	0	782	782	0	11590	1967	12	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
127	111	2772	Monday	19:55:49	4988	3436	1393.03	7514	7514	0	654	654	0	4903	4903	0	486	486	0	12417	1140	39	Short Circuit / Overload	Central UA ground impact point below flight path
1278	70	2668	Thursday	14:46:13	4498	3177	877.05	6411	6411	0	1757	1757	0	4284	4284	0	1105	1105	0	10695	2862	23	Generator Failure	Central UA ground impact point below flight path
1290	36	2071	Tuesday	10:28:26	2085	2298	447.39	6738	6738	0	1430	1430	0	4472	4472	0	917	917	1	11210	2347	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1293	47	1530	Friday	11:50:18	1831	2792	583.83	6616	6616	0	1552	1552	0	4338	4338	0	1051	1051	0	10954	2603	67	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
13	55	2581	Saturday	12:52:52	4085	2977	688.11	6003	6003	0	2165	2165	0	3826	3826	0	1563	1563	0	9829	3728	11	Engine Anomaly	Central UA ground impact point below flight path
1309	19	2734	Sunday	08:21:32	4811	3340	235.92	7147	7147	0	1021	1021	0	4688	4688	0	701	701	0	11835	1722	11	Engine Anomaly	Central UA ground impact point below flight path
131	94	1082	Friday	17:44:00	3263	3877	1173.33	6411	6411	29	1757	1757	0	4230	4230	0	1159	1159	0	10641	2916	20	Engine Fire	UA structural desintegration - Debris Impact
1314	47	2881	Friday	11:53:07	5479	3720	588.55	6616	6616	0	1552	1552	0	4338	4338	0	1051	1051	0	10954	2603	40	Short Circuit / Overload	Central UA ground impact point below flight path
1315	103	83	Saturday	18:49:49	7016	5273	1283.03	6411	6411	0	1757	1757	0	4230	4230	0	1159	1159	1	10641	2916	63	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
1319	85	29	Wednesday	16:33:53	7067	5234	1056.47	6126	6126	0	2042	2042	0	4014	4014	0	1375	1375	0	10140	3417	74	Degradation of altitude	Central UA ground impact point below flight path
1319	90	3268	Wednesday	17:18:24	6794	4680	1130.67	6126	6126	0	2042	2042	0	4014	4014	0	1375	1375	0	10140	3417	29	Connection Failure	UA approaches Emergency landing site
1324	105	2711	Monday	19:10:24	4702	3282	1317.36	7514	7514	0	654	654	0	4903	4903	0	486	486	0	12417	1140	13	Engine Anomaly	UA approaches Emergency landing site
1339	60	595	Tuesday	13:26:25	5510	4984	744.05	6248	6248	0	1920	1920	0	4257	4257	0	1132	1132	0	10505	3052	28	Generator Failure	UA ground impact tangential to trajectory
1344	38	2075	Sunday	10:43:31	2096	2299	472.56	5840	5840	0	2328	2328	0	4014	4014	0	1375	1375	0	9854	3703	78	Degradation of altitude	Central UA ground impact point below flight path
1351	103	1530	Sunday	18:52:50	1831	2792	1288.08	6207	6207	0	1961	1961	0	3933	3933	0	1456	1456	0	10140	3417	9	Engine Out	UA ground impact tangential to trajectory
1356	77	35	Friday	15:33:31	7063	5239	955.89	6330	6330	0	1838	1838	0	4095	4095	0	1294	1294	0	10425	3132	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
1357	12	127	Saturday	07:23:16	6957	5294	138.78	7800	7800	0	368	368	0	5146	5146	0	243	243	0	12946	611	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1372	15	1994	Sunday	07:49:48	1907	2290	183.03	7963	7963	0	205	205	0	5200	5200	0	189	189	0	13163	394	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
1399	61	2506	Saturday	13:37:59	3734	2818	763.31	6493	6493	8	1675	1675	4	4149	4149	0	1240	1240	0	10642	2915	63	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
149	56	2082	Tuesday	12:59:22	2114	2301	698.95	6248	6248	0	1920	1920	0	4257	4257	0	1132	1132	0	10505	3052	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
152	69	957	Friday	14:35:06	3828	4202	858.50	6330	6330	0	1838	1838	0	4095	4095	0	1294	1294	0	10425	3132	50	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
153	80	272	Saturday	15:56:39	6658	5302	994.44	6411	6411	0	1757	1757	0	4230	4230	0	1159	1159	0	10641	2916	44	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
168	70	1460	Sunday	14:43:42	1970	2937	872.83	6044	6044	0	2124	2124	4	3880	3880	0	1509	1509	0	9924	3633	20	Engine Fire	UA structural desintegration - Debris Impact
191	90	779	Tuesday	17:13:11	4670	4628	1121.97	5962	5962	0	2206	2206	0	4068	4068	0	1321	1321	0	10030	3527	78	Degradation of altitude	Central UA ground impact point below flight path
197	91	105	Monday	17:19:18	6989	5284	1132.19	6166	6166	0	2002	2002	0	4068	4068	0	1321	1321	0	10234	3323	11	Engine Anomaly	Central UA ground impact point below flight path
202	23	675	Saturday	08:47:24	5155	4842	279.03	6861	6861	0	1307	1307	0	4472	4472	0	917	917	0	11333	2224	69	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
206	97	1692	Wednesday	18:07:54	1657	2518	1213.19	6126	6126	0	2042	2042	0	4014	4014	0	1375	1375	0	10140	3417	73	Degradation of altitude	Central UA ground impact point below flight path
212	37	37	Tuesday	10:31:42	7061	5241	452.86	6738	6738	0	1430	1430	0	4472	4472	0	917	917	0	11210	2347	21	Engine Fire	UA structural desintegration - Debris Impact
214	69	1736	Thursday	14:36:44	1647	2461	861.22	6411	6411	0	1757	1757	0	4284	4284	0	1105	1105	0	10695	2862	7	Engine Out	Central UA ground impact point below flight path
225	39	2626	Monday	10:52:14	4299	3078	487.06	6779	6779	0	1389	1389	0	4472	4472	0	917	917	0	11251	2306	37	Short Circuit / Overload	Central UA ground impact point below flight path
233	18	3464	Tuesday	08:15:32	7074	5041	225.89	6901	6901	0	1267	1267	0	4553	4553	0	836	836	0	11454	2103	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
248	26	1668	Wednesday	09:12:08	1670	2553	320.22	6983	6983	0	1185	1185	0	4553	4553	0	836	836	0	11536	2021	1	Engine Out	No Ground Effect
25	63	2924	Thursday	13:53:57	5663	3833	789.92	6411	6411	0	1757	1757	0	4284	4284	0	1105	1105	0	10695	2862	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
255	51	2556	Wednesday	12:22:37	3967	2922	637.72	6738	6738	5	1430	1430	0	4445	4445	0	944	944	0	11183	2374	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
261	64	2194	Tuesday	13:59:57	2453	2366	799.94	6248	6248	0	1920	1920	0	4257	4257	0	1132	1132	0	10505	3052	29	Connection Failure	UA approaches Emergency landing site
267	61	1910	Monday	13:36:44	1764	2313	761.22	6330	6330	0	1838	1838	0	4257	4257	0	1132	1132	0	10587	2970	1	Engine Out	No Ground Effect
273	51	2318	Sunday	12:22:08	2914	2501	636.89	5840	5840	0	2328	2328	0	4014	4014	0	1375	1375	0	9854	3703	40	Short Circuit / Overload	Central UA ground impact point below flight path
279	42	438	Saturday	11:10:17	6138	5194	517.14	6003	6003	0	2165	2165	0	3826	3826	0	1563	1563	0	9829	3728	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
299	7	554	Friday	06:46:26	5685	5048	77.39	7024	7024	0	1144	1144	0	4742	4742	0	647	647	1	11766	1791	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
311	36	401	Wednesday	10:24:56	6269	5228	441.56	6738	6738	0	1430	1430	0	4445	4445	0	944	944	0	11183	2374	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
313	84	2452	Friday	16:31:25	3487	2715	1052.36	6411	6411	0	1757	1757	0	4230	4230	0	1159	1159	0	10641	2916	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
321	54	2602	Saturday	12:45:21	4185	3023	675.61	6003	6003	0	2165	2165	0	3826	3826	0	1563	1563	0	9829	3728	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
323	79	1988	Monday	15:52:43	1895	2291	987.86	6330	6330	0	1838	1838	2	4257	4257	0	1132	1132	0	10587	2970	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
323	80	2006	Monday	16:00:18	1932	2290	1000.50	6166	6166	0	2002	2002	0	4068	4068	0	1321	1321	0	10234	3323	9	Engine Out	UA ground impact tangential to trajectory
345	98	2911	Tuesday	18:18:00	5608	3799	1230.03	5962	5962	0	2206	2206	0	4068	4068	0	1321	1321	0	10030	3527	77	Degradation of altitude	Central UA ground impact point below flight path
355	18	2819	Friday	08:14:10	5203	3557	223.64	7106	7106	0	1062	1062	0	4661	4661	0	728	728	0	11767	1790	72	Degradation of altitude	UA approaches Emergency landing site
355	90	763	Friday	17:13:09	4746	4663	1121.92	6411	6411	0	1757	1757	0	4230	4230	0	1159	1159	0	10641	2916	21	Engine Fire	UA structural desintegration - Debris Impact
356	105	381	Saturday	19:05:31	6336	5245	1309.22	7310	7310	0	858	858	0	4850	4850	0	539	539	0	12160	1397	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
361	68	1694	Thursday	14:29:06	1657	2516	848.50	6411	6411	0	1757	1757	0	4284	4284	0	1105	1105	0	10695	2862	13	Engine Anomaly	UA approaches Emergency landing site
374	111	855	Wednesday	19:51:47	4309	4454	1386.33	7473	7473	1	695	695	0	4903	4903	0	486	486	0	12376	1181	76	Degradation of altitude	Central UA ground impact point below flight path
384	28	1322	Saturday	09:26:29	2346	3257	344.17	6861	6861	0	1307	1307	2	4472	4472	0	917	917	0	11333	2224	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
385	16	251	Sunday	08:08:47	6711	5307	214.67	7147	7147	0	1021	1021	0	4688	4688	0	701	701	0	11835	1722	43	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
396	6	2134	Thursday	06:42:12	2262	2324	70.33	7106	7106	0	1062	1062	0	4688	4688	0	701	701	0	11794	1763	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
406	42	3443	Sunday	11:16:34	7059	5009	527.64	5840	5840	0	2328	2328	0	4014	4014	0	1375	1375	0	9854	3703	49	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
409	20	414	Wednesday	08:24:13	6224	5217	240.39	6983	6983	0	1185	1185	0	4553	4553	0	836	836	0	11536	2021	25	Generator Failure	UA approaches Emergency landing site
418	19	786	Friday	08:17:28	4637	4612	229.11	7106	7106	0	1062	1062	0	4661	4661	0	728	728	0	11767	1790	18	Engine Fire	UA structural desintegration - Debris Impact
429	33	3026	Tuesday	10:07:47	6068	4100	413.00	6738	6738	2	1430	1430	1	4472	4472	0	917	917	0	11210	2347	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact

915	97	1700	Friday	18:07:55	1654	2507	1213.22	6411	6411	0	1757	1757	2	4230	4230	0	1159	1159	0	10641	2916	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
924	82	499	Sunday	16:12:13	5908	5124	1020.39	6207	6207	0	1961	1961	0	3933	3933	0	1456	1456	0	10140	3417	37	Short Circuit / Overload	Central UA ground impact point below flight path
926	14	2859	Tuesday	07:44:05	5383	3662	173.47	6779	6779	2	1389	1389	0	4661	4661	0	728	728	0	11440	2117	20	Engine Fire	UA structural desintegration - Debris Impact
928	81	2740	Thursday	16:09:23	4839	3355	1015.64	6126	6126	0	2042	2042	0	4014	4014	0	1375	1375	0	10140	3417	76	Degradation of altitude	Central UA ground impact point below flight path
930	38	397	Saturday	10:40:00	6282	5232	466.69	6003	6003	0	2165	2165	0	3826	3826	0	1563	1563	0	9829	3728	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
936	45	3283	Friday	11:38:53	6826	4712	564.81	6616	6616	0	1552	1552	0	4338	4338	0	1051	1051	0	10954	2603	11	Engine Anomaly	Central UA ground impact point below flight path
937	30	3211	Saturday	09:45:33	6657	4554	375.92	6861	6861	0	1307	1307	0	4472	4472	0	917	917	0	11333	2224	37	Short Circuit / Overload	Central UA ground impact point below flight path
94	37	1469	Wednesday	10:34:43	1950	2917	457.86	6738	6738	0	1430	1430	0	4445	4445	0	944	944	0	11183	2374	2	Engine Out	UA approaches Emergency landing site
96	32	742	Friday	09:55:27	4845	4708	392.44	6616	6616	0	1552	1552	0	4338	4338	0	1051	1051	0	10954	2603	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
968	59	2955	Tuesday	13:23:50	5791	3915	739.72	6248	6248	17	1920	1920	1	4257	4257	0	1132	1132	0	10505	3052	21	Engine Fire	UA structural desintegration - Debris Impact
971	73	647	Friday	15:04:38	5281	4894	907.72	6330	6330	0	1838	1838	0	4095	4095	0	1294	1294	0	10425	3132	50	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
973	32	1943	Sunday	09:57:59	1814	2300	396.64	5840	5840	0	2328	2328	0	4014	4014	0	1375	1375	0	9854	3703	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
975	2	3095	Tuesday	06:14:01	6312	4276	23.39	6779	6779	0	1389	1389	0	4661	4661	0	728	728	0	11440	2117	37	Short Circuit / Overload	Central UA ground impact point below flight path
975	78	984	Tuesday	15:43:04	3703	4133	971.78	6248	6248	0	1920	1920	0	4257	4257	0	1132	1132	0	10505	3052	9	Engine Out	UA ground impact tangential to trajectory
976	45	2973	Wednesday	11:38:14	5863	3962	563.72	6738	6738	0	1430	1430	0	4445	4445	0	944	944	0	11183	2374	50	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
984	42	1193	Thursday	11:11:52	2804	3586	519.78	6575	6575	0	1593	1593	0	4418	4418	0	971	971	0	10993	2564	67	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
990	68	2115	Wednesday	14:29:58	2206	2314	849.97	6248	6248	0	1920	1920	0	4230	4230	0	1159	1159	0	10478	3079	62	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
990	69	2117	Wednesday	14:37:31	2211	2315	862.55	6248	6248	0	1920	1920	0	4230	4230	0	1159	1159	0	10478	3079	29	Connection Failure	UA approaches Emergency landing site
996	50	89	Tuesday	12:09:55	7009	5276	616.53	6738	6738	0	1430	1430	0	4472	4472	0	917	917	0	11210	2347	22	Generator Failure	UA approaches Emergency landing site

O.R.C.U.S. 02.00 - tTest of the Simulation

nProbes	200
nEvents	195
nEvents_cor	181
tMission	14
x_cross_ATB	0.91
x_cross_OTW	0.235
x_cross_TOT	1.145
s2ATB	0.8479171
sATB	0.9208242
tATB	13.822315
s2OTW	0.0517014
sOTW	0.2273793
tOTW	13.99415
s2TOT	1.2721116
sTOT	1.1278792
tTOT	14.231421

UADay/Prot	HIT_TOT_ATB	HIT_TOT_OTW	UADay/Prot cor	HIT_TOT_mean_ATB	HIT_TOT_mean_OTW	HIT_TOT_mean_ATB/Fh	HIT_TOT_mean_OTW/Fh	x_i-x_cross ATB	x_i-x_cross OTW	(x_i-x_cross ATB)^2	(x_i-x_cross OTW)^2
5	0	0	5	0	0	0	0	-0.91	-0.235	0.8281	0.055225
10	0	0	10	0	0	0	0	-0.91	-0.235	0.8281	0.055225
13	0	0	13	0	0	0	0	-0.91	-0.235	0.8281	0.055225
25	0	0	25	0	0	0	0	-0.91	-0.235	0.8281	0.055225
53	0	1	53	0	1	0	0.071428571	-0.91	-0.163571429	0.8281	0.026755612
72	0	0	72	0	0	0	0	-0.91	-0.235	0.8281	0.055225
94	0	0	94	0	0	0	0	-0.91	-0.235	0.8281	0.055225
96	0	0	96	0	0	0	0	-0.91	-0.235	0.8281	0.055225
103	0	0	103	0	0	0	0	-0.91	-0.235	0.8281	0.055225
105	0	0	105	0	0	0	0	-0.91	-0.235	0.8281	0.055225
111	0	0	111	0	0	0	0	-0.91	-0.235	0.8281	0.055225
127	0	0	127	0	0	0	0	-0.91	-0.235	0.8281	0.055225
131	29	0	131	29	0	2.071428571	0	1.161428571	-0.235	1.348916327	0.055225
149	0	0	149	0	0	0	0	-0.91	-0.235	0.8281	0.055225
152	0	0	152	0	0	0	0	-0.91	-0.235	0.8281	0.055225
153	0	0	153	0	0	0	0	-0.91	-0.235	0.8281	0.055225
168	0	4	168	0	4	0	0.285714286	-0.91	0.050714286	0.8281	0.002571939
191	0	0	191	0	0	0	0	-0.91	-0.235	0.8281	0.055225
197	0	0	197	0	0	0	0	-0.91	-0.235	0.8281	0.055225
202	0	0	202	0	0	0	0	-0.91	-0.235	0.8281	0.055225
206	0	0	206	0	0	0	0	-0.91	-0.235	0.8281	0.055225
212	0	0	212	0	0	0	0	-0.91	-0.235	0.8281	0.055225
214	0	0	214	0	0	0	0	-0.91	-0.235	0.8281	0.055225
225	0	0	225	0	0	0	0	-0.91	-0.235	0.8281	0.055225
233	0	0	233	0	0	0	0	-0.91	-0.235	0.8281	0.055225
248	0	0	248	0	0	0	0	-0.91	-0.235	0.8281	0.055225
255	5	0	255	5	0	0.357142857	0	-0.552857143	-0.235	0.30565102	0.055225
261	0	0	261	0	0	0	0	-0.91	-0.235	0.8281	0.055225
267	0	0	267	0	0	0	0	-0.91	-0.235	0.8281	0.055225
273	0	0	273	0	0	0	0	-0.91	-0.235	0.8281	0.055225
279	0	0	279	0	0	0	0	-0.91	-0.235	0.8281	0.055225
299	0	1	299	0	1	0	0.071428571	-0.91	-0.163571429	0.8281	0.026755612
311	0	0	311	0	0	0	0	-0.91	-0.235	0.8281	0.055225
313	0	0	313	0	0	0	0	-0.91	-0.235	0.8281	0.055225
321	0	0	321	0	0	0	0	-0.91	-0.235	0.8281	0.055225
323	0	2	323	0	2	0	0.142857143	-0.91	-0.092142857	0.8281	0.008490306
323	0	0	345	0	0	0	0	-0.91	-0.235	0.8281	0.055225
345	0	0	355	0	0	0	0	-0.91	-0.235	0.8281	0.055225
355	0	0	356	0	0	0	0	-0.91	-0.235	0.8281	0.055225
355	0	0	361	0	0	0	0	-0.91	-0.235	0.8281	0.055225
356	0	0	374	1	0	0.071428571	0	-0.838571429	-0.235	0.703202041	0.055225
361	0	0	384	0	2	0	0.142857143	-0.91	-0.092142857	0.8281	0.008490306
374	1	0	385	0	0	0	0	-0.91	-0.235	0.8281	0.055225
384	0	2	396	0	0	0	0	-0.91	-0.235	0.8281	0.055225
385	0	0	406	0	0	0	0	-0.91	-0.235	0.8281	0.055225
396	0	0	409	0	0	0	0	-0.91	-0.235	0.8281	0.055225
406	0	0	418	0	0	0	0	-0.91	-0.235	0.8281	0.055225
409	0	0	429	2	1	0.142857143	0.071428571	-0.767142857	-0.163571429	0.588508163	0.026755612
418	0	0	433	0	0	0	0	-0.91	-0.235	0.8281	0.055225
429	2	1	441	0	0	0	0	-0.91	-0.235	0.8281	0.055225
433	0	0	443	0	0	0	0	-0.91	-0.235	0.8281	0.055225
441	0	0	445	0	0	0	0	-0.91	-0.235	0.8281	0.055225
443	0	0	459	11	0	0.785714286	0	-0.124285714	-0.235	0.015446939	0.055225
445	0	0	461	0	0	0	0	-0.91	-0.235	0.8281	0.055225
459	11	0	471	0	0	0	0	-0.91	-0.235	0.8281	0.055225
461	0	0	473	0	0	0	0	-0.91	-0.235	0.8281	0.055225
471	0	0	474	0	0	0	0	-0.91	-0.235	0.8281	0.055225
473	0	0	481	0	0	0	0	-0.91	-0.235	0.8281	0.055225
474	0	0	482	0	0	0	0	-0.91	-0.235	0.8281	0.055225
481	0	0	485	0	0	0	0	-0.91	-0.235	0.8281	0.055225
482	0	0	505	0	0	0	0	-0.91	-0.235	0.8281	0.055225
485	0	0	516	0	1	0	0.071428571	-0.91	-0.163571429	0.8281	0.026755612
505	0	0	517	4	4	0.285714286	0.285714286	-0.624285714	0.050714286	0.389732653	0.002571939
516	0	1	524	0	0	0	0	-0.91	-0.235	0.8281	0.055225
517	0	0	533	0	0	0	0	-0.91	-0.235	0.8281	0.055225
517	4	4	566	0	0	0	0	-0.91	-0.235	0.8281	0.055225
517	0	0	574	0	7	0	0.5	-0.91	0.265	0.8281	0.070225
524	0	0	577	0	0	0	0	-0.91	-0.235	0.8281	0.055225
533	0	0	579	0	0	0	0	-0.91	-0.235	0.8281	0.055225
566	0	0	592	0	0	0	0	-0.91	-0.235	0.8281	0.055225
574	0	0	601	0	0	0	0	-0.91	-0.235	0.8281	0.055225
574	0	7	602	0	1	0	0.071428571	-0.91	-0.163571429	0.8281	0.026755612
574	0	0	609	0	0	0	0	-0.91	-0.235	0.8281	0.055225
577	0	0	612	0	0	0	0	-0.91	-0.235	0.8281	0.055225
579	0	0	616	0	0	0	0	-0.91	-0.235	0.8281	0.055225
592	0	0	631	60	0	4.285714286	0	3.375714286	-0.235	11.39544694	0.055225
601	0	0	637	0	0	0	0	-0.91	-0.235	0.8281	0.055225
602	0	1	642	2	0	0.142857143	0	-0.767142857	-0.235	0.588508163	0.055225
609	0	0	646	0	0	0	0	-0.91	-0.235	0.8281	0.055225
612	0	0	660	0	5	0	0.357142857	-0.91	0.122142857	0.8281	0.014918878
616	0	0	665	0	0	0	0	-0.91	-0.235	0.8281	0.055225
631	60	0	666	0	1	0	0.071428571	-0.91	-0.163571429	0.8281	0.026755612
637	0	0	681	0	0	0	0	-0.91	-0.235	0.8281	0.055225
642	2	0	686	2	0	0.142857143	0	-0.767142857	-0.235	0.588508163	0.055225
646	0	0	703	0	0	0	0	-0.91	-0.235	0.8281	0.055225
660	0	5	706	0	1	0	0.071428571	-0.91	-0.163571429	0.8281	0.026755612
665	0	0	713	0	0	0	0	-0.91	-0.235	0.8281	0.055225
666	0	1	721	0	0	0	0	-0.91	-0.235	0.8281	0.055225
681	0	0	725	0	0	0	0	-0.91	-0.235	0.8281	0.055225
686	2	0	726	0	0	0	0	-0.91	-0.235	0.8281	0.055225
686	0	0	728	0	0	0	0	-0.91	-0.235	0.8281	0.055225
703	0	0	737	0	0	0	0	-0.91	-0.235	0.8281	0.055225
706	0	1	747	0	0	0	0	-0.91	-0.235	0.8281	0.055225
713	0	0	749	0	0	0	0	-0.91	-0.235	0.8281	0.055225
721	0	0	754	0	0	0	0	-0.91	-0.235	0.8281	0.055225
725	0	0	755	0	0	0	0	-0.91	-0.235	0.8281	0.055225
725	0	0	764	4	0	0.285714286	0	-0.624285714	-0.235	0.389732653	0.055225
726	0	0	771	0	0	0	0	-0.91	-0.235	0.8281	0.055225
728	0	0	786	0	0	0	0	-0.91	-0.235	0.8281	0.055225
737	0	0	799	0	0	0	0	-0.91	-0.235	0.8281	0.055225
747	0	0	809	0	0	0	0	-0.91	-0.235	0.8281	0.055225
749	0	0	827	0	0	0	0	-0.91	-0.235	0.8281	0.055225
754	0	0	842	0	0	0	0	-0.91	-0.235	0.8281	0.055225
755	0	0	857	0	0	0	0	-0.91	-0.235	0.8281	0.055225
764	4	0	858	0	0	0	0	-0.91	-0.235	0.8281	0.055225
771	0	0	859	10	0	0.714285714	0	-0.195714286	-0.235	0.038304082	0.055225
786	0	0	863	0	0	0	0	-0.91	-0.235	0.8281	0.055225
799	0	0	865	0	0	0	0	-0.91	-0.235	0.8281	0.055225
809	0	0	867	0	0	0	0	-0.91	-0.235	0.8281	0.055225
827	0	0	881	1	0	0.071428571	0	-0.838571429	-0.235	0.703202041	0.055225
842	0	0	890	0	0	0	0	-0.91	-0.235	0.8281	0.055225
857	0	0	898	4	3	0.285714286	0.214285714	-0.624285714	-0.020714286	0.389732653	0.000429082
858	0	0	904	0	1	0	0.071428571	-0.91	-0.163571429	0.8281	0.026755612
859	10	0	910	0	0	0	0	-0.91	-0.235	0.8281	0.055225
863	0	0	914	5	0	0.357142857	0	-0.552857143	-0.235	0.30565102	0.055225
865	0	0	915	0	3	0	0.214285714	-0.91	-0.020714286	0.8281	0.000429082
867	0	0	924	0	0	0	0	-0.91	-0.235	0.8281	0.055225
881	1	0	926	2	0	0.142857143	0	-0.767142857	-0.235	0.588508163	0.055225
881	0	0	928	0	0	0	0	-0.91	-0.235	0.8281	0.055225
890	0	0	930	0	0	0	0	-0.91	-0.235	0.8281	0.055225
898	4	3	936	0	0	0	0	-0.91	-0.235	0.8281	0.055225
904	0	1	937	0	0	0	0	-0.91	-0.235	0.8281	0.055225
910	0	0	968	17	1	1.214285714	0.071428571	0.304285714	-0.163571429	0.092589796	0.026755612
914	5	0	971	0	0	0	0	-0.91	-0.235	0.8281	0.055225
915	0	1	973	0	0	0	0	-0.91	-0.235	0.8281	0.055225
915	0	2	975	0	0	0	0	-0.91	-0.235	0.8281	0.055225
924	0	0	976	0	0	0	0	-0.91	-0.235	0.8281	0.055225
926	2	0	984	0	0	0	0	-0.91	-0.235	0.8281	0.055225
928	0	0	990	0	0	0	0	-0.91	-0.235	0.8281	0.055225
930	0	0	996	0	0	0	0	-0.91	-0.235	0.8281	0.055225
936	0	0	1003	0	0	0	0	-0.91	-0.235	0.8281	0.055225
937	0	0	1006	0	0	0	0	-0.91	-0.235	0.8281	0.055225
968	17	1	1017	0	0	0	0	-0.91	-0.235	0.8281	0.055225
971	0	0	1032	0	0	0	0	-0.91	-0.235	0.8281	0.055225
973	0	0	1037	0	1	0	0.071428571	-0.91	-0.163571429	0.8281	0.026755612
975	0	0	1042	0	0	0	0	-0.91	-0.235	0.8281	0.055225
975	0	0	1050	0	0	0	0	-0.91	-0.235	0.8281	0.055225
976	0	0	1052	0	0	0	0	-0.91	-0.235	0.8281	0.055225
984	0	0	1054	0	0	0	0	-0.91	-0.235	0.8281	0.055225
990	0	0	1061	0	0	0	0	-0.91	-0.235	0.8281	0.055225
990	0	0	1068	0	0	0	0	-0.91	-0.235	0.8281	0.055225
996	0	0	1072	0	0	0	0	-0.91	-0.235	0.8281	0.055225
1003	0	0	1076	0	1	0	0.071428571	-0.91	-0.163571429	0.8281	0.026755612
1006	0	0	1089	0	0	0	0	-0.91	-0.235	0.8281	0.055225
1017	0	0	1102	0	0	0	0	-0.91	-0.235	0.8281	0.055225
1032	0	0	1113	0	0	0	0	-0.91	-0.235	0.8281	0.055225
1037	0	1	1114	0	0	0	0	-0.91	-0.235	0.8281	0.055225
1042	0	0	1126	0	0	0	0	-0.91	-0.235	0.8281	0.055225
1050	0	0	1129	0	0	0	0	-0.91	-0.235	0.8281	0.055225
1052	0	0	1134	0	0	0	0	-0.91	-0.235	0.8281	0.055225
1054	0	0	1137	0	0	0	0	-0.91	-0.235	0.8281	0.055225
1061	0	0	1148	0	0	0	0	-0.91	-0.235	0.8281	0.055225
1068	0	0	1152	10	0	0.714285714	0	-0.195714286	-0.235	0.038304082	0.055225
1072	0	0	1157	0	0	0	0	-0.91	-0.235	0.8281	0.055225
1076	0	1	1166	0	1	0	0.071428571	-0.91	-0.163571429	0.8281	0.026755612
1089	0	0	1171	0	0	0	0	-0.91	-0.235	0.8281	0.055225
1102	0	0	1180	0	0	0	0	-0.91	-0.235	0.8281	0.055225
1113	0	0	1191	0	0	0	0	-0.91	-0.235	0.8281	0.055225
1114	0	0	1203	0	0	0	0	-0.91	-0.235	0.8281	0.055225
1126	0	0	1206	0	0	0	0	-0.91	-0.235	0.8281	0.055225
1129	0	0	1210	0	0	0	0	-0.91	-0.235	0.8281	0.055225
1134	0	0	1213	0	0	0	0	-0.91	-0.235	0.8281	0.055225
1137	0	0	1231	1	0	0.071428571	0	-0.838571429	-0.235	0.703202041	0.055225
1148	0	0	1241	0	0	0	0	-0.91	-0.235	0.8281	0.055225
1152	10	0	1242	0	0	0	0	-0.91	-0.235	0.8281	0.055225
1157	0	0	1264	4	0	0.285714286	0	-0.624285714	-0.235	0.389732653	0.055225
1166	0	1	1278	0	0	0	0	-0.91	-0.235	0.8281	0.055225
1171	0	0	1290	0	1	0	0.071428571	-0.91	-0.163571429	0.8281	0.026755612
1180	0	0	1293	0	0	0	0	-0.91	-0.235	0.8281	0.055225
1191	0	0	1309	0	0	0	0	-0.91	-0.235	0.8281	0.055225
1203	0	0	1314	0	0	0	0	-0.91	-0.235	0.8281	0.055225
1206	0	0	1315	0	1	0	0.071428571	-0.91	-0.163571429	0.8281	0.026755612
1210	0	0	1319	0	0	0	0	-0.91	-0.235	0.8281	0.055225
1213	0	0	1324	0	0	0	0	-0.91	-0.235	0.8281	0.055225
1231	1	0	1339	0	0	0	0	-0.91	-0.235	0.8281	0.055225
1241	0	0	1344	0	0	0	0	-0.91	-0.235	0.8281	0.055225
1241	0	0	1351	0	0	0	0	-0.91	-0.235	0.8281	0.055225
1242	0	0	1356	0	0	0	0	-0.91	-0.235	0.8281	0.055225
1264	4	0	1357	0	0	0	0	-0.91	-0.235	0.8281	0.055225
1278	0	0	1372	0	0	0	0	-0.91	-0.235	0.8281	0.055225
1290	0	1	1399	8	4	0.571428571	0.285714286	-0.338571429	0.050714286	0.114630612	0.002571939
1293	0	0									
1309	0	0									
1314	0	0									
1315	0	1									
1319	0	0									
1319	0	0									
1324	0	0									
1339	0	0									
1344	0	0									
1351	0	0									
1356	0	0									
1357	0	0									
1372	0	0									
1399	8	4									

11.4.5 Ibbenbüren – R75

11.4.5.1 Ibbenbüren – R75 – Phase 1

O.R.C.U.S. 02.00 - Simulation Summary

UA Parameters

MTOW [kg]	Wingspan [m]	Length [m]	L/D
90	5	4	8

v [km/h]	Alt [m]	CCF [m]
100	100	8995.0725

P_CumCat [1/Fh]	Engine [%]	ESys [%]	FCS [%]	NavSys [%]	Struct [%]
0.01	20	20	20	20	20

General map parameters

	Name	Area [km2]	PPL	PPL/km2
City	Ibbenbueren, Stadt	108.87	52037	478
County	Steinfurt	1795.76	446565	249
FS	NW	34112.45	17912134	525

Mission specific map parameters

	Area [km2]	PPL	Tourists	Total PPL
City	66.8555	31957	0	31957
Map total	66.8555	31957	0	31957

PPL MOD NA

Sim FH [Fh]	19600	Ev/Fh [1/Fh]	0.00892857
Events total	175		

Hits due to UA impacts		Hits/Fh [1/Fh]
City ATB	319	0.0162755
City OTW	26	0.0013265
Total	345	0.017602

Prot	cyc	k_UA	Day	Time of impact	UA X Pos	UA Y Pos	Travelled Distance [km]	PPL_TD_CITY_ATB	PPL_CITY_ATB_COUNT	HIT_CITY_ATB_COUNT	PPL_TD_CITY_OTW	PPL_CITY_OTW_COUNT	HIT_CITY_OTW_COUNT	PPL_ALL_ATB_COUNT	PPL_ALL_OTW_COUNT	E	Case	Outcome
1004	74	1044	Wednesday	12:35:32	6683	3579	659.25	25405	25405	0	6552	6552	0	25405	6552	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
101	54	1105	Wednesday	10:47:41	6626	3797	479.50	25405	25405	7	6552	6552	0	25405	6552	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1014	143	3393	Saturday	18:51:28	6807	934	1285.78	25086	25086	0	6871	6871	0	25086	6871	39	Short Circuit / Overload	Central UA ground impact point below flight path
102	71	372	Thursday	12:18:21	7054	1298	630.58	25565	25565	0	6392	6392	0	25565	6392	66	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
1020	56	1376	Friday	10:58:54	6359	4618	498.17	26204	26204	2	5753	5753	0	26204	5753	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
1023	26	3596	Monday	08:20:19	6950	2450	233.86	26524	26524	0	5433	5433	0	26524	5433	57	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
1023	35	1946	Monday	09:06:25	5951	5051	310.69	26524	26524	1	5433	5433	0	26524	5433	74	Degradation of altitude	Central UA ground impact point below flight path
1025	122	1195	Wednesday	16:54:50	6538	4099	1091.39	23648	23648	15	8309	8309	2	23648	8309	21	Engine Fire	UA structural desintegration - Debris Impact
1031	7	1224	Tuesday	06:34:13	6509	4191	57.03	27962	27962	0	3995	3995	0	27962	3995	2	Engine Out	UA approaches Emergency landing site
1045	30	1347	Tuesday	08:38:32	6387	4544	264.22	27163	27163	0	4794	4794	0	27163	4794	4	Engine Out	Central ground impact point below flight path with B/G Ratio.
1046	18	2713	Wednesday	07:35:49	6171	2863	159.70	28122	28122	0	3835	3835	0	28122	3835	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
1049	144	2606	Saturday	18:55:41	6088	3265	1292.81	25086	25086	0	6871	6871	0	25086	6871	17	Engine Fire	Central UA ground impact point below flight path
1059	38	1174	Tuesday	09:21:27	6558	4031	335.75	27163	27163	0	4794	4794	0	27163	4794	36	Short Circuit / Overload	Central UA ground impact point below flight path
1061	6	1777	Thursday	06:29:38	6031	5138	49.42	27802	27802	0	4155	4155	0	27802	4155	72	Degradation of altitude	UA approaches Emergency landing site
1064	137	3181	Sunday	18:18:46	6616	1326	1231.28	23648	23648	0	8309	8309	0	23648	8309	47	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
1078	143	858	Sunday	18:47:39	6843	2886	1279.44	23648	23648	1	8309	8309	0	23648	8309	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1080	24	90	Tuesday	08:04:16	6997	855	207.11	27163	27163	0	4794	4794	0	27163	4794	75	Degradation of altitude	UA approaches Emergency landing site
1086	98	3048	Monday	14:48:04	6485	1691	880.14	24606	24606	0	7351	7351	0	24606	7351	13	Engine Anomaly	UA approaches Emergency landing site
109	60	1006	Thursday	11:19:56	6718	3441	533.22	25565	25565	0	6392	6392	0	25565	6392	19	Engine Fire	Central UA ground impact point below flight path
1096	24	2402	Thursday	08:07:43	5971	3994	212.89	27163	27163	0	4794	4794	0	27163	4794	36	Short Circuit / Overload	Central UA ground impact point below flight path
1116	27	685	Wednesday	08:21:21	6958	2248	235.58	26684	26684	0	5273	5273	0	26684	5273	67	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
1119	54	1828	Saturday	10:48:47	6002	5132	481.31	22529	22529	12	9428	9428	1	22529	9428	20	Engine Fire	UA structural desintegration - Debris Impact
1127	18	789	Sunday	07:32:55	6894	2627	154.89	30518	30518	8	1439	1439	1	30518	1439	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1130	117	62	Wednesday	16:26:09	6985	838	1043.58	23648	23648	0	8309	8309	0	23648	8309	72	Degradation of altitude	UA approaches Emergency landing site
1130	125	1479	Wednesday	17:11:27	6262	4843	1119.08	23648	23648	0	8309	8309	0	23648	8309	35	Connection Failure	UA ground impact tangential to trajectory
1146	1	3369	Friday	06:05:03	6787	966	8.42	28281	28281	0	3676	3676	0	28281	3676	78	Degradation of altitude	Central UA ground impact point below flight path
1164	147	688	Tuesday	19:08:59	6957	2259	1315.00	29560	29560	4	2397	2397	0	29560	2397	21	Engine Fire	UA structural desintegration - Debris Impact
1169	61	541	Sunday	11:24:38	7022	1765	541.06	23009	23009	0	8948	8948	0	23009	8948	17	Engine Fire	Central UA ground impact point below flight path
1183	19	2515	Sunday	07:40:55	6029	3600	168.20	30518	30518	23	1439	1439	0	30518	1439	21	Engine Fire	UA structural desintegration - Debris Impact
1188	12	3335	Friday	07:04:22	6758	1016	107.28	28281	28281	0	3676	3676	0	28281	3676	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1193	77	3585	Wednesday	12:55:32	6944	817	692.58	25405	25405	0	6552	6552	0	25405	6552	36	Short Circuit / Overload	Central UA ground impact point below flight path
1200	118	1798	Wednesday	16:34:08	6019	5138	1056.92	23648	23648	11	8309	8309	2	23648	8309	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1207	27	2942	Wednesday	08:24:44	6380	2032	241.22	26684	26684	0	5273	5273	0	26684	5273	62	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
1222	151	2063	Thursday	19:32:38	5922	4885	1354.42	29080	29080	0	2877	2877	0	29080	2877	12	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
1225	125	1001	Sunday	17:10:44	6723	3422	1117.89	23648	23648	11	8309	8309	1	23648	8309	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1230	2	380	Friday	06:05:58	7053	1317	9.94	28281	28281	0	3676	3676	0	28281	3676	18	Engine Fire	UA structural desintegration - Debris Impact
1232	87	692	Sunday	13:45:10	6955	2273	775.31	23648	23648	0	8309	8309	0	23648	8309	38	Short Circuit / Overload	Central UA ground impact point below flight path
1234	47	1247	Tuesday	10:10:08	6486	4262	416.89	26044	26044	2	5913	5913	1	26044	5913	21	Engine Fire	UA structural desintegration - Debris Impact
1237	18	1590	Friday	07:34:08	6165	5018	156.89	28281	28281	0	3676	3676	0	28281	3676	13	Engine Anomaly	UA approaches Emergency landing site
1255	33	1820	Sunday	08:55:26	6007	5134	292.39	27163	27163	0	4794	4794	0	27163	4794	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
1256	14	326	Wednesday	07:10:39	7054	1194	117.75	28122	28122	0	3835	3835	0	28122	3835	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1269	83	128	Tuesday	13:22:44	7013	887	737.92	25086	25086	1	6871	6871	2	25086	6871	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1282	113	2444	Monday	16:08:07	5990	3851	1013.55	22689	22689	0	9268	9268	0	22689	9268	42	Partial Lock of Flight Control Surfaces	Central UA ground impact point below flight path
1288	93	2794	Sunday	14:20:43	6241	2560	834.53	23648	23648	15	8309	8309	0	23648	8309	21	Engine Fire	UA structural desintegration - Debris Impact
1321	64	2959	Friday	11:44:26	6397	1975	574.08	26204	26204	0	5753	5753	0	26204	5753	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1335	40	355	Friday	09:31:01	7054	1258	351.69	28122	28122	0	3835	3835	0	28122	3835	50	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
1337	71	1039	Sunday	12:19:21	6688	3561	632.25	23009	23009	0	8948	8948	0	23009	8948	17	Engine Fire	Central UA ground impact point below flight path
1343	81	2715	Saturday	13:15:50	6173	2855	726.39	24606	24606	0	7351	7351	0	24606	7351	58	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
1351	21	1607	Sunday	07:50:21	6151	5038	183.92	30518	30518	0	1439	1439	0	30518	1439	72	Degradation of altitude	UA approaches Emergency landing site
1370	136	2534	Friday	18:12:23	6040	3531	1220.67	23967	23967	0	7990	7990	0	23967	7990	10	Engine Anomaly	UA approaches Emergency landing site
1373	116	3429	Monday	16:25:48	6836	894	1043.00	22689	22689	0	9268	9268	0	22689	9268	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1378	11	3288	Saturday	06:58:53	6717	1096	98.17	30838	30838	0	1119	1119	0	30838	1119	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
1386	32	2863	Sunday	08:51:36	6304	2308	286.00	27962	27962	0	3995	3995	0	27962	3995	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
1387	12	3435	Monday	07:04:31	6841	889	107.53	27962	27962	0	3995	3995	0	27962	3995	10	Engine Anomaly	UA approaches Emergency landing site
1391	39	2921	Friday	09:29:28	6360	2104	349.11	28122	28122	0	3835	3835	0	28122	3835	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1391	61	1352	Friday	11:25:50	6382	4557	543.08	26204	26204	0	5753	5753	0	26204	5753	47	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
1392	57	966	Saturday	11:03:40	6754	3292	506.14	22529	22529	0	9428	9428	0	22529	9428	78	Degradation of altitude	Central UA ground impact point below flight path
1395	126	2581	Tuesday	17:18:29	6071	3358	1130.83	23967	23967	27	7990	7990	0	23967	7990	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
174	130	188	Saturday	17:36:30	7032	955	1160.83	25086	25086	0	6871	6871	0	25086	6871	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
183	129	1464	Monday	17:33:00	6275	4813	1155.03	22689	22689	0	9268	9268	0	22689	9268	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
187	119	1522	Friday	16:39:07	6223	4919	1065.22	23967	23967	0	7990	7990	0	23967	7990	81	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
188	35	34	Saturday	09:03:33	6971	826	305.92	26524	26524	0	5433	5433	0	26524	5433	68	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
194	104	2315	Friday	15:19:21	5940	4270	932.28	24766	24766	9	7191	7191	1	24766	7191	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
196	35	3269	Sunday	09:08:24	6699	1133	314.00	27962	27962	0	3995	3995	0	27962	3995	36	Short Circuit / Overload	UA approaches Emergency landing site
200	85	1889	Thursday	13:36:11	5973	5101	760.31	25405	25405	0	6552	6552	0	25405	6552	75	Degradation of altitude	UA approaches Emergency landing site
205	82	2139	Tuesday	13:20:22	5916	4733	733.95	25086	25086	0	6871	6871	0	25086	6871	55	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
212	48	1783	Tuesday	10:16:20	6028	5139	427.22	26044	26044	0	5913	5913	0	26044	5913	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
25	68	2089	Thursday	12:04:44	5919	4837	607.89	25565	25565	0	6392	6392	0	25565	6392	14	Engine Anomaly	Central UA ground impact point below flight path
273	57	2256	Sunday	11:05:36	5926	4442	509.36	23009	23009	0	8948	8948	0	23009	8948	11	Engine Anomaly	Central UA ground impact point below flight path
28	2	2737	Sunday	06:09:30	6191	2772	15.83	30518	30518	0	1439	1439	0	30518	1439	36	Short Circuit / Overload	Central UA ground impact point below flight path
290	146	1409	Wednesday	19:04:41	6327	4696	1307.81	28921	28921	4	3036	3036	0	28921	3036	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
309	67	2898	Monday	12:00:32	6338	2184	600.92	26044	26044	4	5913	5913	0	26044	5913	78	Degradation of altitude	Central UA ground impact point below flight path
313	67	2298	Friday	11:59:38	5935	4321	599.42	26204	26204	7	5753	5753	0	26204	5753	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
320	40	1967	Friday	09:33:26	5944	5027	355.72	28122	28122	9	3835	3835	0	28122	3835	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
321	75	1947	Saturday	12:42:18	5951	5050	670.50	22529	22529	0	9428	9428	0	22529	9428	10	Engine Anomaly	UA approaches Emergency landing site
34	97	356	Saturday	14:38:38	7054	1261	864.42	24606	24606	2	7351	7351	1	24606	7351	21	Engine Fire	UA structural desintegration - Debris Impact
344	64	914	Monday	11:41:23	6798	3097	568.97	26044	26044	1	5913	5913	0	26044	5913	28	Generator Failure	UA ground impact tangential to trajectory
344	76	3439	Monday	12:49:56	6844	885	683.22	26044	26044	0	5913	5913	0	26044	5913	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
345	104	3094	Tuesday	15:20:32	6531	1556	934.22	25086	25086	0	6871	6871	0	25086	6871	13	Engine Anomaly	UA approaches Emergency landing site
345	66	2974	Tuesday	11:55:15	6412	1925	592.11	26044	26044	0	5913	5913	0	26044	5913	13	Engine Anomaly	UA approaches Emergency landing site
36	62	2277	Monday	11:32:37	5930	4382	554.39	26044	26044	4	5913	5913	2	26044	5913	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
360	147	2856	Wednesday	19:12:15	6298	2333	1320.42	28921	28921	1	3036	3036	1	28921	3036	21	Engine Fire	UA structural desintegration - Debris Impact
377	103	3370	Saturday	15:15:33	6788	964	925.92	24606	24606	0	7351	7351	0	24606	7351	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
382	100	3230	Thursday	14:59:08	6663	1213	898.58	25405	25405	1	6552	6552	0	25405	6552	46	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
395	92	1102	Wednesday	14:12:46	6628	3786	821.31	24766	24766	7	7191	7191	2	24766	7191	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
398	49	2162	Saturday	10:22:17	5916	4681	437.17	22529	22529	20	9428	9428	2	22529	9428	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
399	113	3011	Sunday	16:08:58	6448	1806	1014.97	23648	23648	0	8309	8309	0	23648	8309	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
403	109	1547	Thursday	15:45:11	6201	4959	975.33	25405	25405	0	6552	6552	0	25405	6552	46	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
415	94	183	Tuesday	14:22:11	7031	949	837.00	25086	25086	0	6871	6871	0	25086	6871	68	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
421	142	1290	Monday	18:42:55	6443	4389	1271.53	22689	22689	0	9268	9268	0	22689	9268	1	Engine Out	No Ground Effect
421	32	1328	Monday	08:49:17	6406	4494	282.17	26524	26524	0	5433	5433	0	26524	5433	73	Degradation of altitude	Central UA ground impact point below flight path
422	30	1780	Tuesday	08:39:10	6029	5139	265.30	27163	27163	0	4794	4794	0	27163	4794	3	Engine Out	Central UA ground impact point below flight path
423	65	171	Wednesday	11:45:40	7027	933	576.11	25405	25405	0	6552	6552	0	25405	6552	1	Engine Out	No Ground Effect
442	142	634	Monday	18:41:56	6985	2070	1269.89	22689	22689	0	9268	9268	0	22689	9268	17	Engine Fire	Central UA ground impact point below flight path
443	91	1356	Tuesday	14:07:46	6378	4567	812.94	25086	25086	5	6871	6871	0	25086	6871	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
445	20	3284	Thursday	07:47:28	6713	1104	179.11	27802	27802	3	4155	4155	0	27802	4155	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
456	89	229	Monday	13:55:16	7042	1014	792.14	24606	24606	0	7351	7351	0	24606	7351	75	Degradation of altitude	UA approaches Emergency landing site
46	34	910	Thursday	08:59:28	6802	3082	299.11	27163	27163	4	4794	4794	0	27163	4794	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
465	75	2080	Wednesday	12:42:29	5920	4854	670.83	25405	25405	0	6552	6552	0	25405	6552	36	Short Circuit / Overload	Central UA ground impact point below flight path
471	112	741	Tuesday	16:00:10	6925	2450	1000.30	23967	23967	0	7990	7990	0	23967	7990	3	Engine Out	Central UA ground impact point below flight path
474	49	61	Friday	10:19:08	6984	838	431.92	26204	26204	0	5753	5753	0	26204	5753	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
479	141	3300	Wednesday	18:40:32	6727	1075	1267.56	23648	23648	0	8309	8309	0	23648	8309	1	Engine Out	No Ground Effect
48	67	1520	Saturday	11:58:29	6225	4916	597.47	22529	22529	0	9428	9428	0	22529	9428	50	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
484	150	3462	Monday	19:29:20	6861	865	1348.92	29080	29080	7	2877	2877	0	29080	2877	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
49	151	3142	Sunday	19:34:16	6578	1425	1357.11	28441	28441	0	3516	3516	0	28441	3516	72	Degradation of altitude	UA approaches Emergency landing site
511	143	2704	Sunday	18:50:26	6164	2897	1284.06	23648	23648	0	8309	8309	0	23648	8309	37	Short Circuit / Overload	Central UA ground impact point below flight path
522	145	862	Thursday	18:58:27	6840	2901	1297.44	29080	29080	0	2877	2877	0	29080	2877	10	Engine Anomaly	UA approaches Emergency landing site
530	43	2051	Friday	09:49:45	5924	4905	382.92	28122	28122	0	3835	3835	0	28122	3835	57	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
531	44	3042	Saturday	09:56:38	6479	1709	394.39	26524	26524	0	5433	5433	0	26524	5433	58	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
535	71	49	Wednesday	12:17:51	6978	832	629.78	25405	25405	0	6552	6552	0	25405	6552	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
546	128	3352	Sunday	17:30:26	6773	990	1150.75	23648	23648	0	8309	8309	0	23648	8309	22	Generator Failure	UA approaches Emergency landing site
546	16	2120	Sunday	07:24:08	5917	4774	140.22	30518	30518	1	1439	1439	0	30518	1439	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
555	113	1021	Tuesday	16:05:59	6705	3496	1010.00	23967	23967	17	7990	7990	1	23967	7990	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
559	142	2368	Saturday	18:44:31	5957	4105	1274.22	25086	25086	0	6871	6871	0	25086	6871	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
562	23	310	Tuesday	07:59:11	7053	1161	198.67	27163	27163	5	4794	4794	0	27163	4794	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
578	103	2747	Thursday	15:14:37	6200	2735	924.36	25405	25405	0	6552	6552	2	25405	6552	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
580	140	1275	Saturday	18:32:06	6458	4345	1253.50	25086	25086	1	6871	6871	1	25086	6871	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
582	16	1252	Monday	07:22:49	6481	4277	138.05	27962	27962	0	3995	3995	0	27962	3995	78	Degradation of altitude	Central UA ground impact point below flight path
599	14	2783	Thursday	07:14:20	6231	2601	123.89	27802	27802	19	4155	4155	0	27802	4155	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
605	90	1009	Wednesday	14:01:50	6716	3452	803.08	24766	24766	0	7191	7191	0	24766	7191	28	Generator Failure	UA ground impact tangential to trajectory
612	7	2124	Wednesday	06:35:33	5916	4766	59.28	28122	28122	0	3835	3835	0	28122	3835	19	Engine Fire	Central UA ground impact point below flight path
616	83	2530	Sunday	13:26:21	6038	3546	743.92	23648	23648	0	8309	8309	0	23648	8309	36	Short Circuit / Overload	Central UA ground impact point below flight path
617	78	1097	Monday	12:57:13	6633	3769	695.36	24606	24606	0	7351	7351	0	24606	7351	12	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
632	108	122	Tuesday	15:37:39	7010	881	962.78	25086	25086	0	6871	6871	0	25086	6871	74	Degradation of altitude	Central UA ground impact point below flight path
634	153	1523	Thursday	19:42:38	6222	4921	1371.06	29080	29080	19	2877	2877	0	29080	2877	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
640	10	3153	Wednesday	06:53:18	6589	1396	88.83	28122	28122	0	3835	3835	0	28122	3835	40	Short Circuit / Overload	Central UA ground impact point below flight path
641	53	2326	Thursday	10:44:08	5943	4237	473.56	25565	25565	0	6392	6392	0	25565	6392	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
645	122	1350	Monday	16:55:03	6384	4552	1091.78	22689	22689	0	9268	9268	0	22689	9268	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
66	73	487	Wednesday	12:29:19	7037	1603	648.86	25405	25405	0	6552	6552	0	25405	6552	75	Degradation of altitude	UA approaches Emergency landing site
660	152	2532	Tuesday	19:38:44	6039	3539	1364.58	29560	29560	0	2397	2397	0	29560	2397	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
660	69	2068	Tuesday	12:10:05	5921	4876	616.83	26044	26044	7	5913	5913	0	26044	5913	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
663	35	1601	Friday	09:05:53	6156	5031	309.83	28122	28122	8	3835	3835	1	28122	3835	21	Engine Fire	UA structural desintegration - Debris Impact
667	27	1485	Tuesday	08:22:32	6256	4854	237.58	27163	27163	0	4794	4794	0	27163	4794	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
668	3	3061	Wednesday	06:15:22	6498	1652	25.64	28122	28122	0	3835	3835	0	28122	3835	36	Short Circuit / Overload	Central UA ground impact point below flight path
67	70	2226	Thursday	12:15:43	5921	4523	626.22	25565	25565	0	6392	6392	0	25565	6392	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
678	70	2571	Saturday	12:16:15	6064	3395	627.08	22529	22529	0	9428	9428	0	22529	9428	29	Connection Failure	UA approaches Emergency landing site
68	107	1643	Friday	15:34:32	6123	5075	957.58	24766	24766	0	7191	7191	0	24766	7191	29	Connection Failure	UA approaches Emergency landing site
686	45	2199	Sunday	10:00:45	5918	4592	401.28	23009	23009	1	8948	8948	0	23009	8948	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
689	72	396	Wednesday	12:23:47	7052	1356	639.64	25405	25405	0	6552	6552	0	25405	6552	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
69	92	1413	Saturday	14:13:14	6323	4705	822.08	24606	24606	0	7351	7351	0	24606	7351	1	Engine Out	No Ground Effect
704	152	2888	Thursday	19:39:16	6328	2219	1365.47	29080	29080	0	2877	2877	0	29080	2877	73	Degradation of altitude	Central UA ground impact point below flight path

705	28	2432	Friday	08:29:21	5984	3892	248.94	28122	28122	0	3835	3835	0	28122	3835	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
714	61	1441	Sunday	11:25:58	6297	4766	543.30	23009	23009	0	8948	8948	0	23009	8948	5	Engine Out	No Ground Effect
729	84	2543	Monday	13:31:46	6046	3498	752.95	24606	24606	0	7351	7351	0	24606	7351	70	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
730	154	2192	Tuesday	19:49:02	5918	4610	1381.72	29560	29560	1	2397	2397	0	29560	2397	76	Degradation of altitude	Central UA ground impact point below flight path
731	64	513	Wednesday	11:40:46	7031	1680	567.97	25405	25405	1	6552	6552	0	25405	6552	28	Generator Failure	UA ground impact tangential to trajectory
735	26	1150	Sunday	08:16:39	6582	3951	227.75	27962	27962	0	3995	3995	0	27962	3995	2	Engine Out	UA approaches Emergency landing site
741	94	606	Saturday	14:22:50	6997	1976	838.06	24606	24606	0	7351	7351	0	24606	7351	72	Degradation of altitude	UA approaches Emergency landing site
760	35	1790	Thursday	09:06:10	6023	5138	310.31	27163	27163	0	4794	4794	0	27163	4794	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
776	30	1213	Saturday	08:38:19	6520	4157	263.89	26524	26524	0	5433	5433	0	26524	5433	45	Partial Lock of Flight Control Surfaces	Central UA ground impact point below flight path
787	69	2891	Wednesday	12:11:19	6331	2209	618.89	25405	25405	0	6552	6552	0	25405	6552	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
791	69	1368	Sunday	12:09:02	6367	4598	615.08	23009	23009	6	8948	8948	1	23009	8948	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
791	91	1100	Sunday	14:07:22	6630	3779	812.31	23648	23648	0	8309	8309	0	23648	8309	2	Engine Out	UA approaches Emergency landing site
803	3	1594	Friday	06:13:11	6162	5023	21.97	28281	28281	0	3676	3676	0	28281	3676	50	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
807	137	1713	Tuesday	18:16:33	6072	5123	1227.61	23967	23967	0	7990	7990	0	23967	7990	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
818	36	80	Saturday	09:09:00	6993	849	315.03	26524	26524	0	5433	5433	0	26524	5433	68	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
821	101	3243	Tuesday	15:04:33	6675	1186	907.61	25086	25086	0	6871	6871	0	25086	6871	39	Short Circuit / Overload	Central UA ground impact point below flight path
828	106	1030	Tuesday	15:28:14	6696	3529	947.06	25086	25086	0	6871	6871	0	25086	6871	11	Engine Anomaly	Central UA ground impact point below flight path
828	119	3034	Tuesday	16:41:23	6471	1734	1069.00	23967	23967	0	7990	7990	0	23967	7990	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
830	79	2855	Thursday	13:05:14	6297	2337	708.75	25405	25405	0	6552	6552	0	25405	6552	28	Generator Failure	UA ground impact tangential to trajectory
836	126	35	Wednesday	17:14:40	6971	827	1124.47	23648	23648	0	8309	8309	0	23648	8309	31	Connection Failure	UA ground impact tangential to trajectory
836	8	603	Wednesday	06:38:40	6999	1966	64.47	28122	28122	0	3835	3835	0	28122	3835	11	Engine Anomaly	Central UA ground impact point below flight path
846	148	3025	Saturday	19:17:54	6462	1762	1329.83	28921	28921	0	3036	3036	0	28921	3036	72	Degradation of altitude	UA approaches Emergency landing site
854	63	1145	Sunday	11:36:19	6587	3934	560.56	23009	23009	0	8948	8948	0	23009	8948	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
87	32	3052	Wednesday	08:51:53	6489	1679	286.47	26684	26684	0	5273	5273	0	26684	5273	35	Connection Failure	UA ground impact tangential to trajectory
878	75	2658	Wednesday	12:43:21	6127	3070	672.28	25405	25405	0	6552	6552	0	25405	6552	29	Connection Failure	UA approaches Emergency landing site
893	132	414	Thursday	17:47:38	7050	1402	1179.39	24287	24287	0	7670	7670	0	24287	7670	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
897	94	2640	Monday	14:25:52	6113	3138	843.14	24606	24606	0	7351	7351	0	24606	7351	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
918	88	3018	Monday	13:54:04	6455	1784	790.11	24606	24606	0	7351	7351	0	24606	7351	9	Engine Out	UA ground impact tangential to trajectory
939	86	2113	Monday	13:41:54	5917	4789	769.86	24606	24606	0	7351	7351	0	24606	7351	5	Engine Out	No Ground Effect
948	21	228	Wednesday	07:48:16	7042	1013	180.47	28122	28122	0	3835	3835	0	28122	3835	77	Degradation of altitude	Central UA ground impact point below flight path
957	10	963	Friday	06:50:01	6756	3281	83.36	28281	28281	0	3676	3676	0	28281	3676	47	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
99	119	2100	Monday	16:39:59	5918	4815	1066.67	22689	22689	9	9268	9268	1	22689	9268	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
99	121	1938	Monday	16:50:33	5954	5059	1084.25	22689	22689	0	9268	9268	0	22689	9268	1	Engine Out	No Ground Effect
997	78	52	Wednesday	12:55:39	6980	833	692.75	24766	24766	0	7191	7191	0	24766	7191	53	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path

O.R.C.U.S. 02.00 - tTest of the Simulation

nProbes	1400
nEvents	175
nEvents_cor	163
tMission	14
x_cross_ATB	0.2278571
x_cross_OTW	0.0185714
x_cross_TOT	0.2464286
s2ATB	0.0602264
sATB	0.2454107
tATB	33.21562
s2OTW	0.0004417
sOTW	0.021017
tOTW	15.259707
s2TOT	0.0694009
sTOT	0.2634405
tTOT	33.580061

UADay/Prot	HIT_TOT_ATB	HIT_TOT_OTW	UADay/Prot cor	HIT_TOT_mean_ATB	HIT_TOT_mean_OTW	HIT_TOT_mean_ATB/Fh	HIT_TOT_mean_OTW/Fh	x_i-x_cross ATB	x_i-x_cross OTW	(x_i-x_cross ATB)^2	(x_i-x_cross OTW)^2
25	0	0	25	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
28	0	0	28	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
34	2	1	34	2	1	0.142857143	0.071428571	-0.085	0.052857143	0.007225	0.002793878
36	4	2	36	4	2	0.285714286	0.142857143	0.057857143	0.124285714	0.003347449	0.015446939
46	4	0	46	4	0	0.285714286	0	0.057857143	-0.018571429	0.003347449	0.000344898
48	0	0	48	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
49	0	0	49	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
66	0	0	66	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
67	0	0	67	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
68	0	0	68	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
69	0	0	69	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
87	0	0	87	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
99	9	1	99	9	1	0.642857143	0.071428571	0.415	0.052857143	0.172225	0.002793878
99	0	0	101	7	0	0.5	0	0.272142857	-0.018571429	0.074061735	0.000344898
101	7	0	102	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
102	0	0	109	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
109	0	0	174	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
174	0	0	183	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
183	0	0	187	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
187	0	0	188	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
188	0	0	194	9	1	0.642857143	0.071428571	0.415	0.052857143	0.172225	0.002793878
194	9	1	196	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
196	0	0	200	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
200	0	0	205	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
205	0	0	212	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
212	0	0	273	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
273	0	0	290	4	0	0.285714286	0	0.057857143	-0.018571429	0.003347449	0.000344898
290	4	0	309	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
309	0	0	313	7	0	0.5	0	0.272142857	-0.018571429	0.074061735	0.000344898
313	7	0	320	9	0	0.642857143	0	0.415	-0.018571429	0.172225	0.000344898
320	9	0	321	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
321	0	0	344	1	0	0.071428571	0	-0.156428571	-0.018571429	0.024469898	0.000344898
344	1	0	345	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
344	0	0	360	1	1	0.071428571	0.071428571	-0.156428571	0.052857143	0.024469898	0.002793878
345	0	0	377	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
345	0	0	382	1	0	0.071428571	0	-0.156428571	-0.018571429	0.024469898	0.000344898
360	1	1	395	7	2	0.5	0.142857143	0.272142857	0.124285714	0.074061735	0.015446939
377	0	0	398	20	2	1.428571429	0.142857143	1.200714286	0.124285714	1.441714796	0.015446939
382	1	0	399	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
395	7	2	403	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
398	20	2	415	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
399	0	0	421	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
403	0	0	422	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
415	0	0	423	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
421	0	0	442	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
421	0	0	443	5	0	0.357142857	0	0.129285714	-0.018571429	0.016714796	0.000344898
422	0	0	445	3	0	0.214285714	0	-0.013571429	-0.018571429	0.000184184	0.000344898
423	0	0	456	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
442	0	0	465	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
443	5	0	471	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
445	3	0	474	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
456	0	0	479	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
465	0	0	484	7	0	0.5	0	0.272142857	-0.018571429	0.074061735	0.000344898
471	0	0	511	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
474	0	0	522	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
479	0	0	530	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
484	7	0	531	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
511	0	0	535	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
522	0	0	546	1	0	0.071428571	0	-0.156428571	-0.018571429	0.024469898	0.000344898
530	0	0	555	17	1	1.214285714	0.071428571	0.986428571	0.052857143	0.973041327	0.002793878
531	0	0	559	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
535	0	0	562	5	0	0.357142857	0	0.129285714	-0.018571429	0.016714796	0.000344898
546	0	0	578	0	2	0	0.142857143	-0.227857143	0.124285714	0.051918878	0.015446939
546	1	0	580	1	1	0.071428571	0.071428571	-0.156428571	0.052857143	0.024469898	0.002793878
555	17	1	582	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
559	0	0	599	19	0	1.357142857	0	1.129285714	-0.018571429	1.275286224	0.000344898
562	5	0	605	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
578	0	2	612	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
580	1	1	616	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
582	0	0	617	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
599	19	0	632	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
605	0	0	634	19	0	1.357142857	0	1.129285714	-0.018571429	1.275286224	0.000344898
612	0	0	640	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
616	0	0	641	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
617	0	0	645	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
632	0	0	660	7	0	0.5	0	0.272142857	-0.018571429	0.074061735	0.000344898
634	19	0	663	8	1	0.571428571	0.071428571	0.343571429	0.052857143	0.118041327	0.002793878
640	0	0	667	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
641	0	0	668	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
645	0	0	678	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
660	0	0	686	1	0	0.071428571	0	-0.156428571	-0.018571429	0.024469898	0.000344898
660	7	0	689	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
663	8	1	704	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
667	0	0	705	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
668	0	0	714	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
678	0	0	729	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
686	1	0	730	1	0	0.071428571	0	-0.156428571	-0.018571429	0.024469898	0.000344898
689	0	0	731	1	0	0.071428571	0	-0.156428571	-0.018571429	0.024469898	0.000344898
704	0	0	735	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
705	0	0	741	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
714	0	0	760	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
729	0	0	776	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
730	1	0	787	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
731	1	0	791	6	1	0.428571429	0.071428571	0.200714286	0.052857143	0.040286224	0.002793878
735	0	0	803	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
741	0	0	807	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
760	0	0	818	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
776	0	0	821	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
787	0	0	828	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
791	6	1	830	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
791	0	0	836	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
803	0	0	846	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
807	0	0	854	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
818	0	0	878	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
821	0	0	893	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
828	0	0	897	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
828	0	0	918	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
830	0	0	939	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
836	0	0	948	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
836	0	0	957	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
846	0	0	997	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
854	0	0	1004	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
878	0	0	1014	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
893	0	0	1020	2	0	0.142857143	0	-0.085	-0.018571429	0.007225	0.000344898
897	0	0	1023	1	0	0.071428571	0	-0.156428571	-0.018571429	0.024469898	0.000344898
918	0	0	1025	15	2	1.071428571	0.142857143	0.843571429	0.124285714	0.711612755	0.015446939
939	0	0	1031	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
948	0	0	1045	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
957	0	0	1046	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
997	0	0	1049	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
1004	0	0	1059	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
1014	0	0	1061	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
1020	2	0	1064	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
1023	0	0	1078	1	0	0.071428571	0	-0.156428571	-0.018571429	0.024469898	0.000344898
1023	1	0	1080	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
1025	15	2	1086	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
1031	0	0	1096	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
1045	0	0	1116	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
1046	0	0	1119	12	1	0.857142857	0.071428571	0.629285714	0.052857143	0.39600051	0.002793878
1049	0	0	1127	8	1	0.571428571	0.071428571	0.343571429	0.052857143	0.118041327	0.002793878
1059	0	0	1130	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
1061	0	0	1146	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
1064	0	0	1164	4	0	0.285714286	0	0.057857143	-0.018571429	0.003347449	0.000344898
1078	1	0	1169	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
1080	0	0	1183	23	0	1.642857143	0	1.415	-0.018571429	2.002225	0.000344898
1086	0	0	1188	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
1096	0	0	1193	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
1116	0	0	1200	11	2	0.785714286	0.142857143	0.557857143	0.124285714	0.311204592	0.015446939
1119	12	1	1207	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
1127	8	1	1222	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
1130	0	0	1225	11	1	0.785714286	0.071428571	0.557857143	0.052857143	0.311204592	0.002793878
1130	0	0	1230	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
1146	0	0	1232	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
1164	4	0	1234	2	1	0.142857143	0.071428571	-0.085	0.052857143	0.007225	0.002793878
1169	0	0	1237	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
1183	23	0	1255	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
1188	0	0	1256	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
1193	0	0	1269	1	2	0.071428571	0.142857143	-0.156428571	0.124285714	0.024469898	0.015446939
1200	11	2	1282	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
1207	0	0	1288	15	0	1.071428571	0	0.843571429	-0.018571429	0.711612755	0.000344898
1222	0	0	1321	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
1225	11	1	1335	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
1230	0	0	1337	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
1232	0	0	1343	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
1234	2	1	1351	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
1237	0	0	1370	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
1255	0	0	1373	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
1256	0	0	1378	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
1269	1	2	1386	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
1282	0	0	1387	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
1288	15	0	1391	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
1321	0	0	1392	0	0	0	0	-0.227857143	-0.018571429	0.051918878	0.000344898
1335	0	0	1395	27	0	1.928571429	0	1.700714286	-0.018571429	2.892429082	0.000344898
1337	0	0									
1343	0	0									
1351	0	0									
1370	0	0									
1373	0	0									
1378	0	0									
1386	0	0									
1387	0	0									
1391	0	0									
1391	0	0									
1392	0	0									
1395	27	0									

11.4.5.2 Ibbenbüren – R75 – Phase 2

O.R.C.U.S. 02.00 - Simulation Summary

UA Parameters

MTOW [kg]	Wingspan [m]	Length [m]	L/D
90	5	4	8

v [km/h]	Alt [m]	CCF [m]
100	100	8995.0725

P_CumCat [1/Fh]	Engine [%]	ESys [%]	FCS [%]	NavSys [%]	Struct [%]
0.01	20	20	20	20	20

General map parameters

	Name	Area [km2]	PPL	PPL/km2
City	Ibbenbueren, Stadt	108.87	52037	478
County	Steinfurt	1795.76	446565	249
FS	NW	34112.45	17912134	525

Mission specific map parameters

	Area [km2]	PPL	Tourists	Total PPL
City	66.8555	31957	0	31957
Map total	66.8555	31957	0	31957

PPL MOD NA

Sim FH [Fh] 19600 Ev/Fh [1/Fh] 0.01035714
Events total 203

Hits due to UA impacts		Hits/Fh [1/Fh]
City ATB	207	0.0105612
City OTW	38	0.0019388
Total	245	0.0125

Prot	cyc	k_UA	Day	Time of impact	UA X Pos	UA Y Pos	Travelled Distance [km]	PPL_TD_CITY_ATB	PPL_CITY_ATB_COUNT	HIT_CITY_ATB_COUNT	PPL_TD_CITY_OTW	PPL_CITY_OTW_COUNT	HIT_CITY_OTW_COUNT	PPL_ALL_ATB_COUNT	PPL_ALL_OTW_COUNT	E	Case	Outcome
1000	7	90	Saturday	06:32:31	6997	855	54.20	30838	30838	0	1119	1119	0	30838	1119	78	Degradation of altitude	Central UA ground impact point below flight path
1006	45	2722	Friday	10:01:33	6178	2829	402.58	26204	26204	0	5753	5753	0	26204	5753	55	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
1029	3	2072	Sunday	06:13:54	5921	4868	23.17	30518	30518	0	1439	1439	0	30518	1439	55	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
1030	92	913	Monday	14:12:29	6799	3093	820.83	24606	24606	0	7351	7351	0	24606	7351	28	Generator Failure	UA ground impact tangential to trajectory
1039	134	2853	Wednesday	18:02:05	6295	2344	1203.47	23648	23648	3	8309	8309	3	23648	8309	18	Engine Fire	UA structural desintegration - Debris Impact
1047	77	2573	Thursday	12:54:01	6065	3388	690.05	25565	25565	0	6392	6392	0	25565	6392	76	Degradation of altitude	Central UA ground impact point below flight path
109	78	1742	Thursday	12:58:11	6053	5133	696.97	25405	25405	0	6552	6552	0	25405	6552	67	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
1090	42	3394	Friday	09:46:22	6808	933	377.28	28122	28122	0	3835	3835	0	28122	3835	35	Connection Failure	UA ground impact tangential to trajectory
1093	48	1405	Monday	10:15:46	6331	4687	426.28	26044	26044	1	5913	5913	0	26044	5913	17	Engine Fire	Central UA ground impact point below flight path
1104	21	284	Friday	07:48:21	7051	1110	180.61	28281	28281	0	3676	3676	0	28281	3676	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
1110	128	3441	Thursday	17:30:34	6845	883	1150.97	24287	24287	0	7670	7670	0	24287	7670	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1112	90	3477	Saturday	14:05:32	6872	854	809.25	24606	24606	0	7351	7351	0	24606	7351	78	Degradation of altitude	Central UA ground impact point below flight path
1128	125	1345	Monday	17:11:14	6389	4539	1118.75	22689	22689	0	9268	9268	0	22689	9268	22	Generator Failure	UA approaches Emergency landing site
1131	108	2045	Thursday	15:40:32	5925	4916	967.58	25405	25405	0	6552	6552	0	25405	6552	66	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
1140	86	2991	Saturday	13:43:13	6429	1870	772.05	24606	24606	0	7351	7351	0	24606	7351	29	Connection Failure	UA approaches Emergency landing site
1145	112	3498	Thursday	16:04:18	6887	841	1007.19	24287	24287	0	7670	7670	0	24287	7670	19	Engine Fire	Central UA ground impact point below flight path
1146	18	211	Friday	07:32:03	7038	987	153.44	28281	28281	0	3676	3676	0	28281	3676	1	Engine Out	No Ground Effect
1150	105	1272	Tuesday	15:23:11	6461	4337	938.67	25086	25086	0	6871	6871	0	25086	6871	29	Connection Failure	UA approaches Emergency landing site
1150	39	564	Tuesday	09:25:55	7014	1838	343.22	27163	27163	0	4794	4794	0	27163	4794	68	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
1158	77	1906	Wednesday	12:53:01	5966	5088	688.39	25405	25405	0	6552	6552	0	25405	6552	67	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
1167	135	531	Friday	18:03:59	7025	1734	1206.67	23967	23967	0	7990	7990	0	23967	7990	50	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
1172	21	2674	Wednesday	07:51:56	6139	3010	186.58	28122	28122	0	3835	3835	0	28122	3835	10	Engine Anomaly	UA approaches Emergency landing site
1173	84	686	Thursday	13:28:58	6958	2252	748.31	25405	25405	3	6552	6552	0	25405	6552	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1177	125	89	Monday	17:09:22	6997	855	1115.61	22689	22689	0	9268	9268	0	22689	9268	75	Degradation of altitude	UA approaches Emergency landing site
1177	51	1488	Monday	10:32:04	6253	4860	453.47	26044	26044	0	5913	5913	0	26044	5913	66	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
1179	69	1924	Wednesday	12:09:53	5959	5073	616.47	25405	25405	0	6552	6552	0	25405	6552	37	Short Circuit / Overload	Central UA ground impact point below flight path
118	10	1507	Saturday	06:50:49	6236	4894	84.72	30838	30838	0	1119	1119	0	30838	1119	35	Connection Failure	UA ground impact tangential to trajectory
1185	59	1782	Tuesday	11:15:42	6028	5139	526.17	26044	26044	0	5913	5913	0	26044	5913	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
1186	48	571	Wednesday	10:14:31	7011	1861	424.20	25405	25405	0	6552	6552	0	25405	6552	73	Degradation of altitude	Central UA ground impact point below flight path
1192	113	1099	Tuesday	16:06:06	6631	3776	1010.19	23967	23967	0	7990	7990	0	23967	7990	37	Short Circuit / Overload	Central UA ground impact point below flight path
1197	57	1022	Sunday	11:03:45	6704	3499	506.28	23009	23009	0	8948	8948	0	23009	8948	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
1205	68	2300	Monday	12:05:03	5936	4315	608.42	26044	26044	0	5913	5913	0	26044	5913	22	Generator Failure	UA approaches Emergency landing site
1212	113	2889	Monday	16:08:48	6329	2216	1014.67	22689	22689	0	9268	9268	1	22689	9268	19	Engine Fire	Central UA ground impact point below flight path
1226	33	2620	Monday	08:56:37	6098	3213	294.39	26524	26524	1	5433	5433	0	26524	5433	14	Engine Anomaly	Central UA ground impact point below flight path
1230	78	1775	Friday	12:58:14	6032	5138	697.06	24766	24766	0	7191	7191	0	24766	7191	74	Degradation of altitude	Central UA ground impact point below flight path
1246	82	2439	Sunday	13:20:49	5988	3868	734.70	23648	23648	0	8309	8309	0	23648	8309	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
1247	10	2163	Monday	06:51:48	5916	4679	86.36	27962	27962	22	3995	3995	1	27962	3995	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1261	17	788	Monday	07:27:32	6894	2624	145.89	27962	27962	0	3995	3995	0	27962	3995	29	Connection Failure	UA approaches Emergency landing site
1261	32	3007	Monday	08:51:48	6444	1818	286.36	26524	26524	0	5433	5433	0	26524	5433	72	Degradation of altitude	UA approaches Emergency landing site
1273	60	2873	Saturday	11:22:43	6314	2272	537.89	22529	22529	0	9428	9428	0	22529	9428	31	Connection Failure	UA ground impact tangential to trajectory
1275	37	1072	Monday	09:15:54	6657	3680	326.50	26524	26524	0	5433	5433	0	26524	5433	66	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
1311	2	1158	Tuesday	06:07:07	6574	3978	11.89	27962	27962	0	3995	3995	0	27962	3995	26	Generator Failure	Central UA ground impact point below flight path
1325	150	550	Tuesday	19:24:59	7019	1794	1341.64	29560	29560	0	2397	2397	0	29560	2397	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1325	24	79	Tuesday	08:04:15	6993	848	207.08	27163	27163	0	4794	4794	0	27163	4794	54	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
1326	74	3479	Wednesday	12:39:11	6874	852	665.33	25405	25405	0	6552	6552	0	25405	6552	29	Connection Failure	UA approaches Emergency landing site
1327	4	862	Thursday	06:17:29	6840	2901	29.14	27802	27802	0	4155	4155	0	27802	4155	78	Degradation of altitude	Central UA ground impact point below flight path
1337	99	2050	Sunday	14:51:59	5924	4907	886.64	23648	23648	0	8309	8309	0	23648	8309	22	Generator Failure	UA approaches Emergency landing site
1340	40	2778	Wednesday	09:34:38	6227	2619	357.75	26684	26684	0	5273	5273	0	26684	5273	75	Degradation of altitude	UA approaches Emergency landing site
1348	2	2059	Thursday	06:08:29	5923	4892	14.14	27802	27802	10	4155	4155	2	27802	4155	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1348	47	1469	Thursday	10:10:27	6271	4823	417.44	25565	25565	0	6392	6392	0	25565	6392	58	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
1359	140	1063	Monday	18:31:46	6666	3648	1252.97	22689	22689	0	9268	9268	0	22689	9268	22	Generator Failure	UA approaches Emergency landing site
1369	60	1840	Thursday	11:21:11	5996	5128	535.31	25565	25565	0	6392	6392	0	25565	6392	26	Generator Failure	Central UA ground impact point below flight path
137	91	1400	Thursday	14:07:49	6336	4675	813.05	25405	25405	0	6552	6552	0	25405	6552	28	Generator Failure	UA ground impact tangential to trajectory
1383	136	177	Thursday	18:08:51	7029	941	1214.78	24287	24287	0	7670	7670	0	24287	7670	2	Engine Out	UA approaches Emergency landing site
1384	83	3330	Friday	13:27:32	6754	1024	745.92	24766	24766	0	7191	7191	0	24766	7191	77	Degradation of altitude	Central UA ground impact point below flight path
1387	71	3395	Monday	12:22:52	6809	932	638.14	26044	26044	0	5913	5913	0	26044	5913	21	Engine Fire	UA structural desintegration - Debris Impact
1392	2	2437	Saturday	06:09:03	5987	3875	15.08	30838	30838	0	1119	1119	0	30838	1119	49	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
1397	81	725	Thursday	13:12:51	6935	2392	721.42	25405	25405	1	6552	6552	0	25405	6552	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
144	67	1031	Thursday	11:57:45	6695	3532	596.25	25565	25565	0	6392	6392	0	25565	6392	75	Degradation of altitude	UA approaches Emergency landing site
145	124	554	Friday	17:04:40	7018	1806	1107.78	23967	23967	0	7990	7990	0	23967	7990	55	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
147	25	2015	Sunday	08:12:32	5931	4963	220.92	27962	27962	3	3995	3995	0	27962	3995	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
148	47	2826	Monday	10:12:30	6270	2442	420.83	26044	26044	0	5913	5913	0	26044	5913	10	Engine Anomaly	UA approaches Emergency landing site
156	127	3006	Tuesday	17:24:32	6443	1822	1140.89	23967	23967	0	7990	7990	0	23967	7990	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
158	138	1004	Thursday	18:20:54	6720	3433	1234.83	24287	24287	2	7670	7670	0	24287	7670	39	Short Circuit / Overload	Central UA ground impact point below flight path
170	98	2837	Tuesday	14:47:45	6280	2402	879.61	25086	25086	9	6871	6871	2	25086	6871	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
172	148	1935	Thursday	19:16:15	5955	5062	1327.11	29080	29080	0	2877	2877	0	29080	2877	10	Engine Anomaly	UA approaches Emergency landing site
174	154	1213	Saturday	19:47:33	6520	4157	1379.28	28921	28921	0	3036	3036	0	28921	3036	57	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
175	153	2746	Sunday	19:44:28	6199	2739	1374.11	28441	28441	0	3516	3516	0	28441	3516	78	Degradation of altitude	Central UA ground impact point below flight path
18	150	1806	Thursday	19:26:52	6014	5137	1344.78	29080	29080	0	2877	2877	0	29080	2877	36	Short Circuit / Overload	Central UA ground impact point below flight path
182	129	2620	Sunday	17:34:44	6098	3213	1157.92	23648	23648	0	8309	8309	0	23648	8309	5	Engine Out	No Ground Effect
191	40	2078	Tuesday	09:33:35	5920	4857	356.00	27163	27163	0	4794	4794	0	27163	4794	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
2	41	2091	Tuesday	09:39:00	5919	4833	365.03	27163	27163	0	4794	4794	0	27163	4794	55	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
20	96	1455	Saturday	14:34:54	6284	4795	858.17	24606	24606	0	7351	7351	0	24606	7351	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
211	88	2873	Monday	13:53:50	6314	2272	789.75	24606	24606	0	7351	7351	0	24606	7351	77	Degradation of altitude	Central UA ground impact point below flight path
231	155	993	Sunday	19:52:38	6730	3393	1387.72	28441	28441	11	3516	3516	0	28441	3516	21	Engine Fire	UA structural desintegration - Debris Impact
258	13	2503	Saturday	07:08:31	6022	3643	114.19	30838	30838	0	1119	1119	0	30838	1119	44	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
263	38	3419	Thursday	09:24:48	6828	905	341.36	27163	27163	0	4794	4794	0	27163	4794	51	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
264	61	1008	Friday	11:25:20	6716	3448	542.22	26204	26204	0	5753	5753	0	26204	5753	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
278	100	1607	Friday	14:56:42	6151	5038	894.53	24766	24766	0	7191	7191	0	24766	7191	47	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
283	77	3063	Wednesday	12:54:46	6500	1646	691.28	25405	25405	0	6552	6552	0	25405	6552	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
284	40	377	Thursday	09:31:02	7053	1310	351.75	27163	27163	2	4794	4794	1	27163	4794	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
292	91	833	Friday	14:06:58	6862	2792	811.64	24766	24766	2	7191	7191	0	24766	7191	31	Connection Failure	UA ground impact tangential to trajectory
295	59	370	Monday	11:13:34	7054	1293	522.64	26044	26044	0	5913	5913	0	26044	5913	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
3	109	3570	Wednesday	15:48:13	6935	818	980.39	24766	24766	0	7191	7191	0	24766	7191	36	Short Circuit / Overload	Central UA ground impact point below flight path
309	87	2749	Monday	13:48:16	6201	2727	780.44	24606	24606	0	7351	7351	0	24606	7351	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
316	19	3015	Monday	07:41:40	6452	1793	169.44	27962	27962	0	3995	3995	0	27962	3995	10	Engine Anomaly	UA approaches Emergency landing site
321	74	689	Saturday	12:35:01	6956	2263	658.36	22529	22529	0	9428	9428	0	22529	9428	37	Short Circuit / Overload	Central UA ground impact point below flight path
327	33	3120	Friday	08:57:22	6556	1484	295.64	28122	28122	0	3835	3835	0	28122	3835	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
331	121	3349	Tuesday	16:52:39	6770	994	1087.78	23967	23967	0	7990	7990	0	23967	7990	30	Connection Failure	Central UA ground impact point below flight path
333	24	568	Thursday	08:04:59	7013	1851	208.31	27163	27163	0	4794	4794	0	27163	4794	40	Short Circuit / Overload	Central UA ground impact point below flight path
334	134	540	Friday	17:58:36	7022	1762	1197.69	23967	23967	0	7990	7990	0	23967	7990	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
337	100	2174	Monday	14:57:33	5917	4653	895.94	24606	24606	26	7351	7351	0	24606	7351	63	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
346	115	1981	Wednesday	16:18:13	5940	5010	1030.39	23648	23648	0	8309	8309	0	23648	8309	32	Connection Failure	UA approaches Emergency landing site
372	109	3015	Monday	15:47:24	6452	1793	979.00	24606	24606	0	7351	7351	0	24606	7351	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
375	115	303	Thursday	16:15:43	7052	1147	1026.20	24287	24287	1	7670	7670	1	24287	7670	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
38	9	1439	Wednesday	06:45:20	6299	4762	75.56	28122	28122	8	3835	3835	1	28122	3835	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
387	119	655	Tuesday	16:37:49	6974	2143	1063.06	23967	23967	0	7990	7990	0	23967	7990	72	Degradation of altitude	UA approaches Emergency landing site
389	153	900	Thursday	19:41:41	6810	3044	1369.50	29080	29080	0	2877	2877	0	29080	2877	43	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
39	55	1563	Thursday	10:53:47	6188	4982	489.64	25565	25565	0	6392	6392	0	25565	6392	66	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
391	92	869	Saturday	14:12:26	6835	2928	820.72	24606	24606	0	7351	7351	0	24606	7351	68	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
392	136	1300	Sunday	18:10:32	6433	4417	1217.58	23648	23648	0	8309	8309	0	23648	8309	15	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
396	123	752	Thursday	16:59:34	6918	2491	1099.28	24287	24287	0	7670	7670	0	24287	7670	55	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
4	75	2369	Thursday	12:42:55	5958	4102	671.55	25565	25565	0	6392	6392	0	25565	6392	78	Degradation of altitude	Central UA ground impact point below flight path
40	48	760	Friday	10:14:48	6913	2520	424.67	26204	26204	0	5753	5753	0	26204	5753	70	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
41	63	111	Saturday	11:34:46	7006	872	557.97	22529	22529	0	9428	9428	0	22529	9428	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
417	154	3281	Thursday	19:50:39	6710	1110	1384.44	29080	29080	0	2877	2877	0	29080	2877	55	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
417	86	712	Thursday	13:39:48	6943	2345	766.36	25405	25405	0	6552	6552	0	25405	6552	27	Generator Failure	UA ground impact tangential to trajectory
43	79	2833	Monday	13:05:12	6276	2417	708.69	24606	24606	0	7351	7351	0	24606	7351	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
438	82	527	Thursday	13:17:57	7027	1722	729.92	25405	25405	0	6552	6552	0	25405	6552	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
439	36	1592	Friday	09:11:16	6163	5020	318.81	28122	28122	0	3835	3835	0	28122	3835	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
440	119	689	Saturday	16:37:53	6956	2263	1063.14	25086	25086	0	6871	6871	0	25086	6871	78	Degradation of altitude	Central UA ground impact point below flight path
447	30	1591	Saturday	08:38:53	6164	5019	264.83	26524	26524	0	5433	5433	0	26524	5433	66	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
450	26	1717	Tuesday	08:17:30	6069	5125	229.17	27163	27163	0	4794	4794	0	27163	4794	14	Engine Anomaly	Central UA ground impact point below flight path
456	102	2678	Monday	15:09:06	6143	2995	915.19	24606	24606	0	7351	7351	0	24606	7351	10	Engine Anomaly	UA approaches Emergency landing site
456	93	2472	Monday	14:20:14	6005	3754	833.72	24606	24606	0	7351	7351	0	24606	7351	32	Connection Failure	UA approaches Emergency landing site
46	38	1285	Thursday	09:21:37	6448	4374	336.03	27163	27163	0	4794	4794	0	27163	4794	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
461	36	2582	Saturday	09:12:46	6072	3355	321.28	26524	26524	0	5433	5433	0	26524	5433	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
464	155	2171	Tuesday	19:54:23	5916	4660	1390.67	29560	29560	0	2397	2397	0	29560	2397	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
466	89	2063	Thursday	13:58:01	5922	4885	796.72	25405	25405	0	6552	6552	0	25405	6552	24	Generator Failure	UA ground impact tangential to trajectory
469	1	1612	Sunday	06:02:25	6147	5044	4.03	30518	30518	0	1439	1439	0	30518	1439	13	Engine Anomaly	UA approaches Emergency landing site
469	42	2927	Sunday	09:45:40	6366	2083	376.11	27962	27962	0	3995	3995	0	27962	3995	22	Generator Failure	UA approaches Emergency landing site
472	36	1814	Wednesday	09:11:36	6010	5135	319.36	26684	26684	0	5273	5273	0	26684	5273	5	Engine Out	No Ground Effect
480	131	379	Thursday	17:42:11	7053	1315	1170.31	24287	24287	3	7670	7670	1	24287	7670	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
485	123	3276	Tuesday	17:03:21	6706	1119	1105.58	23967	23967	0	7990	7990	0	23967	7990	62	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
485	95	319	Tuesday	14:27:48	7053	1180	846.33	25086	25086	0	6871	6871	0	25086	6871	35	Connection Failure	UA ground impact tangential to trajectory
511	77	784	Sunday	12:51:21	6897	2609	685.58	23009	23009	0	8948	8948	0	23009	8948	31	Connection Failure	UA ground impact tangential to trajectory
514	134	3286	Wednesday	18:02:43	6715	1100	1204.56	23648	23648	0	8309	8309	0	23648	8309	66	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
517	136	1845	Saturday	18:11:22	5994	5126	1218.94	25086	25086	0	6871	6871	0	25086	6871	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
526	150	405	Monday	19:24:45	7051	1379	1341.28	29080	29080	0	2877	2877	0	29080	2877	72	Degradation of altitude	UA approaches Emergency landing site
529	14	1860	Thursday	07:12:57	5986	5119	121.58	27802	27802	0	4155	4155	0	27802	4155	35	Connection Failure	UA ground impact tangential to trajectory
529	45	2699	Thursday	10:01:30	6159	2915	402.53	25565	25565	0	6392	6392	0	25565	6392	2	Engine Out	UA approaches Emergency landing site
541	146	3076	Tuesday	19:07:10	6513	1608	1311.97	29560	29560	1	2397	2397	0	29560	2397	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
543	66	2618	Thursday	11:54:43	6097	3220	591.22	25565	25565	0	6392	6392	0	25565	6392	15	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
545	113	1233	Saturday	16:06:19	6500	4219	1010.53	25086	25086	0	6871	6871	0	25086	6871	17	Engine Fire	Central UA ground impact point below flight path
572	104	1037	Friday	15:17:27	6690	3554	929.08	24766	24766	0	7191	7191	0	24766	7191	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
585	52	2491	Thursday	10:38:59	6015	3686	464.97	25565	25565	0	6392	6392	0	25565	6392	67	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
59	99	760	Wednesday	14:50:02	6913	2520	883.42	24766	24766	0	7191	7191	0	24766	7191	10	Engine Anomaly	UA approaches Emergency landing site
594	140	830	Saturday	18:31:26	6864	2781	1252.39	25086	25086	0	6871	6871	0	25086	6871	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
607	124	3300	Friday	17:08:47	6727	1075	1114.64	23967	23967	1	7990	7990	1	23967	7990	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
610	52	2613	Monday	10:39:09	6093	3239	465.28	26044	26044	0	5913	5913	0	26044	5913	36	Short Circuit / Overload	Central UA ground impact point below flight path
617	11	1243	Monday	06:55:50	6490	4250	93.06	27962	27962	0	3995	3995	0	27962	3995	32	Connection Failure	UA approaches Emergency landing site

643	113	2100	Saturday	16:07:37	5918	4815	1012.70	25086	25086	0	6871	6871	0	25086	6871	44	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
650	26	2973	Saturday	08:19:22	6411	1929	232.31	26524	26524	7	5433	5433	3	26524	5433	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
650	69	1124	Saturday	12:08:41	6607	3862	614.47	22529	22529	0	9428	9428	0	22529	9428	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
655	74	1534	Thursday	12:36:17	6213	4939	660.47	25565	25565	10	6392	6392	2	25565	6392	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
658	26	928	Sunday	08:16:19	6787	3150	227.20	27962	27962	0	3995	3995	0	27962	3995	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
662	97	3302	Thursday	14:43:03	6729	1071	871.78	25405	25405	0	6552	6552	0	25405	6552	36	Short Circuit / Overload	Central UA ground impact point below flight path
673	137	90	Monday	18:14:07	6997	855	1223.55	22689	22689	0	9268	9268	0	22689	9268	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
675	105	983	Wednesday	15:22:45	6739	3355	937.94	24766	24766	10	7191	7191	3	24766	7191	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
679	43	1428	Sunday	09:48:48	6309	4738	381.36	27962	27962	0	3995	3995	1	27962	3995	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
68	91	1434	Friday	14:07:53	6303	4751	813.14	24766	24766	0	7191	7191	0	24766	7191	35	Connection Failure	UA ground impact tangential to trajectory
682	132	2871	Wednesday	17:51:19	6312	2280	1185.53	23648	23648	0	8309	8309	0	23648	8309	31	Connection Failure	UA ground impact tangential to trajectory
70	7	1713	Sunday	06:34:57	6072	5123	58.25	30518	30518	0	1439	1439	0	30518	1439	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
703	34	3523	Wednesday	09:03:23	6905	829	305.64	26684	26684	1	5273	5273	1	26684	5273	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
732	48	1227	Thursday	10:15:30	6506	4201	425.83	25565	25565	0	6392	6392	0	25565	6392	32	Connection Failure	UA approaches Emergency landing site
738	115	3360	Wednesday	16:20:18	6780	978	1033.83	23648	23648	1	8309	8309	0	23648	8309	62	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
738	1	389	Wednesday	06:00:34	7053	1339	0.97	28122	28122	0	3835	3835	0	28122	3835	29	Connection Failure	UA approaches Emergency landing site
745	12	600	Wednesday	07:00:16	7000	1956	100.44	28122	28122	0	3835	3835	0	28122	3835	46	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
747	8	1459	Friday	06:39:57	6280	4803	66.61	28281	28281	0	3676	3676	0	28281	3676	70	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
749	98	1492	Sunday	14:45:45	6250	4867	876.25	23648	23648	0	8309	8309	0	23648	8309	29	Connection Failure	UA approaches Emergency landing site
765	135	1109	Tuesday	18:04:51	6622	3810	1208.11	23967	23967	0	7990	7990	0	23967	7990	4	Engine Out	Central ground impact point below flight path with B/G Ratio.
767	63	2902	Thursday	11:38:58	6342	2170	564.95	25565	25565	0	6392	6392	0	25565	6392	55	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
770	22	2365	Sunday	07:56:53	5956	4115	194.81	30518	30518	0	1439	1439	0	30518	1439	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
779	29	289	Tuesday	08:31:33	7051	1119	252.58	27163	27163	0	4794	4794	1	27163	4794	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
782	10	2308	Friday	06:52:02	5938	4291	86.72	28281	28281	13	3676	3676	1	28281	3676	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
786	147	3167	Tuesday	19:12:42	6602	1361	1321.19	29560	29560	0	2397	2397	0	29560	2397	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
788	133	738	Thursday	17:53:30	6927	2439	1189.19	24287	24287	0	7670	7670	0	24287	7670	23	Generator Failure	Central UA ground impact point below flight path
81	150	1394	Thursday	19:26:14	6342	4661	1343.75	29080	29080	0	2877	2877	0	29080	2877	68	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
815	34	1655	Wednesday	09:00:35	6114	5085	300.97	26684	26684	0	5273	5273	0	26684	5273	31	Connection Failure	UA ground impact tangential to trajectory
822	134	3586	Wednesday	18:03:10	6944	817	1205.30	23648	23648	0	8309	8309	0	23648	8309	57	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
827	67	2487	Monday	11:59:56	6013	3701	599.89	26044	26044	0	5913	5913	0	26044	5913	75	Degradation of altitude	UA approaches Emergency landing site
836	100	3030	Wednesday	14:58:50	6467	1746	898.08	24766	24766	0	7191	7191	0	24766	7191	73	Degradation of altitude	Central UA ground impact point below flight path
840	23	121	Sunday	07:58:54	7010	880	198.19	27962	27962	3	3995	3995	0	27962	3995	18	Engine Fire	UA structural desintegration - Debris Impact
842	141	2833	Tuesday	18:39:49	6276	2417	1266.39	23967	23967	6	7990	7990	2	23967	7990	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
858	66	2663	Thursday	11:54:48	6131	3051	591.33	25565	25565	0	6392	6392	0	25565	6392	28	Generator Failure	UA ground impact tangential to trajectory
861	26	950	Sunday	08:16:21	6768	3232	227.25	27962	27962	0	3995	3995	0	27962	3995	32	Connection Failure	UA approaches Emergency landing site
871	91	1056	Wednesday	14:07:19	6672	3623	812.20	24766	24766	0	7191	7191	0	24766	7191	72	Degradation of altitude	UA approaches Emergency landing site
885	50	3410	Wednesday	10:29:34	6821	914	449.28	25405	25405	0	6552	6552	0	25405	6552	19	Engine Fire	Central UA ground impact point below flight path
886	152	220	Thursday	19:35:17	7040	1001	1358.81	29080	29080	0	2877	2877	0	29080	2877	17	Engine Fire	Central UA ground impact point below flight path
892	94	161	Wednesday	14:22:09	7024	922	836.94	24766	24766	0	7191	7191	0	24766	7191	66	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
894	116	3173	Friday	16:25:25	6608	1346	1042.36	23967	23967	0	7990	7990	2	23967	7990	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
895	33	1586	Saturday	08:55:04	6168	5013	291.81	26524	26524	0	5433	5433	0	26524	5433	38	Short Circuit / Overload	Central UA ground impact point below flight path
9	98	3249	Tuesday	14:48:23	6681	1173	880.64	25086	25086	0	6871	6871	0	25086	6871	28	Generator Failure	UA ground impact tangential to trajectory
901	72	2464	Friday	12:26:53	6000	3782	644.81	26204	26204	0	5753	5753	0	26204	5753	40	Short Circuit / Overload	Central UA ground impact point below flight path
906	7	2358	Wednesday	06:35:55	5954	4137	59.86	28122	28122	0	3835	3835	0	28122	3835	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
916	130	732	Saturday	17:37:18	6931	2417	1162.19	25086	25086	7	6871	6871	2	25086	6871	18	Engine Fire	UA structural desintegration - Debris Impact
918	108	3535	Monday	15:42:46	6913	825	971.31	24606	24606	0	7351	7351	0	24606	7351	23	Generator Failure	Central UA ground impact point below flight path
92	112	608	Monday	15:59:59	6996	1982	999.97	22689	22689	0	9268	9268	0	22689	9268	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
93	76	1315	Tuesday	12:46:44	6419	4459	677.92	26044	26044	0	5913	5913	0	26044	5913	35	Connection Failure	UA ground impact tangential to trajectory
937	6	1911	Saturday	06:29:51	5964	5084	49.75	30838	30838	0	1119	1119	0	30838	1119	9	Engine Out	UA ground impact tangential to trajectory
947	6	966	Tuesday	06:28:26	6754	3292	47.39	27962	27962	0	3995	3995	0	27962	3995	70	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
952	111	2885	Sunday	15:57:59	6325	2230	996.67	23648	23648	0	8309	8309	0	23648	8309	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
952	131	2469	Sunday	17:45:19	6003	3764	1175.53	23648	23648	0	8309	8309	0	23648	8309	35	Connection Failure	UA ground impact tangential to trajectory
953	106	2419	Monday	15:30:18	5978	3937	950.53	24606	24606	0	7351	7351	0	24606	7351	31	Connection Failure	UA ground impact tangential to trajectory
96	52	1101	Friday	10:36:53	6629	3783	461.50	26204	26204	6	5753	5753	3	26204	5753	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
966	103	1102	Sunday	15:12:09	6628	3786	920.25	23648	23648	0	8309	8309	0	23648	8309	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
972	122	2173	Saturday	16:56:17	5916	4656	1093.83	25086	25086	21	6871	6871	2	25086	6871	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
980	15	372	Sunday	07:16:06	7054	1298	126.86	30518	30518	2	1439	1439	0	30518	1439	9	Engine Out	UA ground impact tangential to trajectory
982	12	2445	Tuesday	07:03:01	5991	3848	105.05	27962	27962	8	3995	3995	1	27962	3995	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
987	150	3440	Sunday	19:29:18	6845	884	1348.86	28441	28441	2	3516	3516	0	28441	3516	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
989	147	755	Tuesday	19:09:06	6916	2502	1315.17	29560	29560	0	2397	2397	0	29560	2397	24	Generator Failure	UA ground impact tangential to trajectory
99	66	2963	Monday	11:55:14	6401	1962	592.08	26044	26044	0	5913	5913	0	26044	5913	31	Connection Failure	UA ground impact tangential to trajectory
996	11	1198	Tuesday	06:55:45	6535	4109	92.94	27962	27962	0	3995	3995	0	27962	3995	29	Connection Failure	UA approaches Emergency landing site

O.R.C.U.S. 02.00 - tTest of the Simulation

nProbes	200
nEvents	203
nEvents_cor	190
tMission	14
x_cross_ATB	1.035
x_cross_OTW	0.19
x_cross_TOT	1.225
s2ATB	0.9905692
sATB	0.9952734
tATB	14.564529
s2OTW	0.0330469
sOTW	0.181788
tOTW	14.003041
s2TOT	1.3759102
sTOT	1.172992
tTOT	14.648604

UADay/Prot	HIT_TOT_ATB	HIT_TOT_OTW	UADay/Prot cor	HIT_TOT_mean_ATB	HIT_TOT_mean_OTW	HIT_TOT_mean_ATB/Fh	HIT_TOT_mean_OTW/Fh	x_i-x_cross ATB	x_i-x_cross OTW	(x_i-x_cross ATB)^2	(x_i-x_cross OTW)^2
2	0	0	2	0	0	0	0	-1.035	-0.19	1.071225	0.0361
3	0	0	3	0	0	0	0	-1.035	-0.19	1.071225	0.0361
4	0	0	4	0	0	0	0	-1.035	-0.19	1.071225	0.0361
9	0	0	9	0	0	0	0	-1.035	-0.19	1.071225	0.0361
18	0	0	18	0	0	0	0	-1.035	-0.19	1.071225	0.0361
20	0	0	20	0	0	0	0	-1.035	-0.19	1.071225	0.0361
38	8	1	38	8	1	0.571428571	0.071428571	-0.463571429	-0.118571429	0.214898469	0.014059184
39	0	0	39	0	0	0	0	-1.035	-0.19	1.071225	0.0361
40	0	0	40	0	0	0	0	-1.035	-0.19	1.071225	0.0361
41	0	0	41	0	0	0	0	-1.035	-0.19	1.071225	0.0361
43	0	0	43	0	0	0	0	-1.035	-0.19	1.071225	0.0361
46	0	0	46	0	0	0	0	-1.035	-0.19	1.071225	0.0361
59	0	0	59	0	0	0	0	-1.035	-0.19	1.071225	0.0361
68	0	0	68	0	0	0	0	-1.035	-0.19	1.071225	0.0361
70	0	0	70	0	0	0	0	-1.035	-0.19	1.071225	0.0361
81	0	0	81	0	0	0	0	-1.035	-0.19	1.071225	0.0361
92	0	0	92	0	0	0	0	-1.035	-0.19	1.071225	0.0361
93	0	0	93	0	0	0	0	-1.035	-0.19	1.071225	0.0361
96	6	3	96	6	3	0.428571429	0.214285714	-0.606428571	0.024285714	0.367755612	0.000589796
99	0	0	99	0	0	0	0	-1.035	-0.19	1.071225	0.0361
109	0	0	109	0	0	0	0	-1.035	-0.19	1.071225	0.0361
118	0	0	118	0	0	0	0	-1.035	-0.19	1.071225	0.0361
137	0	0	137	0	0	0	0	-1.035	-0.19	1.071225	0.0361
144	0	0	144	0	0	0	0	-1.035	-0.19	1.071225	0.0361
145	0	0	145	0	0	0	0	-1.035	-0.19	1.071225	0.0361
147	3	0	147	3	0	0.214285714	0	-0.820714286	-0.19	0.673571939	0.0361
148	0	0	148	0	0	0	0	-1.035	-0.19	1.071225	0.0361
156	0	0	156	0	0	0	0	-1.035	-0.19	1.071225	0.0361
158	2	0	158	2	0	0.142857143	0	-0.892142857	-0.19	0.795918878	0.0361
170	9	2	170	9	2	0.642857143	0.142857143	-0.392142857	-0.047142857	0.15377602	0.002222449
172	0	0	172	0	0	0	0	-1.035	-0.19	1.071225	0.0361
174	0	0	174	0	0	0	0	-1.035	-0.19	1.071225	0.0361
175	0	0	175	0	0	0	0	-1.035	-0.19	1.071225	0.0361
182	0	0	182	0	0	0	0	-1.035	-0.19	1.071225	0.0361
191	0	0	191	0	0	0	0	-1.035	-0.19	1.071225	0.0361
211	0	0	211	0	0	0	0	-1.035	-0.19	1.071225	0.0361
231	11	0	231	11	0	0.785714286	0	-0.249285714	-0.19	0.062143367	0.0361
258	0	0	258	0	0	0	0	-1.035	-0.19	1.071225	0.0361
263	0	0	263	0	0	0	0	-1.035	-0.19	1.071225	0.0361
264	0	0	264	0	0	0	0	-1.035	-0.19	1.071225	0.0361
278	0	0	278	0	0	0	0	-1.035	-0.19	1.071225	0.0361
283	0	0	283	0	0	0	0	-1.035	-0.19	1.071225	0.0361
284	2	1	284	2	1	0.142857143	0.071428571	-0.892142857	-0.118571429	0.795918878	0.014059184
292	2	0	292	2	0	0.142857143	0	-0.892142857	-0.19	0.795918878	0.0361
295	0	0	295	0	0	0	0	-1.035	-0.19	1.071225	0.0361
309	0	0	309	0	0	0	0	-1.035	-0.19	1.071225	0.0361
316	0	0	316	0	0	0	0	-1.035	-0.19	1.071225	0.0361
321	0	0	321	0	0	0	0	-1.035	-0.19	1.071225	0.0361
327	0	0	327	0	0	0	0	-1.035	-0.19	1.071225	0.0361
331	0	0	331	0	0	0	0	-1.035	-0.19	1.071225	0.0361
333	0	0	333	0	0	0	0	-1.035	-0.19	1.071225	0.0361
334	0	0	334	0	0	0	0	-1.035	-0.19	1.071225	0.0361
337	26	0	337	26	0	1.857142857	0	0.822142857	-0.19	0.675918878	0.0361
346	0	0	346	0	0	0	0	-1.035	-0.19	1.071225	0.0361
372	0	0	372	0	0	0	0	-1.035	-0.19	1.071225	0.0361
375	1	1	375	1	1	0.071428571	0.071428571	-0.963571429	-0.118571429	0.928469898	0.014059184
387	0	0	387	0	0	0	0	-1.035	-0.19	1.071225	0.0361
389	0	0	389	0	0	0	0	-1.035	-0.19	1.071225	0.0361
391	0	0	391	0	0	0	0	-1.035	-0.19	1.071225	0.0361
392	0	0	392	0	0	0	0	-1.035	-0.19	1.071225	0.0361
396	0	0	396	0	0	0	0	-1.035	-0.19	1.071225	0.0361
417	0	0	417	0	0	0	0	-1.035	-0.19	1.071225	0.0361
417	0	0	438	0	0	0	0	-1.035	-0.19	1.071225	0.0361
438	0	0	439	0	0	0	0	-1.035	-0.19	1.071225	0.0361
439	0	0	440	0	0	0	0	-1.035	-0.19	1.071225	0.0361
440	0	0	447	0	0	0	0	-1.035	-0.19	1.071225	0.0361
447	0	0	450	0	0	0	0	-1.035	-0.19	1.071225	0.0361
450	0	0	456	0	0	0	0	-1.035	-0.19	1.071225	0.0361
456	0	0	461	0	0	0	0	-1.035	-0.19	1.071225	0.0361
456	0	0	464	0	0	0	0	-1.035	-0.19	1.071225	0.0361
461	0	0	466	0	0	0	0	-1.035	-0.19	1.071225	0.0361
464	0	0	469	0	0	0	0	-1.035	-0.19	1.071225	0.0361
466	0	0	472	0	0	0	0	-1.035	-0.19	1.071225	0.0361
469	0	0	480	3	1	0.214285714	0.071428571	-0.820714286	-0.118571429	0.673571939	0.014059184
469	0	0	485	0	0	0	0	-1.035	-0.19	1.071225	0.0361
472	0	0	511	0	0	0	0	-1.035	-0.19	1.071225	0.0361
480	3	1	514	0	0	0	0	-1.035	-0.19	1.071225	0.0361
485	0	0	517	0	0	0	0	-1.035	-0.19	1.071225	0.0361
485	0	0	526	0	0	0	0	-1.035	-0.19	1.071225	0.0361
511	0	0	529	0	0	0	0	-1.035	-0.19	1.071225	0.0361
514	0	0	541	1	0	0.071428571	0	-0.963571429	-0.19	0.928469898	0.0361
517	0	0	543	0	0	0	0	-1.035	-0.19	1.071225	0.0361
526	0	0	545	0	0	0	0	-1.035	-0.19	1.071225	0.0361
529	0	0	572	0	0	0	0	-1.035	-0.19	1.071225	0.0361
529	0	0	585	0	0	0	0	-1.035	-0.19	1.071225	0.0361
541	1	0	594	0	0	0	0	-1.035	-0.19	1.071225	0.0361
543	0	0	607	1	1	0.071428571	0.071428571	-0.963571429	-0.118571429	0.928469898	0.014059184
545	0	0	610	0	0	0	0	-1.035	-0.19	1.071225	0.0361
572	0	0	617	0	0	0	0	-1.035	-0.19	1.071225	0.0361
585	0	0	643	0	0	0	0	-1.035	-0.19	1.071225	0.0361
594	0	0	650	7	3	0.5	0.214285714	-0.535	0.024285714	0.286225	0.000589796
607	1	1	655	10	2	0.714285714	0.142857143	-0.320714286	-0.047142857	0.102857653	0.002222449
610	0	0	658	0	0	0	0	-1.035	-0.19	1.071225	0.0361
617	0	0	662	0	0	0	0	-1.035	-0.19	1.071225	0.0361
643	0	0	673	0	0	0	0	-1.035	-0.19	1.071225	0.0361
650	7	3	675	10	3	0.714285714	0.214285714	-0.320714286	0.024285714	0.102857653	0.000589796
650	0	0	679	0	1	0	0.071428571	-1.035	-0.118571429	1.071225	0.014059184
655	10	2	682	0	0	0	0	-1.035	-0.19	1.071225	0.0361
658	0	0	703	1	1	0.071428571	0.071428571	-0.963571429	-0.118571429	0.928469898	0.014059184
662	0	0	732	0	0	0	0	-1.035	-0.19	1.071225	0.0361
673	0	0	738	1	0	0.071428571	0	-0.963571429	-0.19	0.928469898	0.0361
675	10	3	745	0	0	0	0	-1.035	-0.19	1.071225	0.0361
679	0	1	747	0	0	0	0	-1.035	-0.19	1.071225	0.0361
682	0	0	749	0	0	0	0	-1.035	-0.19	1.071225	0.0361
703	1	1	765	0	0	0	0	-1.035	-0.19	1.071225	0.0361
732	0	0	767	0	0	0	0	-1.035	-0.19	1.071225	0.0361
738	1	0	770	0	0	0	0	-1.035	-0.19	1.071225	0.0361
738	0	0	779	0	1	0	0.071428571	-1.035	-0.118571429	1.071225	0.014059184
745	0	0	782	13	1	0.928571429	0.071428571	-0.106428571	-0.118571429	0.011327041	0.014059184
747	0	0	786	0	0	0	0	-1.035	-0.19	1.071225	0.0361
749	0	0	788	0	0	0	0	-1.035	-0.19	1.071225	0.0361
765	0	0	815	0	0	0	0	-1.035	-0.19	1.071225	0.0361
767	0	0	822	0	0	0	0	-1.035	-0.19	1.071225	0.0361
770	0	0	827	0	0	0	0	-1.035	-0.19	1.071225	0.0361
779	0	1	836	0	0	0	0	-1.035	-0.19	1.071225	0.0361
782	13	1	840	3	0	0.214285714	0	-0.820714286	-0.19	0.673571939	0.0361
786	0	0	842	6	2	0.428571429	0.142857143	-0.606428571	-0.047142857	0.367755612	0.002222449
788	0	0	858	0	0	0	0	-1.035	-0.19	1.071225	0.0361
815	0	0	861	0	0	0	0	-1.035	-0.19	1.071225	0.0361
822	0	0	871	0	0	0	0	-1.035	-0.19	1.071225	0.0361
827	0	0	885	0	0	0	0	-1.035	-0.19	1.071225	0.0361
836	0	0	886	0	0	0	0	-1.035	-0.19	1.071225	0.0361
840	3	0	892	0	0	0	0	-1.035	-0.19	1.071225	0.0361
842	6	2	894	0	2	0	0.142857143	-1.035	-0.047142857	1.071225	0.002222449
858	0	0	895	0	0	0	0	-1.035	-0.19	1.071225	0.0361
861	0	0	901	0	0	0	0	-1.035	-0.19	1.071225	0.0361
871	0	0	906	0	0	0	0	-1.035	-0.19	1.071225	0.0361
885	0	0	916	7	2	0.5	0.142857143	-0.535	-0.047142857	0.286225	0.002222449
886	0	0	918	0	0	0	0	-1.035	-0.19	1.071225	0.0361
892	0	0	937	0	0	0	0	-1.035	-0.19	1.071225	0.0361
894	0	2	947	0	0	0	0	-1.035	-0.19	1.071225	0.0361
895	0	0	952	0	0	0	0	-1.035	-0.19	1.071225	0.0361
901	0	0	953	0	0	0	0	-1.035	-0.19	1.071225	0.0361
906	0	0	966	0	0	0	0	-1.035	-0.19	1.071225	0.0361
916	7	2	972	21	2	1.5	0.142857143	0.465	-0.047142857	0.216225	0.002222449
918	0	0	980	2	0	0.142857143	0	-0.892142857	-0.19	0.795918878	0.0361
937	0	0	982	8	1	0.571428571	0.071428571	-0.463571429	-0.118571429	0.214898469	0.014059184
947	0	0	987	2	0	0.142857143	0	-0.892142857	-0.19	0.795918878	0.0361
952	0	0	989	0	0	0	0	-1.035	-0.19	1.071225	0.0361
952	0	0	996	0	0	0	0	-1.035	-0.19	1.071225	0.0361
953	0	0	1000	0	0	0	0	-1.035	-0.19	1.071225	0.0361
966	0	0	1006	0	0	0	0	-1.035	-0.19	1.071225	0.0361
972	21	2	1029	0	0	0	0	-1.035	-0.19	1.071225	0.0361
980	2	0	1030	0	0	0	0	-1.035	-0.19	1.071225	0.0361
982	8	1	1039	3	3	0.214285714	0.214285714	-0.820714286	0.024285714	0.673571939	0.000589796
987	2	0	1047	0	0	0	0	-1.035	-0.19	1.071225	0.0361
989	0	0	1090	0	0	0	0	-1.035	-0.19	1.071225	0.0361
996	0	0	1093	1	0	0.071428571	0	-0.963571429	-0.19	0.928469898	0.0361
1000	0	0	1104	0	0	0	0	-1.035	-0.19	1.071225	0.0361
1006	0	0	1110	0	0	0	0	-1.035	-0.19	1.071225	0.0361
1029	0	0	1112	0	0	0	0	-1.035	-0.19	1.071225	0.0361
1030	0	0	1128	0	0	0	0	-1.035	-0.19	1.071225	0.0361
1039	3	3	1131	0	0	0	0	-1.035	-0.19	1.071225	0.0361
1047	0	0	1140	0	0	0	0	-1.035	-0.19	1.071225	0.0361
1090	0	0	1145	0	0	0	0	-1.035	-0.19	1.071225	0.0361
1093	1	0	1146	0	0	0	0	-1.035	-0.19	1.071225	0.0361
1104	0	0	1150	0	0	0	0	-1.035	-0.19	1.071225	0.0361
1110	0	0	1158	0	0	0	0	-1.035	-0.19	1.071225	0.0361
1112	0	0	1167	0	0	0	0	-1.035	-0.19	1.071225	0.0361
1128	0	0	1172	0	1	0	0.071428571	-1.035	-0.118571429	1.071225	0.014059184
1131	0	0	1173	3	0	0.214285714	0	-0.820714286	-0.19	0.673571939	0.0361
1140	0	0	1177	0	0	0	0	-1.035	-0.19	1.071225	0.0361
1145	0	0	1179	0	0	0	0	-1.035	-0.19	1.071225	0.0361
1146	0	0	1185	0	0	0	0	-1.035	-0.19	1.071225	0.0361
1150	0	0	1186	0	0	0	0	-1.035	-0.19	1.071225	0.0361
1150	0	0	1192	0	0	0	0	-1.035	-0.19	1.071225	0.0361
1158	0	0	1197	0	0	0	0	-1.035	-0.19	1.071225	0.0361
1167	0	0	1205	0	0	0	0	-1.035	-0.19	1.071225	0.0361
1172	0	0	1212	0	1	0	0.071428571	-1.035	-0.118571429	1.071225	0.014059184
1173	3	0	1226	1	0	0.071428571	0	-0.963571429	-0.19	0.928469898	0.0361
1177	0	0	1230	0	0	0	0	-1.035	-0.19	1.071225	0.0361
1177	0	0	1246	0	0	0	0	-1.035	-0.19	1.071225	0.0361
1179	0	0	1247	22	1	1.571428571	0.071428571	0.536428571	-0.118571429	0.287755612	0.014059184
1185	0	0	1261	0	0	0	0	-1.035	-0.19	1.071225	0.0361
1186	0	0	1273	0	0	0	0	-1.035	-0.19	1.071225	0.0361
1192	0	0	1275	0	0	0	0	-1.035	-0.19	1.071225	0.0361
1197	0	0	1311	0	0	0	0	-1.035	-0.19	1.071225	0.0361
1205	0	0	1325	0	0	0	0	-1.035	-0.19	1.071225	0.0361
1212	0	1	1326	0	0	0	0	-1.035	-0.19	1.071225	0.0361
1226	1	0	1327	0	0	0	0	-1.035	-0.19	1.071225	0.0361
1230	0	0	1337	0	0	0	0	-1.035	-0.19	1.071225	0.0361
1246	0	0	1340	0	0	0	0	-1.035	-0.19	1.071225	0.0361
1247	22	1	1348	10	2	0.714285714	0.142857143	-0.320714286	-0.047142857	0.102857653	0.002222449
1261	0	0	1359	0	0	0	0	-1.035	-0.19	1.071225	0.0361
1261	0	0	1369	0	0	0	0	-1.035	-0.19	1.071225	0.0361
1273	0	0	1383	0	0	0	0	-1.035	-0.19	1.071225	0.0361
1275	0	0	1384	0	0	0	0	-1.035	-0.19	1.071225	0.0361
1311	0	0	1387	0	0	0	0	-1.035	-0.19	1.071225	0.0361
1325	0	0	1392	0	0	0	0	-1.035	-0.19	1.071225	0.0361
1325	0	0	1397	1	0	0.071428571	0	-0.963571429	-0.19	0.928469898	0.0361
1326	0	0									
1327	0	0									
1337	0	0									
1340	0	0									
1348	10	2									
1348	0	0									
1359	0	0									
1369	0	0									
1383	0	0									
1384	0	0									
1387	0	0									
1392	0	0									
1397	1	0									

11.4.6 Eberbach – R76

11.4.6.1 Eberbach – R76 – Phase 1

O.R.C.U.S. 02.00 - Simulation Summary

UA Parameters

MTOW [kg]	Wingspan [m]	Length [m]	L/D
90	5	4	8

v [km/h]	Alt [m]	CCF [m]
100	100	9103.1565

P_CumCat [1/Fh]	Engine [%]	ESys [%]	FCS [%]	NavSys [%]	Struct [%]
0.01	20	20	20	20	20

General map parameters

	Name	Area [km2]	PPL	PPL/km2
City	Eberbach, Stadt	81.15	14578	180
County	Rhein-Neckar-Kreis	1061.55	546745	515
FS	BW	35748.3	11023425	308

Mission specific map parameters

	Area [km2]	PPL	Tourists	Total PPL
City-SMP	16.8002	14578	0	14578
SurM	50.0553	25779	0	25779
Map total	66.8555	40357	0	40357

PPL MOD NA

Sim FH [Fh] 19600 Ev/Fh [1/Fh] 0.0097449
Events total 191

Hits due to UA impacts		Hits/Fh [1/Fh]
City-SMP ATB	286	0.0145918
SurM ATB	0	0
Total ATB	286	0.0145918
City-SMP OTW	83	0.0042347
SurM OTW	0	0
Total OTW	83	0.0042347
Total	369	0.0188265

Prot	cyc	k_UA	Day	Time of impact	UA X Pos	UA Y Pos	Travelled Distance [km]	PPL_TD_CITY_ATB	PPL_CITY_ATB_COUNT	HIT_CITY_ATB_COUNT	PPL_TD_CITY_OTW	PPL_CITY_OTW_COUNT	HIT_CITY_OTW_COUNT	PPL_TD_SURM_ATB	PPL_SURM_ATB_COUNT	HIT_SURM_ATB_COUNT	PPL_TD_SURM_OTW	PPL_SURM_OTW_COUNT	HIT_SURM_OTW_COUNT	PPL_ALL_ATB_COUNT	PPL_ALL_OTW_COUNT	E	Case	Outcome
10	16	2772	Wednesday	07:26:08	3095	2034	143.56	12464	12464	0	2114	2114	0	22427	21970	0	3352	3352	0	34434	5466	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1009	20	3564	Monday	07:49:10	4176	380	181.97	12391	12391	0	2187	2187	0	22298	21851	0	3481	3481	0	34242	5668	19	Engine Fire	Central UA ground impact point below flight path
1019	136	95	Thursday	18:17:29	4312	443	1229.17	10860	10860	0	3718	3718	0	18947	18697	0	6832	6832	0	29557	10550	75	Degradation of altitude	UA approaches Emergency landing site
1029	33	1100	Sunday	08:56:26	4031	3331	294.08	13047	13047	0	1531	1531	0	22814	22288	0	2965	2965	0	35335	4496	57	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
1030	69	3158	Monday	12:16:12	3619	856	627.00	11808	11808	0	2770	2770	0	21267	20901	0	4512	4512	0	32709	7282	44	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
1032	65	267	Wednesday	11:49:57	4436	684	583.28	11662	11662	0	2916	2916	0	21525	21128	0	4254	4254	0	32790	7170	66	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
1037	36	1121	Monday	09:12:52	4004	3400	321.45	12391	12391	0	2187	2187	0	21396	21023	0	4383	4383	0	33414	6570	17	Engine Fire	Central UA ground impact point below flight path
1044	25	1460	Monday	08:13:18	3514	4277	222.17	12391	12391	0	2187	2187	0	21396	21007	0	4383	4383	0	33398	6570	35	Connection Failure	UA ground impact tangential to trajectory
1047	48	1268	Thursday	10:18:37	3797	3841	431.05	11662	11662	0	2916	2916	0	21009	20631	0	4770	4770	0	32293	7686	67	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
1052	145	969	Tuesday	19:07:58	4192	2879	1313.30	13338	13338	0	1240	1240	0	23329	22797	0	2450	2450	0	36135	3690	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1076	78	868	Friday	13:01:52	4297	2515	703.14	11297	11297	30	3281	3281	2	19720	19446	0	6059	6059	0	30743	9340	20	Engine Fire	UA structural desintegration - Debris Impact
1076	86	3014	Friday	13:48:50	3409	1236	781.39	11297	11297	0	3281	3281	0	19720	19431	0	6059	6059	0	30728	9340	73	Degradation of altitude	Central UA ground impact point below flight path
108	75	255	Wednesday	12:44:34	4429	661	674.28	11662	11662	0	2916	2916	0	21525	21141	0	4254	4254	0	32803	7170	11	Engine Anomaly	Central UA ground impact point below flight path
1089	43	297	Thursday	09:49:51	4450	743	383.08	12391	12391	0	2187	2187	0	21654	21243	0	4125	4125	0	33634	6312	40	Short Circuit / Overload	UA approaches Emergency landing site
1090	87	699	Friday	13:50:47	4425	1907	784.64	11297	11297	0	3281	3281	0	19720	19441	0	6059	6059	0	30738	9340	74	Degradation of altitude	Central UA ground impact point below flight path
1098	16	146	Saturday	07:22:08	4355	496	136.92	13849	13849	0	729	729	0	24747	24036	0	1032	1032	0	37885	1761	38	Short Circuit / Overload	Central UA ground impact point below flight path
110	101	1831	Friday	15:08:58	3034	4526	914.95	11297	11297	0	3281	3281	0	19720	19440	0	6059	6059	0	30737	9340	36	Short Circuit / Overload	Central UA ground impact point below flight path
1102	126	1788	Wednesday	17:25:26	3080	4541	1142.42	10787	10787	0	3791	3791	0	18689	18461	0	7090	7090	0	29248	10881	72	Degradation of altitude	UA approaches Emergency landing site
1103	25	2064	Thursday	08:14:13	2850	4246	223.69	12391	12391	0	2187	2187	0	21654	21300	0	4125	4125	0	33691	6312	76	Degradation of altitude	Central UA ground impact point below flight path
111	26	3385	Saturday	08:21:40	3948	469	236.14	11953	11953	7	2625	2625	0	22427	21978	0	3352	3352	0	33931	5977	20	Engine Fire	UA structural desintegration - Debris Impact
1120	63	3216	Sunday	11:43:31	3705	730	572.53	10714	10714	8	3864	3864	5	18431	18261	0	7348	7348	0	28975	11212	20	Engine Fire	UA structural desintegration - Debris Impact
1121	103	1167	Monday	15:18:53	3941	3546	931.47	11297	11297	0	3281	3281	0	19849	19573	0	5930	5930	0	30870	9211	72	Degradation of altitude	UA approaches Emergency landing site
1150	104	1060	Tuesday	15:24:10	4083	3197	940.31	11589	11589	0	2989	2989	0	20236	19916	0	5543	5543	0	31505	8532	34	Connection Failure	UA ground impact tangential to trajectory
1152	137	142	Thursday	18:23:01	4352	491	1238.39	10860	10860	0	3718	3718	0	18947	18723	0	6832	6832	0	29583	10550	9	Engine Out	UA ground impact tangential to trajectory
1152	59	1270	Thursday	11:18:43	3794	3846	531.19	11662	11662	0	2916	2916	1	21009	20671	0	4770	4770	0	32333	7686	50	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
1153	153	2335	Friday	19:53:45	2799	3561	1389.58	13557	13557	0	1021	1021	0	23072	22560	0	2707	2707	0	36117	3728	9	Engine Out	UA ground impact tangential to trajectory
1157	102	2745	Tuesday	15:15:48	3065	2131	920.23	11589	11589	0	2989	2989	0	20236	19933	0	5543	5543	0	31522	8532	78	Degradation of altitude	Central UA ground impact point below flight path
1157	47	562	Tuesday	10:12:05	4480	1448	420.17	11953	11953	12	2625	2625	2	20752	20390	0	5027	5027	0	32343	7652	21	Engine Fire	UA structural desintegration - Debris Impact
1164	131	837	Tuesday	17:51:18	4325	2402	1185.53	10933	10933	0	3645	3645	0	19205	18961	0	6574	6574	0	29894	10219	12	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
1165	78	1044	Wednesday	13:02:08	4103	3142	703.58	11370	11370	0	3208	3208	0	20494	20207	0	5285	5285	0	31577	8493	2	Engine Out	UA approaches Emergency landing site
1171	102	1482	Tuesday	15:13:53	3482	4315	923.17	11589	11589	0	2989	2989	0	20236	19946	0	5543	5543	0	31535	8532	74	Degradation of altitude	Central UA ground impact point below flight path
1183	64	1099	Sunday	11:45:46	4033	3328	576.28	10714	10714	0	3864	3864	0	18431	18242	0	7348	7348	0	28956	11212	31	Connection Failure	UA ground impact tangential to trajectory
1226	59	2630	Monday	11:21:05	3164	1830	535.14	11808	11808	0	2770	2770	0	21267	20911	0	4512	4512	0	32719	7282	72	Degradation of altitude	UA approaches Emergency landing site
1239	91	3095	Sunday	14:16:15	3526	1011	827.11	10423	10423	3	4155	4155	0	18560	18369	0	7219	7219	0	28792	11374	9	Engine Out	UA ground impact tangential to trajectory
1244	90	2246	Friday	14:09:30	2795	3821	815.86	11297	11297	2	3281	3281	5	19720	19415	0	6059	6059	0	30712	9340	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1264	2	1937	Thursday	06:08:24	2936	4439	14.00	12537	12537	0	2041	2041	0	22427	21959	0	3352	3352	0	34496	5393	51	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
1273	62	3422	Saturday	11:38:22	3999	434	563.95	10641	10641	11	3937	3937	2	18431	18225	0	7348	7348	0	28866	11285	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1274	4	1580	Sunday	06:18:46	3343	4450	31.30	14067	14067	0	511	511	0	25005	24288	0	774	774	0	38355	1285	32	Connection Failure	UA approaches Emergency landing site
1277	41	2499	Wednesday	09:42:16	2859	3017	370.45	12391	12391	0	2187	2187	0	22041	21618	0	3738	3738	0	34009	5925	2	Engine Out	UA approaches Emergency landing site
1282	141	1	Monday	18:44:40	4218	387	1274.44	10787	10787	0	3791	3791	3	18560	18371	0	7219	7219	0	29158	11010	20	Engine Fire	UA structural desintegration - Debris Impact
1298	93	575	Wednesday	14:23:21	4477	1489	838.94	11370	11370	1	3208	3208	0	19978	19675	0	5801	5801	0	31045	9009	50	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
1300	108	699	Friday	15:45:28	4425	1907	975.81	11297	11297	0	3281	3281	3	19720	19452	0	6059	6059	0	30749	9340	21	Engine Fire	UA structural desintegration - Debris Impact
1316	122	172	Sunday	17:01:09	4375	529	1101.92	10641	10641	0	3937	3937	0	19076	18822	0	6703	6703	0	29463	10640	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1324	112	492	Monday	16:07:01	4490	1234	1011.69	10787	10787	20	3791	3791	2	18560	18361	0	7219	7219	0	29148	11010	21	Engine Fire	UA structural desintegration - Debris Impact
1326	52	446	Wednesday	10:39:13	4489	1103	465.39	11662	11662	0	2916	2916	0	21525	21147	0	4254	4254	0	32809	7170	78	Degradation of altitude	Central UA ground impact point below flight path
134	83	2807	Monday	13:32:08	3136	1910	755.61	11297	11297	0	3281	3281	0	19849	19564	0	5930	5930	0	30861	9211	6	Engine Out	UA approaches Emergency landing site
1363	47	1957	Friday	10:14:12	2920	4415	423.69	11516	11516	0	3062	3062	0	20236	19930	0	5543	5543	0	31446	8605	25	Generator Failure	UA approaches Emergency landing site
1369	102	2800	Thursday	15:15:53	3128	1935	926.50	11370	11370	0	3208	3208	0	19978	19684	0	5801	5801	0	31054	9009	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
1373	13	3553	Monday	07:10:55	4164	379	118.22	12391	12391	0	2187	2187	0	22298	21853	0	3481	3481	0	34244	5668	78	Degradation of altitude	Central UA ground impact point below flight path
1377	112	3150	Friday	16:11:02	3607	875	1018.42	11443	11443	0	3135	3135	0	19720	19462	0	6059	6059	0	30905	9194	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
1393	6	2487	Sunday	06:31:04	2852	3058	51.80	14067	14067	0	511	511	0	25005	24275	0	774	774	0	38342	1285	53	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
1400	89	266	Sunday	14:01:03	4435	682	801.75	10423	10423	0	4155	4155	0	18560	18358	0	7219	7219	0	28781	11374	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
148	96	3023	Monday	14:43:27	3422	1210	872.44	11297	11297	0	3281	3281	0	19849	19547	0	5930	5930	0	30844	9211	10	Engine Anomaly	Central UA ground impact point below flight path
155	142	3464	Monday	18:55:22	4054	405	1292.30	10787	10787	0	3791	3791	0	18560	18348	0	7219	7219	0	29135	11010	33	Connection Failure	Central UA ground impact point below flight path
156	145	1584	Tuesday	19:08:54	3337	4454	1314.86	13338	13338	0	1240	1240	0	23329	22837	0	2450	2450	0	36175	3690	66	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
160	121	2190	Saturday	16:58:44	2803	3969	1097.92	11589	11589	0	2989	2989	0	20365	20039	0	5414	5414	0	31628	8403	80	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
160	19	2166	Saturday	07:41:36	2809	4028	169.33	13849	13849	0	729	729	0	24747	24068	0	1032	1032	0	37917	1761	26	Generator Failure	UA approaches Emergency landing site
173	54	1068	Friday	10:51:06	4073	3224	485.17	11516	11516	0	3062	3062	0	20236	19938	0	5543	5543	0	31454	8605	79	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
189	146	3598	Sunday	19:17:26	4215	386	1329.06	12901	12901	0	1677	1677	0	23072	22535	0	2707	2707	0	35436	4384	18	Engine Fire	UA approaches Emergency landing site
190	113	3571	Monday	16:17:09	4184	380	1028.58	10787	10787	0	3791	3791	0	18560	18323	0	7219	7219	0	29110	11010	1	Engine Out	No Ground Effect
190	141	3472	Monday	18:49:55	4064	400	1283.22	10787	10787	0	3791	3791	0	18560	18360	0	7219	7219	0	29147	11010	23	Generator Failure	UA approaches Emergency landing site
192	8	1077	Wednesday	06:39:52	4061	3254	66.45	12464	12464	14	2114	2114	1	22427	22022	0	3352	3352	0	34486	5466	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
195	62	2828	Saturday	11:37:27	3161	1837	562.44	10641	10641	1	3937	3937	0	18431	18213	0	7348	7348	0	28854	11285	35	Connection Failure	UA ground impact tangential to trajectory
207	106	2450	Thursday	15:37:12	2834	3186	962.03	11370	11370	0	3208	3208	0	19978	19694	0	5801	5801	0	31064	9009	28	Generator Failure	UA ground impact tangential to trajectory
217	94	2017	Sunday	14:31:00	2877	4328	851.69	10423	10423	0	4155	4155	0	18560	18346	0	7219	7219	0	28769	11374	37	Short Circuit / Overload	Central UA ground impact point below flight path
22	80	699	Monday	13:12:33	4425	1907	720.92	11297	11297	4	3281	3281	0	19849	19568	0	5930	5930	0	30865	9211	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
222	118	1598	Friday	16:41:27	3318	4468	1069.11	11443	11443	0	3135	3135	2	19720	19485	0	6059	6059	0	30908	9194	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
222	66	2303	Friday	11:58:31	2795	3658	597.53	11516	11516	0	3062	3062	0	20236	19962	0	5543	5543	0	31478	8605	40	Short Circuit / Overload	Central UA ground impact point below flight path
226	133	1953	Tuesday	18:03:55	2923	4420	1206.56	10933	10933	0	3645	3645	0	19205	18986	0	6574	6574	0	29919	10219	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
227	79	2772	Wednesday	13:10:14	3095	2034	717.06	11370	11370	0	3208	3208	0	20494	20196	0	5285	5285	0	31566	8493	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
244	26	1177	Saturday	08:18:19	3927	3577	230.56	11953	11953	0	2625	2625	0	22427	21986	0	3352	3352	0	33939	5977	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
258	56	3084	Saturday	11:05:04	3510	1040	508.47	10641	10641	3	3937	3937	0	18431	18222	0	7348	7348	0	28863	11285	11	Engine Anomaly	Central UA ground impact point below flight path
258	75	398	Saturday	12:44:47	4483	975	674.64	10641	10641	0	3937	3937	0	18431	18208	0	7348	7348	0	28849	11285	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
277	115	1820	Thursday	16:25:25	3046	4531	1042.36	10860	10860	0	3718	3718	0	18947	18722	0	6832	6832	0	29582	10550	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
282	51	223	Tuesday	10:33:25	4410	606	455.72	11953	11953	0	2625	2625	3	20752	20383	0	5027	5027	0	32336	7652	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
283	153	1027	Wednesday	19:51:45	4124	3083	1386.28	13411	13411	0	1167	1167	0	23329	22815	0	2450	2450	0	36226	3617	3	Engine Out	Central UA ground impact point below flight path
291	149	2740	Thursday	19:32:31	3060	2148	1354.20	13193	13193	0	1385	1385	0	23072	22557	0	2707	2707	0	35750	4092	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
300	93	3036	Saturday	14:27:06	3441	1172	845.17	11516	11516	0	3062	3062	0	19849	19585	0	5930	5930	0	31101	8992	30	Connection Failure	Central UA ground impact point below flight path
321	26	496	Saturday	08:17:17	4489	1245	228.83	11953	11953	0	2625	2625	0	22427	21988	0	3352	3352	0	33941	5977	40	Short Circuit / Overload	Central UA ground impact point below flight path
322	18	3041	Sunday	07:37:27	3448	1158	162.44	14067	14067	0	511	511	0	25005	24257	0	774	774	0	38324	1285	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
326	35	1337	Thursday	09:07:43	3696	4018	312.89	12391	12391	18	2187	2187	1	21654	21288	0	4125	4125	0	33679	6312	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
330	78	2560	Monday	13:04:26	2898	2800	707.42	11297	11297	9	3281	3281	2	19849	19575	0	5930	5930	0	30872	9211	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
334	104	1851	Friday	15:25:23	3014	4515	942.31	11297	11297	0	3281	3281	0	19720	19458	0	6059	6059	0	30755	9340	1	Engine Out	No Ground Effect
341	47	123	Friday	10:11:26	4336	470	419.06	11516	11516	0	3062	3062	0	20236	19922	0	5543	5543	0	31438	8605	22	Generator Failure	UA approaches Emergency landing site
342	25	306	Saturday	08:11:32	4454	761	219.25	11953	11953	0	2625	2625	0	22427	21967	0	3352	3352	0	33920	5977	30	Connection Failure	Central UA ground impact point below flight path
358	78	616	Monday	13:01:30	4464	1623	702.50	11297	11297	0	3281	3281	0	19849	19550	0	5930	5930	0	30847	9211	38	Short Circuit / Overload	Central UA ground impact point below flight path
364	34	2114	Sunday	09:03:26	2826	4146	305.75	13047	13047	0	1531	1531	0	22814	22313	0	2965	2965	0	35360	4496	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
367	110	13	Wednesday	15:55:21	4231	391	992.28	10787	10787	0	3791	3791	0	18689	18458	0	7090	7090	0	29245	10881	78	Degradation of altitude	Central UA ground impact point below flight path
37	42	2700	Tuesday	09:48:02	3018	2293	380.06	12537	12537	0	2041	2041	0	22041	21623	0	3738	3738	0	34160	5779	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
373	108	1018	Tuesday	15:45:58	4135	3052	976.61	11589	11589	0	2989	2989	0	20236	19943	0	5543	5543	0	31532	8532	67	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
376	19	2682	Friday	07:42:22	3001	2358	170.64	12609	12609	0	1969	1969	0	22814	22320	0	2965	2965	0	34929	4934	42	Partial Lock of Flight Control Surfaces	Central UA ground impact point below flight path
378	96	2573	Sunday	14:42:47	2907	2753	871.31	10423	10423	0	4155	4155	0	18560	18340	0	7219	7219	0	28763	11374	77	Degradation of altitude	Central UA ground impact point below flight path
385	26	914	Sunday	08:17:56	4251	2682	229.89	13047	13047	0	1531	1531	0	22814	22364	0	2965	2965	0	35411	4496	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
386	52	1951	Monday	10:41:30	2925	4422	469.19	11808	11808	0	2770	2770	0	21267	20885	0	4512	4512	0	32693	7282	58	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
387	19	2528	Tuesday	07:42:08	2876	2914	170.25	12318	12318	0	2260	2260	0	22427	21994	0	3352	3352	0	34312	5612	78	Degradation of altitude	Central UA ground impact point below flight path
389	109	3295	Thursday	15:54:53	3821	588	991.47	11370	11370	0	3208	3208	0	19978	19714	0	5801	5801	0	31084	9009	78	Degradation of altitude	Central UA ground impact point below flight path
393	132	3510	Monday	18:00:50	4112	385	1201.39	10787	10787	0	3791	3791	1	18560	18329	0	7219	7219	0	29116	11010	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
396	54	1782	Thursday	10:52:11	3087	4542	486.97	11662	11662	0	2916	2916	0	21009	20658	0	4770	4770	0	32320	7686	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
4	108	1501	Thursday	15:46:41	3455	4346	977.83	11370	11370	0	3208	3208	0	19978	19688	0	5801	5801	0	31058	9009	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
4	121	70	Thursday	16:55:32	4288	422	1092.56	10860	10860	0	3718	3718	0	18947	18704	0	6832	6832	0	29564	10550	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
402	7	2392	Wednesday	06:36:24	2812	3380	60.67	12464	12464	0	2114	2114	0	22427	21980	0	3352	3352	0	34444	5466	1	Engine Out	No Ground Effect
402	96	3155	Wednesday	14:43:40	3615	863	872.78	11370	11370	0	3208	3208	0	20494	20170	0	5285	5285	0	31540	8493	1	Engine Out	No Ground Effect
408	111	1499	Tuesday	16:03:04	3458	4343	1005.14	10933	10933	0	3645	3645	0	19205	18956	0	6574	6574	0	29889	10219	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
412	46	427	Saturday	10:06:25	4487	1051	410.72	10641	10641	0	3937	3937	0	18431	18244	0	7348	7348	0	28885	11285	30	Connection Failure	Central UA ground impact point below flight path
414	6	1927	Monday	06:30:13	2944	4450	50.39	12391	12391	0	2187	2187	0	22298	21860	0	3481	3481	0	34251	5668	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
415	53	427	Tuesday	10:44:39	4487	1051	474.44	11953	11953	0	2625	2625	0	20752	20405	0	5027	5027	0	32358	7652	10	Engine Anomaly	UA approaches Emergency landing site
417	52	3423	Thursday	10:43:44	4000	433	472.92	11662	11662	0	2916	2916	0	21009	20681	0	4770	4770	0	32343	7686	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
423	20	895	Wednesday	07:45:08	4271	2613	175.22	12464	12464	7	2114	2114	2	22427	21964	0	3352	3352	0	34428	5466	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
432	12	3429	Friday	07:05:16	4008	428	108.81	12609	12609	0	1969	1969	0	22814	22293	0	2965	2965	0	34902	4934	25	Generator Failure	UA approaches Emergency landing site
435	91	1448	Monday	14:13:46	3532	4256	822.95	11297	11297	0	3281	3281	0	19849	19570	0	5930	5930	0	30867	9211	23	Generator Failure	Central UA ground impact point below flight path
448	144	2889	Sunday	19:05:26	3238	1630	1309.06	12901	12901	0	1677	1677	0	23072	22601	0	2707	2707	0	35502	4384	3	Engine Out	Central UA ground impact point below flight path
456	142	3025	Monday	18:54:42	3425	1204	1291.19	10787	10787	0	3791	3791	0	18560	18370	0	7219	7219	0	29157	11010	58	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
463	113	3384	Monday	16:16:51	3947	470	1028.11	10787	10787	0	3791	3791	0	18560	18344	0	7219	7219	0	29131	11010	35	Connection Failure	UA ground impact tangential to trajectory
466	102	1592	Thursday	15:14:03	3326	4463	923.44	11370	11370	0	3208	3208	0	19978	19684	0	5801	5801	0	31054	9009	15	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
489	29	956	Saturday	08:34:23	4207	2833	257.31	11953	11953	1	2625	2625	0	22427	21951	0	3352	3352	0	33904	5977	15	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
489	94	2028	Saturday	14:31:01	2870	4310	851.72	11516	11516	0	3062	3062	0	19849	19554	0	5930	5930	0	31070	8992	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
503	117	903	Saturday	16:34:56	4263	2642	1058.25	11589	11589	5	2989	2989	0	20365	20061	0	5414	5414	0	31650	8403	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
505	67	98	Monday	12:00:38	4315	445	601.06	11808	11808	0	2770	2770	0	21267	20914	0	4512	4512	0	32722	7282	74	Degradation of altitude	Central UA ground impact point below flight path
505	6	3542	Monday	06:32:41	4151	380	54.47	12391	12391	0	2187	2187	0	22298	21873	0	3481	3481	0	34264	5668	2	Engine Out	UA approaches Emergency landing site
517	44	3024	Saturday	09:59:26	3423	1207	399.08	10641	10641	0	3937	3937	0	18431	18192	0	7348	7348	0	28833	11285	31	Connection Failure	UA ground impact tangential to trajectory
519	130	2163	Monday	17:47:51	2810	4035	1179.78	10787	10787	0	3791	3791	0	18560	18357	0	7219	7219	0	29144	11010	51	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
529	44	586	Thursday	09:55:45	4474	1525	392.92	11662	11662	0	2916	2916	0	21009	20675	0	4770	4770	0	32337	7686	15	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
535	13	2147	Wednesday	07:08:48	2814	4072	114.67	12464	12464	0	2114	2114	0	22427	22002	0	3352	3352	0	34466	5466	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
541	25	526	Tuesday	08:11:53	4487	1336	219.81	12537	12537	0	2041	2041	0	22041	21607	0	3738	3738	0	34144	5779	14	Engine Anomaly	Central UA ground impact point below flight path
553	139	1115	Sunday	18:35:25	4012	3380	1259.06	10641	10641	0	3937	3937	0	19076	18824	0	6703	6703	0	29465	10640	13	Engine Anomaly	UA approaches Emergency landing site
555	128	1168	Tuesday	17:35:25	3940	3549	1159.05	10933	10933	0	3645	3645	0	19205	18946	0	6574	6574	0	29879	10219	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
556	149	1037	Wednesday	19:29:56	4112	3118	1349.89	13411	13411	0	1167	1167	0	23329	22823	0	2450	2450	0	36234	3617	69	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
568	81	1361	Monday	13:19:00	3660	4075	731.69	11297	11297	1	3281	3281	0	19849	19572	0	5930	5930	0	30869	9211	78	Degradation of altitude	Central UA ground impact point below flight path
570	58	2871	Wednesday	11:15:41	3215	1690	526.14	11662	11662	0	2916	2916	1	21525	21171	0	4254	4254	0	32833	7170	77	Degradation of altitude	Central UA ground impact point below flight path
580	79	1212	Saturday	13:07:51	3878	3682	713.11	11516	11516	6	3062	3062	1	19849	19605	0	5930	5930	0	31121	8992	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
581	66	1578	Sunday	11:57:25	3345	4448	595.70	10714	10714	0	3864	3864	0	18431	18219	0	7348	7348	0	28933	11212	29	Connection Failure	UA approaches Emergency landing site
587	104	862	Saturday	15:23:52	4302	2493	939.80	11516	11516	0	3062	3062	0	19849	19558	0	5930	5930	0	31074	8992	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
600	111	2565	Friday	16:04:41	2901	2782	1007.83	11443	11443	12	3135	3135	5	19720	19454	0	6059	6059	0	30897	9194	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
609	98	865	Sunday	14:51:06	4300	2504	885.19	10423	10423	0	4155	4155	0	18560	18360	0	7219	7219	0	28783	11374	29	Connection Failure	UA approaches Emergency landing site
617	7	3413	Monday	06:37:56	3986	442	63.25	12391	12391	0	2187	2187	0	22298	21841	0	3481	3481	0	34232	5668	4	Engine Out	Central ground impact point below flight path with B/G Ratio.
625	111	3114	Tuesday	16:05:31	3554	962	1009.22	10933	10933	0	3645	3645	0	19205	18968	0	6574	6574	0	29901	10219	69	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
628	92	3560	Friday	14:22:26	4172	379	837.39	11297	11297	0	3281	3281	0	19720	19421	0	6059	6059	0	30718	9340	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
635	123	1142	Friday	17:08:05	3975	3467	1113.47	11443	11443	0	3135	3135	0	19720	19452	0	6059	6059	0	30895	9194	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
637	3	2753	Sunday	06:15:06	3074	2102	25.17	14067	14067	0	511	511	0	25005	24298	0	774	774	0	38365	1285	25	Generator Failure	UA approaches Emergency landing site
647	88	2614	Wednesday	13:59:09	2939	2605	798.58	11370	11370	0	3208	3208	0	20494	20175	0	5285	5285	0	31545	8493	78	Degradation of altitude	Central UA ground impact point below flight path
652	149	2970	Monday	19:32:51	3347	1369	1354.78	13193	13193	0	1385	1385	0	23072	22550	0	2707	2707	0	35743	4092	30	Connection Failure	Central UA ground impact point below flight path
652	43	187	Monday	09:49:40	4386	550	382.81	12391	12391	0	2187	2187	0	21396	20998	0	4383	4383	0	33389	6570	12	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
654	97	1499	Wednesday	14:46:36	3458	4343	877.69	11370	11370	0	3208	3208	3	20494	20195	0	5285	5285	0	31565	8493	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
656	41	1488	Friday	09:40:44	3473	4325	367.89	12537	12537	0	2041	2041	4	21396	21023	0	4383	4383	0	33560	6424	21	Engine Fire	UA structural desintegration - Debris Impact
66	54	1078	Wednesday	10:51:06	4060	3258	485.19	11662	11662	0	2916	2916	0	21525	21138	0	4254	4254	0	32800	7170	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
666	77	404	Monday	12:55:43	4484	991	692.86	11297	11297	0	3281	3281	0	19849	19525	0	5930	5930	0	30822	9211	32	Connection Failure	UA approaches Emergency landing site
670	67	1713	Friday	12:03:05	3168	4539	605.14	11516	11516	0	3062	3062	0	20236	19917	0	5543	5543	0	31433	8605	22	Generator Failure	UA approaches Emergency landing site
673	18	3338	Monday	07:37:54	3882	525	163.19	12391	12391	0	2187	2187	0	22298	21841	0	3481	3481	0	34232	5668	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
673	65	1311	Monday	11:51:33	3734	3954	585.92	11808	11808	17	2770	2770	0	21267	20886	0	4512	4512	0	32694	7282	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
677	48	2740	Friday	10:20:51	3060	2148	434.78	11516	11516	0	3062	3062	0	20236	19932	0	5543	5543	0	31448	8605	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
691	107	3190	Friday	15:43:48	3667	784	973.00	11297	11297	0	3281	3281	0	19720	19440	0	6059	6059	0	30737	9340	47	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
701	112	470	Monday	16:06:58	4490	1170	1011.64	10787	10787	13	3791	3791	3	18560	18355	0	7219	7219	0	29142	11010	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
730	133	3249	Tuesday	18:05:53	3754	666	1209.83	10933	10933	0	3645	3645	0	19205	18968	0	6574	6574	0	29901	10219	78	Degradation of altitude	Central UA ground impact point below flight path
746	91	1667	Thursday	14:14:05	3226	4521	823.50	11370	11370	0	3208	3208	0	19978	19687	0	5801	5801	0	31057	9009	55	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
756	15	2538	Sunday	07:20:19	2883	2879	133.86	14067	14067	16	511	511	1	25005	24343	0	774	774	0	38410	1285	18	Engine Fire	UA structural desintegration - Debris Impact
767	78	23	Thursday	13:00:36	4241	395	701.00	11370	11370	0	3208	3208	0	19978	19692	0	5801	5801	0	31062	9009	35	Connection Failure	UA ground impact tangential to trajectory
782	144	911	Friday	19:02:25	4254	2671	1304.05	13557	13557	0	1021	1021	0	23072	22599	0	2707	2707	0	36156	3728	2	Engine Out	UA approaches Emergency landing site
789	136	3237	Friday	18:22:16	3736	689	1237.11	11443	11443	1	3135	3135	3	19720	19439	0	6059	6059	0	30882	9194	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
79	8	1033	Tuesday	06:39:48	4117	3104	66.33	12318	12318	8	2260	2260	1	22427	21961	0	3352	3352	0	34279	5612	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
8	24	3555	Monday	08:11:01	4166	379	218.36	12391	12391	0	2187	2187	0	21396	21009	0	4383	4383	0	33400	6570	28	Generator Failure	UA ground impact tangential to trajectory
801	45	1072	Wednesday	10:01:56	4068	3237	403.25	11662	11662	0	2916	2916	0	21525	21184	0	4254	4254	0	32846	7170	29	Connection Failure	UA approaches Emergency landing site
812	89	1793	Sunday	14:03:22	3075	4540	805.61	10423	10423	0	4155	4155	0	18560	18364	0	7219	7219	0	28787	11374	31	Connection Failure	UA ground impact tangential to trajectory
815	20	1488	Wednesday	07:46:02	3473	4325	176.72	12464	12464	0	2114	2114	3	22427	21991	0	3352	3352	0	34455	5466	21	Engine Fire	UA structural desintegration - Debris Impact
82	38	2599	Friday	09:26:01	2927	2660	343.39	12537	12537	0	2041	2041	0	21396	20987	0	4383	4383	0	33524	6424	38	Short Circuit / Overload	Central UA ground impact point below flight path
822	96	2727	Wednesday	14:43:01	3046	2195	871.70	11370	11370	0	3208	3208	0	20494	20164	0	5285	5285	0	31534	8493	29	Connection Failure	UA approaches Emergency landing site
823	122	40	Thursday	17:00:56	4259	403	1101.58	10860	10860	0	3718	3718	0	18947	18736	0	6832	6832	0	29596	10550	27	Generator Failure	UA ground impact tangential to trajectory
83	10	2094	Saturday	06:52:20	2835	4187	87.22	13849	13849	0	729	729	0	24747	24065	0	1032	1032	0	37914	1761	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
833	68	222	Sunday	12:06:17	4410	604	610.47	10714	10714	0	3864	3864	0	18431	18201	0	7348	7348	0	28915	11212	70	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
854	20	466	Sunday	07:44:28	4490	1159	174.14	14067	14067	0	511	511	0	25005	24308	0	774	774	0	38375	1285	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
868	44	2915	Sunday	09:59:17	3272	1544	398.81	10714	10714	0	3864	3864	0	18431	18235	0	7348	7348	0	28949	11212	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
872	34	2619	Thursday	09:04:12	2944	2587	307.03	12391	12391	0	2187	2187	0	21654	21222	0	4125	4125	0	33613	6312	33	Connection Failure	Central UA ground impact point below flight path
883	28	1876	Monday	08:30:19	2990	4497	250.53	12391	12391	0	2187	2187	0	21396	21026	0	4383	4383	0	33417	6570	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
89	20	917	Friday	07:45:10	4248	2693	175.28	12609	12609	0	1969	1969	0	22814	22331	0	2965	2965	0	34940	4934	24	Generator Failure	UA ground impact tangential to trajectory
891	110	563	Tuesday	15:56:12	4480	1451	993.67	10933	10933	7	3645	3645	3	19205	18943	0	6574	6574	0	29876	10219	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
893	46	1559	Thursday	10:08:09	3372	4426	413.58	11662	11662	0	2916	2916	0	21009	20659	0	4770	4770	0	32321	7686	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
901	68	2397	Friday	12:09:35	2814	3363	615.97	11516	11516	0	3062	3062	0	20236	19937	0	5543	5543	0	31453	8605	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
904	56	3029	Monday	11:04:59	3431	1192	508.33	11808	11808	40	2770	2770	2	21267	20891	0	4512	4512	0	32699	7282	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
906	56	766	Wednesday	11:01:33	4382	2145	502.61	11662	11662	6	2916	2916	4	21525	21154	0	4254	4254	0	32816	7170	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
91	52	2775	Sunday	10:42:46	3099	2023	471.28	10714	10714	0	3864	3864	0	18431	18200	0	7348	7348	0	28914	11212	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
919	68	2100	Tuesday	12:09:07	2832	4175	615.22	11953	11953	0	2625	2625	0	20752	20420	0	5027	5027	0	32373	7652	40	Short Circuit / Overload	Central UA ground impact point below flight path
923	22	3230	Saturday	07:59:36	3726	702	199.33	11953	11953	0	2625	2625	0	22427	21979	0	3352	3352	0	33932	5977	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
925	145	25	Monday	19:06:33	4243	396	1310.92	13193	13193	0	1385	1385	0	23072	22573	0	2707	2707	0	35766	4092	13	Engine Anomaly	UA approaches Emergency landing site
929	19	617	Friday	07:39:15	4464	1627	165.42	12609	12609	0	1969	1969	0	22814	22352	0	2965	2965	0	34961	4934	38	Short Circuit / Overload	Central UA ground impact point below flight path

937	19	155	Saturday	07:38:32	4363	507	164.25	13849	13849	0	729	729	0	24747	24060	0	1032	1032	0	37909	1761	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
952	31	3126	Sunday	08:48:35	3572	932	281.00	13047	13047	0	1531	1531	0	22814	22293	0	2965	2965	0	35340	4496	40	Short Circuit / Overload	Central UA ground impact point below flight path
970	92	2472	Thursday	14:20:46	2844	3110	834.64	11370	11370	0	3208	3208	0	19978	19693	0	5801	5801	0	31063	9009	40	Short Circuit / Overload	Central UA ground impact point below flight path
975	56	2568	Tuesday	11:04:18	2904	2771	507.17	11953	11953	0	2625	2625	0	20752	20438	0	5027	5027	0	32391	7652	24	Generator Failure	UA ground impact tangential to trajectory
985	114	2915	Friday	16:21:36	3272	1544	1036.03	11443	11443	0	3135	3135	0	19720	19466	0	6059	6059	0	30909	9194	35	Connection Failure	UA ground impact tangential to trajectory
988	104	1324	Monday	15:24:35	3715	3987	940.97	11297	11297	0	3281	3281	0	19849	19587	0	5930	5930	0	30884	9211	29	Connection Failure	UA approaches Emergency landing site
996	70	1030	Tuesday	12:18:26	4120	3094	630.72	11953	11953	0	2625	2625	0	20752	20403	0	5027	5027	0	32356	7652	24	Generator Failure	UA ground impact tangential to trajectory
997	13	1883	Wednesday	07:08:23	2983	4492	114.00	12464	12464	0	2114	2114	0	22427	21942	0	3352	3352	0	34406	5466	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path

O.R.C.U.S. 02.00 - tTest of the Simulation

nProbes	1400
nEvents	191
nEvents_cor	178
tMission	14
x_cross_ATB	0.2042857
x_cross_OTW	0.0592857
x_cross_TOT	0.2635714
s2ATB	0.0542061
sATB	0.232822
tATB	31.223454
s2OTW	0.0041271
sOTW	0.0642429
tOTW	28.705171
s2TOT	0.0832093
sTOT	0.2884602
tTOT	32.891102

UADay/Prot	HIT_TOT_ATB	HIT_TOT_OTW	UADay/Prot cor	HIT_TOT_mean_ATB	HIT_TOT_mean_OTW	HIT_TOT_mean_ATB/Fh	HIT_TOT_mean_OTW/Fh	x_i-x_cross ATB	x_i-x_cross OTW	(x_i-x_cross ATB)^2	(x_i-x_cross OTW)^2
4	0	0	4	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
4	0	0	8	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
8	0	0	10	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
10	0	0	22	4	9	0.285714286	0.642857143	0.081428571	0.583571429	0.006630612	0.340555612
22	4	9	37	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
37	0	0	66	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
66	0	0	79	8	1	0.571428571	0.071428571	0.367142857	0.012142857	0.134793878	0.000147449
79	8	1	82	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
82	0	0	83	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
83	0	0	89	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
89	0	0	91	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
91	0	0	108	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
108	0	0	110	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
110	0	0	111	7	0	0.5	0	0.295714286	-0.059285714	0.087446939	0.003514796
111	7	0	134	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
134	0	0	148	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
148	0	0	155	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
155	0	0	156	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
156	0	0	160	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
160	0	0	173	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
160	0	0	189	0	1	0	0.071428571	-0.204285714	0.012142857	0.041732653	0.000147449
173	0	0	190	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
189	0	1	192	14	1	1	0.071428571	0.795714286	0.012142857	0.633161224	0.000147449
190	0	0	195	1	0	0.071428571	0	-0.132857143	-0.059285714	0.01765102	0.003514796
190	0	0	207	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
192	14	1	217	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
195	1	0	222	0	2	0	0.142857143	-0.204285714	0.083571429	0.041732653	0.006984184
207	0	0	226	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
217	0	0	227	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
222	0	2	244	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
222	0	0	258	3	0	0.214285714	0	0.01	-0.059285714	1E-04	0.003514796
226	0	0	277	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
227	0	0	282	0	3	0	0.214285714	-0.204285714	0.155	0.041732653	0.024025
244	0	0	283	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
258	3	0	291	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
258	0	0	300	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
277	0	0	321	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
282	0	3	322	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
283	0	0	326	18	1	1.285714286	0.071428571	1.081428571	0.012142857	1.169487755	0.000147449
291	0	0	330	9	2	0.642857143	0.142857143	0.438571429	0.083571429	0.192344898	0.006984184
300	0	0	334	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
321	0	0	341	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
322	0	0	342	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
326	18	1	358	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
330	9	2	364	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
334	0	0	367	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
341	0	0	373	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
342	0	0	376	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
358	0	0	378	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
364	0	0	385	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
367	0	0	386	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
373	0	0	387	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
376	0	0	389	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
378	0	0	393	0	1	0	0.071428571	-0.204285714	0.012142857	0.041732653	0.000147449
385	0	0	396	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
386	0	0	402	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
387	0	0	408	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
389	0	0	412	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
393	0	1	414	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
396	0	0	415	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
402	0	0	417	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
402	0	0	423	7	2	0.5	0.142857143	0.295714286	0.083571429	0.087446939	0.006984184
408	0	0	432	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
412	0	0	435	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
414	0	0	448	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
415	0	0	456	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
417	0	0	463	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
423	7	2	466	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
432	0	0	489	1	0	0.071428571	0	-0.132857143	-0.059285714	0.01765102	0.003514796
435	0	0	503	5	0	0.357142857	0	0.152857143	-0.059285714	0.023365306	0.003514796
448	0	0	505	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
456	0	0	517	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
463	0	0	519	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
466	0	0	529	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
489	1	0	535	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
489	0	0	541	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
503	5	0	553	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
505	0	0	555	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
505	0	0	556	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
517	0	0	568	1	0	0.071428571	0	-0.132857143	-0.059285714	0.01765102	0.003514796
519	0	0	570	0	1	0	0.071428571	-0.204285714	0.012142857	0.041732653	0.000147449
529	0	0	580	6	1	0.428571429	0.071428571	0.224285714	0.012142857	0.050304082	0.000147449
535	0	0	581	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
541	0	0	587	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
553	0	0	600	12	5	0.857142857	0.357142857	0.652857143	0.297857143	0.426222449	0.088718878
555	0	0	609	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
556	0	0	617	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
568	1	0	625	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
570	0	1	628	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
580	6	1	635	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
581	0	0	637	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
587	0	0	647	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
600	12	5	652	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
609	0	0	654	0	3	0	0.214285714	-0.204285714	0.155	0.041732653	0.024025
617	0	0	656	0	4	0	0.285714286	-0.204285714	0.226428571	0.041732653	0.051269898
625	0	0	666	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
628	0	0	670	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
635	0	0	673	17	0	1.214285714	0	1.01	-0.059285714	1.0201	0.003514796
637	0	0	677	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
647	0	0	691	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
652	0	0	701	13	3	0.928571429	0.214285714	0.724285714	0.155	0.524589796	0.024025
652	0	0	730	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
654	0	3	746	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
656	0	4	756	16	1	1.142857143	0.071428571	0.938571429	0.012142857	0.880916327	0.000147449
666	0	0	767	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
670	0	0	782	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
673	0	0	789	1	3	0.071428571	0.214285714	-0.132857143	0.155	0.01765102	0.024025
673	17	0	801	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
677	0	0	812	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
691	0	0	815	0	3	0	0.214285714	-0.204285714	0.155	0.041732653	0.024025
701	13	3	822	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
730	0	0	823	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
746	0	0	833	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
756	16	1	854	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
767	0	0	868	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
782	0	0	872	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
789	1	3	883	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
801	0	0	891	7	3	0.5	0.214285714	0.295714286	0.155	0.087446939	0.024025
812	0	0	893	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
815	0	3	901	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
822	0	0	904	40	2	2.857142857	0.142857143	2.652857143	0.083571429	7.03765102	0.006984184
823	0	0	906	6	4	0.428571429	0.285714286	0.224285714	0.226428571	0.050304082	0.051269898
833	0	0	919	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
854	0	0	923	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
868	0	0	925	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
872	0	0	929	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
883	0	0	937	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
891	7	3	952	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
893	0	0	970	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
901	0	0	975	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
904	40	2	985	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
906	6	4	988	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
919	0	0	996	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
923	0	0	997	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
925	0	0	1009	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
929	0	0	1019	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
937	0	0	1029	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
952	0	0	1030	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
970	0	0	1032	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
975	0	0	1037	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
985	0	0	1044	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
988	0	0	1047	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
996	0	0	1052	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
997	0	0	1076	30	2	2.142857143	0.142857143	1.938571429	0.083571429	3.758059184	0.006984184
1009	0	0	1089	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
1019	0	0	1090	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
1029	0	0	1098	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
1030	0	0	1102	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
1032	0	0	1103	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
1037	0	0	1120	8	5	0.571428571	0.357142857	0.367142857	0.297857143	0.134793878	0.088718878
1044	0	0	1121	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
1047	0	0	1150	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
1052	0	0	1152	0	1	0	0.071428571	-0.204285714	0.012142857	0.041732653	0.000147449
1076	30	2	1153	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
1076	0	0	1157	12	2	0.857142857	0.142857143	0.652857143	0.083571429	0.426222449	0.006984184
1089	0	0	1164	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
1090	0	0	1165	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
1098	0	0	1171	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
1102	0	0	1183	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
1103	0	0	1226	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
1120	8	5	1239	3	0	0.214285714	0	0.01	-0.059285714	1E-04	0.003514796
1121	0	0	1244	2	5	0.142857143	0.357142857	-0.061428571	0.297857143	0.003773469	0.088718878
1150	0	0	1264	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
1152	0	0	1273	11	2	0.785714286	0.142857143	0.581428571	0.083571429	0.338059184	0.006984184
1152	0	1	1274	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
1153	0	0	1277	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
1157	0	0	1282	0	3	0	0.214285714	-0.204285714	0.155	0.041732653	0.024025
1157	12	2	1298	1	0	0.071428571	0	-0.132857143	-0.059285714	0.01765102	0.003514796
1164	0	0	1300	3	3	0.214285714	0.214285714	0.01	0.155	1E-04	0.024025
1165	0	0	1316	0	2	0	0.142857143	-0.204285714	0.083571429	0.041732653	0.006984184
1171	0	0	1324	20	2	1.428571429	0.142857143	1.224285714	0.083571429	1.49887551	0.006984184
1183	0	0	1326	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
1226	0	0	1363	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
1239	3	0	1369	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
1244	2	5	1373	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
1264	0	0	1377	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
1273	11	2	1393	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
1274	0	0	1400	0	0	0	0	-0.204285714	-0.059285714	0.041732653	0.003514796
1277	0	0									
1282	0	3									
1298	1	0									
1300	3	3									
1316	0	2									
1324	20	2									
1326	0	0									
1363	0	0									
1369	0	0									
1373	0	0									
1377	0	0									
1393	0	0									
1400	0	0									

11.4.6.2 Eberbach – R76 – Phase 2

O.R.C.U.S. 02.00 - Simulation Summary

UA Parameters

MTOW [kg]	Wingspan [m]	Length [m]	L/D
90	5	4	8

v [km/h]	Alt [m]	CCF [m]
100	100	9103.1565

P_CumCat [1/Fh]	Engine [%]	ESys [%]	FCS [%]	NavSys [%]	Struct [%]
0.01	20	20	20	20	20

General map parameters

	Name	Area [km2]	PPL	PPL/km2
City	Eberbach, Stadt	81.15	14578	180
County	Rhein-Neckar-Kreis	1061.55	546745	515
FS	BW	35748.3	11023425	308

Mission specific map parameters

	Area [km2]	PPL	Tourists	Total PPL
City-SMP	16.8002	14578	0	14578
SurM	50.0553	25779	0	25779
Map total	66.8555	40357	0	40357

PPL MOD NA

Sim FH [Fh] 19600 Ev/Fh [1/Fh] 0.00938776
Events total 184

Hits due to UA impacts		Hits/Fh [1/Fh]
City-SMP ATB	395	0.0201531
SurM ATB	0	0
Total ATB	395	0.0201531
City-SMP OTW	87	0.0044388
SurM OTW	2	0.000102
Total OTW	89	0.0045408
Total	484	0.0246939

Prot	cyc	k_UA	Day	Time of impact	UA X Pos	UA Y Pos	Travelled Distance [km]	PPL_TD_CITY_ATB	PPL_CITY_ATB_COUNT	HIT_CITY_ATB_COUNT	PPL_TD_CITY_OTW	PPL_CITY_OTW_COUNT	HIT_CITY_OTW_COUNT	PPL_TD_SURM_ATB	PPL_SURM_ATB_COUNT	HIT_SURM_ATB_COUNT	PPL_TD_SURM_OTW	PPL_SURM_OTW_COUNT	HIT_SURM_OTW_COUNT	PPL_ALL_ATB_COUNT	PPL_ALL_OTW_COUNT	E	Case	Outcome
100	145	2507	Tuesday	19:10:18	2863	2988	1317.19	13338	13338	0	1240	1240	0	23329	22767	0	2450	2450	0	36105	3690	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
1006	65	1058	Friday	11:51:09	4086	3190	585.28	11516	11516	6	3062	3062	2	20236	19929	0	5543	5543	0	31445	8605	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1014	66	2896	Saturday	11:59:25	3247	1606	599.03	10641	10641	0	3937	3937	0	18431	18238	0	7348	7348	0	28879	11285	24	Generator Failure	UA ground impact tangential to trajectory
1022	22	857	Sunday	07:56:00	4307	2475	193.33	13047	13047	0	1531	1531	0	22814	22306	0	2965	2965	0	35353	4496	62	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
1035	24	622	Saturday	08:06:34	4462	1644	210.95	11953	11953	0	2625	2625	0	22427	21959	0	3352	3352	0	33912	5977	2	Engine Out	UA approaches Emergency landing site
1041	120	792	Friday	16:51:10	4362	2239	1085.28	11443	11443	0	3135	3135	0	19720	19467	0	6059	6059	0	30910	9194	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1046	115	2808	Wednesday	16:26:54	3137	1907	1044.86	10787	10787	0	3791	3791	0	18689	18481	0	7090	7090	0	29268	10881	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
1049	59	2995	Saturday	11:21:20	3382	1293	535.56	10641	10641	0	3937	3937	1	18431	18224	0	7348	7348	0	28865	11285	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
1055	118	2774	Friday	16:43:15	3098	2027	1072.08	11443	11443	0	3135	3135	0	19720	19460	0	6059	6059	0	30903	9194	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1062	145	1321	Friday	19:08:31	3719	3979	1314.19	13557	13557	0	1021	1021	0	23072	22584	0	2707	2707	0	36141	3728	72	Degradation of altitude	UA approaches Emergency landing site
1075	76	2730	Thursday	12:53:47	3049	2184	689.64	11662	11662	0	2916	2916	0	21009	20691	0	4770	4770	0	32353	7686	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
1076	125	2763	Friday	17:21:28	3085	2066	1135.78	11443	11443	0	3135	3135	0	19720	19444	0	6059	6059	0	30887	9194	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
1084	107	2948	Saturday	15:43:26	3317	1438	972.39	11516	11516	0	3062	3062	0	19849	19559	0	5930	5930	0	31075	8992	10	Engine Anomaly	UA approaches Emergency landing site
1086	129	1314	Monday	17:41:06	3730	3962	1168.53	10787	10787	11	3791	3791	2	18560	18359	0	7219	7219	0	29146	11010	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
109	109	175	Thursday	15:50:09	4378	533	983.58	11370	11370	0	3208	3208	0	19978	19710	0	5801	5801	0	31080	9009	38	Short Circuit / Overload	Central UA ground impact point below flight path
1091	125	2763	Saturday	17:21:28	3085	2066	1135.78	11589	11589	0	2989	2989	0	20365	20056	0	5414	5414	0	31645	8403	68	Degradation of lateral and horizontal navigation data accurracy.	UA approaches Emergency landing site
1091	126	327	Saturday	17:23:13	4463	807	1138.72	11589	11589	0	2989	2989	0	20365	20055	0	5414	5414	0	31644	8403	39	Short Circuit / Overload	Central UA ground impact point below flight path
1096	60	2888	Thursday	11:26:38	3237	1633	544.39	11662	11662	0	2916	2916	0	21009	20678	0	4770	4770	0	32340	7686	78	Degradation of altitude	Central UA ground impact point below flight path
1102	129	2259	Wednesday	17:42:32	2794	3785	1170.92	10787	10787	0	3791	3791	0	18689	18484	0	7090	7090	0	29271	10881	66	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point below flight path
1105	126	1272	Saturday	17:24:39	3791	3852	1141.11	11589	11589	0	2989	2989	0	20365	20059	0	5414	5414	0	31648	8403	37	Short Circuit / Overload	Central UA ground impact point below flight path
1128	91	2249	Monday	14:14:58	2795	3813	824.97	11297	11297	0	3281	3281	0	19849	19560	0	5930	5930	0	30857	9211	1	Engine Out	No Ground Effect
114	82	1408	Tuesday	13:24:32	3591	4177	740.92	11589	11589	0	2989	2989	0	20236	19954	0	5543	5543	0	31543	8532	58	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
1141	153	775	Sunday	19:51:23	4375	2178	1385.64	12901	12901	0	1677	1677	0	23072	22557	0	2707	2707	0	35458	4384	67	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate
1146	143	2490	Friday	18:59:22	2854	3048	1298.94	13557	13557	0	1021	1021	0	23072	22512	0	2707	2707	0	36069	3728	75	Degradation of altitude	UA approaches Emergency landing site
1146	151	977	Friday	19:40:45	4183	2908	1367.94	13557	13557	0	1021	1021	0	23072	22549	0	2707	2707	0	36106	3728	9	Engine Out	UA ground impact tangential to trajectory
1151	88	2185	Wednesday	13:58:29	2804	3981	797.50	11370	11370	0	3208	3208	0	20494	20174	0	5285	5285	0	31544	8493	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
1154	33	1529	Saturday	08:57:06	3414	4387	295.17	11953	11953	0	2625	2625	0	22427	21972	0	3352	3352	0	33925	5977	5	Engine Out	No Ground Effect
1165	52	325	Wednesday	10:39:02	4462	802	465.08	11662	11662	10	2916	2916	4	21525	21118	0	4254	4254	0	32780	7170	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
117	146	2181	Friday	19:15:17	2805	3991	1325.47	13557	13557	0	1021	1021	0	23072	22573	0	2707	2707	0	36130	3728	15	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
1171	14	2524	Tuesday	07:14:50	2874	2928	124.72	12318	12318	0	2260	2260	0	22427	21972	0	3352	3352	0	34290	5612	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
1171	45	1775	Tuesday	10:03:00	3095	4543	405.03	11953	11953	0	2625	2625	0	20752	20392	0	5027	5027	0	32345	7652	28	Generator Failure	UA ground impact tangential to trajectory
1184	132	1653	Monday	17:58:00	3244	4513	1196.69	10787	10787	0	3791	3791	4	18560	18333	0	7219	7219	0	29120	11010	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
1189	75	1353	Saturday	12:46:13	3672	4056	677.05	10641	10641	0	3937	3937	0	18431	18229	0	7348	7348	0	28870	11285	35	Connection Failure	UA ground impact tangential to trajectory
1192	106	3044	Tuesday	15:38:07	3452	1150	963.53	11589	11589	61	2989	2989	1	20236	19910	0	5543	5543	0	31499	8532	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1213	122	2797	Tuesday	17:05:07	3124	1946	1108.55	10933	10933	0	3645	3645	0	19205	18990	0	6574	6574	0	29923	10219	66	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point below flight path
1222	100	3464	Thursday	15:05:58	4054	405	909.97	11370	11370	0	3208	3208	0	19978	19696	0	5801	5801	0	31066	9009	52	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
1222	68	2320	Thursday	12:09:28	2797	3607	615.78	11662	11662	0	2916	2916	0	21009	20646	0	4770	4770	0	32308	7686	62	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
1232	143	2347	Sunday	18:59:08	2801	3523	1298.58	12901	12901	0	1677	1677	0	23072	22556	0	2707	2707	0	35457	4384	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1238	77	371	Saturday	12:55:40	4477	908	692.78	11516	11516	0	3062	3062	0	19849	19558	0	5930	5930	0	31074	8992	65	Degradation of lateral and horizontal navigation data accurracy.	UA approaches Emergency landing site
1257	29	703	Thursday	08:33:59	4423	1922	256.67	12391	12391	0	2187	2187	0	21654	21219	0	4125	4125	0	33610	6312	1	Engine Out	No Ground Effect
1265	78	682	Friday	13:01:36	4434	1848	702.67	11297	11297	0	3281	3281	0	19720	19446	0	6059	6059	0	30743	9340	22	Generator Failure	UA approaches Emergency landing site
128	104	1708	Tuesday	15:25:09	3174	4538	941.94	11589	11589	0	2989	2989	0	20236	19922	0	5543	5543	0	31511	8532	78	Degradation of altitude	Central UA ground impact point below flight path
1286	106	3428	Friday	15:38:41	4007	429	964.50	11297	11297	1	3281	3281	0	19720	19464	0	6059	6059	0	30761	9340	42	Partial Lock of Flight Control Surfaces	Central UA ground impact point below flight path
1286	134	671	Friday	18:07:26	4440	1810	1212.42	11443	11443	0	3135	3135	0	19720	19446	0	6059	6059	0	30889	9194	42	Partial Lock of Flight Control Surfaces	Central UA ground impact point below flight path
1292	146	2818	Thursday	19:16:15	3149	1872	1327.08	13193	13193	0	1385	1385	0	23072	22570	0	2707	2707	0	35763	4092	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1295	111	412	Sunday	16:01:26	4485	1012	1002.39	10641	10641	0	3937	3937	0	19076	18833	0	6703	6703	0	29474	10640	72	Degradation of altitude	UA approaches Emergency landing site
1296	14	2732	Monday	07:15:08	3051	2177	125.25	12391	12391	0	2187	2187	0	22298	21858	0	3481	3481	0	34249	5668	9	Engine Out	UA ground impact tangential to trajectory
1300	136	3577	Friday	18:22:46	4191	381	1237.97	11443	11443	0	3135	3135	0	19720	19450	0	6059	6059	0	30893	9194	15	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
1310	70	3425	Monday	12:22:04	4003	431	636.78	11808	11808	2	2770	2770	0	21267	20892	0	4512	4512	0	32700	7282	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
1327	144	1614	Thursday	19:03:29	3296	4483	1305.83	13193	13193	0	1385	1385	0	23072	22544	0	2707	2707	0	35737	4092	37	Short Circuit / Overload	Central UA ground impact point below flight path
1340	89	1672	Wednesday	14:03:11	3220	4524	805.31	11370	11370	0	3208	3208	0	20494	20195	0	5285	5285	0	31565	8493	77	Degradation of altitude	Central UA ground impact point below flight path
1344	71	3153	Sunday	12:27:06	3612	868	645.19	10714	10714	0	3864	3864	0	18431	18211	0	7348	7348	0	28925	11212	39	Short Circuit / Overload	Central UA ground impact point below flight path
1345	8	1044	Monday	06:39:49	4103	3142	66.36	12391	12391	0	2187	2187	0	22298	21833	0	3481	3481	0	34224	5668	43	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
1352	8	1472	Monday	06:40:27	3497	4298	67.44	12391	12391	0	2187	2187	0	22298	21873	0	3481	3481	0	34264	5668	75	Degradation of altitude	UA approaches Emergency landing site
1387	123	3394	Monday	17:11:30	3961	459	1119.17	10787	10787	0	3791	3791	0	18560	18350	0	7219	7219	0	29137	11010	69	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point below flight path
139	124	1343	Saturday	17:13:51	3687	4033	1123.08	11589	11589	0	2989	2989	0	20365	20059	0	5414	5414	0	31648	8403	12	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
1394	12	1276	Monday	07:02:01	3785	3863	103.36	12391	12391	0	2187	2187	0	22298	21877	0	3481	3481	0	34268	5668	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1395	107	1751	Tuesday	15:41:37	3123	4545	969.36	11589	11589	2	2989	2989	5	20236	19947	0	5543	5543	0	31536	8532	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1396	65	3255	Wednesday	11:54:29	3762	656	590.83	11662	11662	0	2916	2916	0	21525	21144	0	4254	4254	0	32806	7170	71	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate
1396	83	1356	Wednesday	13:29:55	3668	4063	749.89	11370	11370	0	3208	3208	0	20494	20178	0	5285	5285	0	31548	8493	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
1397	111	665	Thursday	16:01:49	4443	1789	1003.03	10860	10860	0	3718	3718	0	18947	18728	0	6832	6832	0	29588	10550	68	Degradation of lateral and horizontal navigation data accurracy.	UA approaches Emergency landing site
140	49	492	Sunday	10:22:55	4490	1234	438.20	10714	10714	16	3864	3864	6	18431	18192	0	7348	7348	0	28906	11212	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
143	3	1478	Wednesday	06:13:09	3488	4309	21.94	12464	12464	0	2114	2114	0	22427	21934	0	3352	3352	0	34398	5466	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
145	42	2458	Friday	09:47:40	2838	3159	379.44	12537	12537	0	2041	2041	0	21396	21043	0	4383	4383	0	33580	6424	36	Short Circuit / Overload	Central UA ground impact point below flight path
156	8	2351	Tuesday	06:41:48	2802	3511	69.67	12318	12318	0	2260	2260	0	22427	22025	0	3352	3352	0	34343	5612	30	Connection Failure	Central UA ground impact point below flight path
170	132	3136	Tuesday	18:00:15	3587	908	1200.44	10933	10933	0	3645	3645	0	19205	18978	0	6574	6574	0	29911	10219	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
170	144	2240	Tuesday	19:04:26	2795	3838	1307.42	13338	13338	0	1240	1240	0	23329	22796	0	2450	2450	0	36134	3690	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
178	145	1716	Wednesday	19:09:06	3165	4540	1315.19	13411	13411	0	1167	1167	0	23329	22786	0	2450	2450	0	36197	3617	69	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point below flight path
204	108	567	Monday	15:45:16	4479	1464	975.47	11297	11297	9	3281	3281	4	19849	19573	0	5930	5930	0	30870	9211	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
207	42	118	Thursday	09:44:07	4332	465	373.53	12391	12391	0	2187	2187	0	21654	21271	0	4125	4125	0	33662	6312	5	Engine Out	No Ground Effect
214	104	917	Thursday	15:23:57	4248	2693	939.94	11370	11370	2	3208	3208	0	19978	19685	0	5801	5801	0	31055	9009	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
219	145	3430	Tuesday	19:11:43	4009	427	1319.53	13338	13338	3	1240	1240	0	23329	22781	0	2450	2450	0	36119	3690	15	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
225	23	1629	Monday	08:02:37	3276	4496	204.39	12391	12391	0	2187	2187	0	21396	21047	0	4383	4383	0	33438	6570	24	Generator Failure	UA ground impact tangential to trajectory
23	115	2193	Tuesday	16:25:58	2802	3961	1043.31	10933	10933	0	3645	3645	0	19205	18971	0	6574	6574	0	29904	10219	43	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
23	38	94	Tuesday	09:22:13	4311	442	337.05	12537	12537	0	2041	2041	0	22041	21668	0	3738	3738	0	34205	5779	10	Engine Anomaly	UA approaches Emergency landing site
236	49	2524	Friday	10:26:00	2874	2928	443.33	11516	11516	0	3062	3062	0	20236	19929	0	5543	5543	0	31445	8605	1	Engine Out	No Ground Effect
242	126	1030	Thursday	17:24:17	4120	3094	1140.50	10860	10860	0	3718	3718	0	18947	18727	0	6832	6832	0	29587	10550	30	Connection Failure	Central UA ground impact point below flight path
25	120	3274	Thursday	16:54:55	3790	622	1091.55	10860	10860	0	3718	3718	0	18947	18739	0	6832	6832	0	29599	10550	23	Generator Failure	Central UA ground impact point below flight path
305	25	3063	Thursday	08:15:43	3480	1097	226.22	12391	12391	64	2187	2187	1	21654	21229	0	4125	4125	0	33620	6312	20	Engine Fire	UA structural desintegration - Debris Impact
307	100	2091	Saturday	15:03:53	2836	4193	906.50	11516	11516	0	3062	3062	0	19849	19587	0	5930	5930	0	31103	8992	3	Engine Out	Central UA ground impact point below flight path
308	19	3506	Sunday	07:43:38	4107	386	172.72	14067	14067	0	511	511	0	25005	24279	0	774	774	0	38346	1285	62	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
317	30	1256	Tuesday	08:40:18	3815	3808	267.17	12537	12537	0	2041	2041	0	22041	21636	0	3738	3738	0	34173	5779	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
317	98	2832	Tuesday	14:54:06	3166	1823	890.17	11589	11589	0	2989	2989	2	20236	19924	0	5543	5543	0	31513	8532	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
325	80	2116	Wednesday	13:14:42	2826	4141	724.50	11370	11370	0	3208	3208	0	20494	20181	0	5285	5285	0	31551	8493	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
33	34	3224	Friday	09:05:08	3717	714	308.56	12537	12537	10	2041	2041	1	21396	21036	0	4383	4383	0	33573	6424	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
333	36	1879	Thursday	09:14:01	2987	4495	323.36	12391	12391	0	2187	2187	0	21654	21233	0	4125	4125	0	33624	6312	23	Generator Failure	Central UA ground impact point below flight path
339	56	3139	Wednesday	11:05:09	3591	901	508.61	11662	11662	0	2916	2916	0	21525	21125	0	4254	4254	0	32787	7170	23	Generator Failure	Central UA ground impact point below flight path
348	109	2482	Friday	15:53:39	2850	3076	989.42	11297	11297	0	3281	3281	0	19720	19430	0	6059	6059	0	30727	9340	5	Engine Out	No Ground Effect
353	122	3511	Wednesday	17:06:12	4113	385	1110.36	10787	10787	0	3791	3791	9	18689	18471	0	7090	7090	0	29258	10881	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
353	149	2223	Wednesday	19:31:43	2797	3883	1352.89	13411	13411	0	1167	1167	0	23329	22779	0	2450	2450	0	36190	3617	72	Degradation of altitude	UA approaches Emergency landing site
359	105	1162	Tuesday	15:29:47	3948	3530	949.67	11589	11589	0	2989	2989	1	20236	19940	0	5543	5543	0	31529	8532	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
366	1	3098	Tuesday	06:04:42	3531	1003	7.83	12318	12318	52	2260	2260	0	22427	22035	0	3352	3352	0	34353	5612	63	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
368	79	388	Thursday	13:06:36	4481	950	711.03	11370	11370	0	3208	3208	0	19978	19705	0	5801	5801	0	31075	9009	55	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
382	80	1743	Thursday	13:14:08	3132	4544	723.56	11370	11370	0	3208	3208	0	19978	19690	0	5801	5801	0	31060	9009	2	Engine Out	UA approaches Emergency landing site
389	108	1765	Thursday	15:47:06	3106	4544	978.50	11370	11370	0	3208	3208	0	19978	19714	0	5801	5801	0	31084	9009	19	Engine Fire	Central UA ground impact point below flight path
397	60	2438	Friday	11:25:57	2829	3227	543.25	11516	11516	0	3062	3062	0	20236	19942	0	5543	5543	0	31458	8605	71	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate
4	134	1374	Thursday	18:08:30	3641	4104	1214.19	10860	10860	0	3718	3718	0	18947	18711	0	6832	6832	0	29571	10550	32	Connection Failure	UA approaches Emergency landing site
412	37	2288	Saturday	09:20:05	2794	3702	333.50	11953	11953	0	2625	2625	0	22427	21932	0	3352	3352	0	33885	5977	36	Short Circuit / Overload	Central UA ground impact point below flight path
417	144	1779	Thursday	19:03:44	3090	4543	1306.25	13193	13193	12	1385	1385	1	23072	22567	0	2707	2707	0	35760	4092	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
417	145	750	Thursday	19:07:39	4393	2088	1312.75	13193	13193	0	1385	1385	0	23072	22577	0	2707	2707	0	35770	4092	44	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
430	101	2797	Wednesday	15:10:25	3124	1946	917.39	11370	11370	5	3208	3208	0	20494	20164	0	5285	5285	0	31534	8493	34	Connection Failure	UA ground impact tangential to trajectory
433	79	2420	Saturday	13:09:41	2822	3287	716.17	11516	11516	0	3062	3062	0	19849	19545	0	5930	5930	0	31061	8992	72	Degradation of altitude	UA approaches Emergency landing site
44	128	2926	Tuesday	17:38:05	3287	1508	1163.50	10933	10933	2	3645	3645	0	19205	18968	0	6574	6574	0	29901	10219	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
45	120	1824	Wednesday	16:52:43	3042	4529	1087.89	10787	10787	0	3791	3791	0	18689	18473	0	7090	7090	0	29260	10881	36	Short Circuit / Overload	Central UA ground impact point below flight path
458	138	475	Wednesday	18:29:00	4490	1184	1248.33	10787	10787	0	3791	3791	0	18689	18460	0	7090	7090	0	29247	10881	36	Short Circuit / Overload	Central UA ground impact point below flight path
463	57	3494	Monday	11:11:10	4092	391	518.61	11808	11808	0	2770	2770	0	21267	20927	0	4512	4512	0	32735	7282	32	Connection Failure	UA approaches Emergency landing site
47	31	1424	Friday	08:46:01	3567	4210	276.70	12537	12537	0	2041	2041	0	21396	21023	0	4383	4383	0	33560	6424	27	Generator Failure	UA ground impact tangential to trajectory
471	13	510	Tuesday	07:06:18	4488	1287	110.53	12318	12318	0	2260	2260	0	22427	21930	0	3352	3352	0	34248	5612	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
48	53	3217	Saturday	10:48:53	3707	728	481.50	10641	10641	0	3937	3937	0	18431	18223	0	7348	7348	0	28864	11285	17	Engine Fire	Central UA ground impact point below flight path
480	138	3034	Thursday	18:32:52	3438	1178	1254.80	10860	10860	0	3718	3718	0	18947	18701	0	6832	6832	0	29561	10550	35	Connection Failure	UA ground impact tangential to trajectory
503	51	14	Saturday	10:33:06	4232	391	455.19	10641	10641	0	3937	3937	0	18431	18227	0	7348	7348	0	28868	11285	72	Degradation of altitude	UA approaches Emergency landing site
516	2	256	Friday	06:05:51	4430	663	9.75	12609	12609	0	1969	1969	3	22814	22331	0	2965	2965	0	34940	4934	63	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
517	141	1056	Saturday	18:46:16	4088	3183	1277.11	11589	11589	0	2989	2989	0	20365	20039	0	5414	5414	0	31628	8403	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
522	149	114	Thursday	19:28:31	4329	461	1347.56	13193	13193	0	1385	1385	0	23072	22560	0	2707	2707	0	35753	4092	55	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
525	61	1144	Sunday	11:29:26	3973	3474	549.08	10714	10714	0	3864	3864	0	18431	18242	0	7348	7348	0	28956	11212	36	Short Circuit / Overload	Central UA ground impact point below flight path
526	102	1834	Monday	15:14:26	3031	4524	924.06	11297	11297	0	3281	3281	0	19849	19583	0	5930	5930	0	30880	9211	5	Engine Out	No Ground Effect
538	25	427	Saturday	08:11:43	4487	1051	219.56	11953	11953	0	2625	2625	0	22427	21977	0	3352	3352	0	33930	5977	66	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point below flight path
544	16	2629	Friday	07:25:55	2952	2551	143.20	12609	12609	0	1969	1969	0	22814	22304	0	2965	2965	0	34913	4934	39	Short Circuit / Overload	Central UA ground impact point below flight path
547	64	649	Monday	11:45:05	4451	1735	575.14	11808	11808	24	2770	2770	3	21267	20875	0	4512	4512	0	32683	7282	63	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
547	95	3196	Monday	14:38:16	3676	772	863.78	11297	11297	0	3281	3281	0	19849	19581	0	5930	5930	0	30878	9211	5	Engine Out	No Ground Effect
558	13	159	Friday	07:05:47	4366	512	109.64	12609	12609	0	1969	1969	0	22814	22324	0	2965	2965	0	34933	4934	4	Engine Out	Central ground impact point below flight path with B/G Ratio.
561	66	732	Monday	11:56:08	4405	2024	593.56	11808	11808	0	2770	2770	1	21267	20917	0	4512	4512	0	32725	7282	36	Short Circuit / Overload	Central UA ground impact point below flight path
564	127	2484	Thursday	17:31:58	2851	3069	1153.28	10860	10860	0	3718	3718	0	18947	18705	0	6832	6832	0	29565	10550	28	Generator Failure	UA ground impact tangential to trajectory
57	151	944	Monday	19:40:42	4220	2790	1367.86	13193	13193	0	1385	1385	0	23072	22562	0	2707	2707	0	35755	4092	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
572	20	2586	Friday	07:47:41	2917	2706	179.50	12609	12609	0	1969	1969	0	22814	22322	0	2965	2965	0	34931	4934	9	Engine Out	UA ground impact tangential to trajectory
576	83	3147	Tuesday	13:32:38	3603	882	754.42	11589	11589	0	2989	2989	0	20236	19952	0	5543	5543	0	31541	8532	71	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate
579	72	2157	Friday	12:31:04	2811	4049	651.78	11516	11516	0	3062	3062	0	20236	19947	0	5543	5543	0	31463	8605	9	Engine Out	UA ground impact tangential to trajectory
582	143	3215	Monday	19:00:28	3704	732	1300.78	13193	13193	0	1385	1385	0	23072	22557	0	2707	2707	0	35750	4092	65	Degradation of lateral and horizontal navigation data accurracy.	UA approaches Emergency landing site
588	25	954	Sunday	08:12:31	4209	2826	220.89	13047	13047	5	1531	1531	0	22814	22333	0	2965	2965	0	35380	4496	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
601	52	1720	Saturday	10:41:09	3160	4541	468.61	10641	10641	0	3937	3937	7	18431	18223	0	7348	7348	0	28864	11285	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
603	12	2825	Monday	07:04:22	3158	1848	107.28	12391	12391	0	2187	2187	0	22298	21848	0	3481	3481	0	34239	5668	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
623	116	1109	Sunday	16:29:48	4020	3361	1049.67	10641	10641	0	3937	3937	0	19076	18840	0	6703	6703	0	29481	10640	70	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate
633	19	1957	Wednesday	07:41:16	2920	4415	168.81	12464	12464	0	2114	2114	0	22427	21931	0	3352	3352	0	34395	5466	73	Degradation of altitude	Central UA ground impact point below flight path
639	129	3424	Tuesday	17:44:19	4001	432	1173.86	10933	10933	12	3645	3645	1	19205	18965	0	6574	6574	0	29898	10219	18	Engine Fire	UA structural desintegration - Debris Impact
646	115	1940	Tuesday	16:25:35	2933	4435	1042.67	10933	10933	5	3645	3645	1	19205	18948	0	6574	6574	0	29881	10219	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
648	37	2882	Thursday	09:21:00	3229	1653	335.00	12391	12391	24	2187	2187	2	21654	21267	0	4125	4125	0	33658	6312	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
670	99	1912	Friday	14:58:09	2957	4465	896.94	11297	11297	0	3281	3281	0	19720	19455	0	6059	6059	0	30752	9340	37	Short Circuit / Overload	Central UA ground impact point below flight path
673	33	2254	Monday	08:58:12	2794	3799	297.00	12391	12391	6	2187	2187	2	21396	21004	0	4383	4383	0	33395	6570	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
678	72	1399	Saturday	12:29:55	3604	4159	649.86	10641	10641	5	3937	3937	9	18431	18216	0	7348	7348	0	28857	11285	20	Engine Fire	UA structural desintegration - Debris Impact
68	110	2727	Friday	15:59:29	3046	2195	999.14	11443	11443	0	3135	3135	0	19720	19461	0	6059	6059	0	30904	9194	19	Engine Fire	Central UA ground impact point below flight path
682	4	833	Wednesday	06:17:38	4328	2388	29.42	12464	12464	0	2114	2114	0	22427	21938	0	3352	3352	0	34402	5466	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
692	136	974	Saturday	18:18:50	4186	2897	1231.39	11589	11589	0	2989	2989	0	20365	20062	0	5414	5414	0	31651	8403	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
694	114	1740	Monday	16:19:50	3136	4544	1033.06	10787	10787	0	3791	3791	6	18560	18343	0	7219	7219	0	29130	11010	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
696	85	978	Wednesday	13:40:16	4182	2911	767.14	11370	11370	0	3208	3208	0	20494	20169	0	5285	5285	0	31539	8493	46	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
701	69	1675	Monday	12:13:57	3216	4525	623.25	11808	11808	0	2770	2770	5	21267	20908	0	4512	4512	0	32716	7282	21	Engine Fire	UA structural desintegration - Debris Impact
709	80	1710	Tuesday	13:14:05	3172	4539	723.47	11589	11589	0	2989	2989	0	20236	19913	0	5543	5543	0	31502	8532	68	Degradation of lateral and horizontal navigation data accurracy.	UA approaches Emergency landing site
715	121	1553	Monday	16:57:47	3380	4419	1096.31	10787	10787	0	3791	3791	0	18560	18317	0	7219	7219	0	29104	11010	24	Generator Failure	UA ground impact tangential to trajectory
729	29	2054	Monday	08:36:02	2855	4265	260.08	12391	12391	0	2187	2187	0	21396	21010	0	4383	4383	0	33401	6570	68	Degradation of lateral and horizontal navigation data accurracy.	UA approaches Emergency landing site
741	97	1412	Saturday	14:46:29	3585	4186	877.47	11516	11516	0	3062	3062	0	19849	19574	0	5930	5930	0	31090	8992	1	Engine Out	No Ground Effect
748	1	3372	Saturday	06:05:06	3930	483	8.53	13849	13849	0	729	729	0	24747	24038	0	1032	1032	0	37887	1761	34	Connection Failure	UA ground impact tangential to trajectory
76	24	3104	Saturday	08:10:19	3540	988	217.22	11953	11953	0	2625	2625	0	22427	21973	0	3352	3352	0	33926	5977	10	Engine Anomaly	UA approaches Emergency landing site
760	149	2772	Thursday	19:32:33	3095	2034	1354.28	13193	13193	0	1385	1385	0	23072	22516	0	2707	2707	0	35709	4092	71	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate
761	36	1165	Friday	09:12:56	3944	3540	321.56	12537	12537	0	2041	2041	0	21396	21018	0	4383	4383	0	33555	6424	1	Engine Out	No Ground Effect
773	134	517	Wednesday	18:07:12	4488	1308	1212.03	10787	10787	0	3791	3791	0	18689	18472	0	7090	7090	0	29259	10881	76	Degradation of altitude	Central UA ground impact point below flight path
788	40	90	Thursday	09:33:09	4307	438	355.25	12391	12391	0	2187	2187	0	21654	21260	0	4125	4125	0	33651	6312	4	Engine Out	Central ground impact point below flight path with B/G Ratio.
793	108	1962	Tuesday	15:47:23	2916	4408	979.00	11589	11589	0	2989	2989	0	20236	19950	0	5543	5543	0	31539	8532	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
814	85	1912	Tuesday	13:41:41	2957	4465	769.50	11589	11589	0	2989	2989	0	20236	19924	0	5543	5543	0	31513	8532	37	Short Circuit / Overload	Central UA ground impact point below flight path
82	37	1102	Friday	09:18:18	4029	3337	330.50	12537	12537	0	2041	2041	0	21396	21008	0	4383	4383	0	33545	6424	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
825	63	173	Saturday	11:38:53	4376	530	564.83	10641	10641	0	3937	3937	0	18431	18225	0	7348	7348	0	28866	11285	28	Generator Failure	UA ground impact tangential to trajectory
830	68	837	Thursday	12:07:13	4325	2402	612.03	11662	11662	0	2916	2916	0	21009	20636	0	4770	4770	0	32298	7686	75	Degradation of altitude	UA approaches Emergency landing site
833	1	1384	Sunday	06:02:05	3626	4127	3.50	14067	14067	0	511	511	0	25005	24325	0	774	774	0	38392	1285	19	Engine Fire	Central UA ground impact point below flight path
841	4	1295	Monday	06:18:21	3758	3913	30.58	12391	12391	0	2187	2187	0	22298	21854	0	3481	3481	0	34245	5668	36	Short Circuit / Overload	Central UA ground impact point below flight path
845	6	268	Friday	06:27:42	4436	685	46.19	12609	12609	0	1969	1969	0	22814	22284	0	2965	2965	0	34893	4934	71	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate
86	153	2346	Tuesday	19:53:46	2801	3527	1389.61	13338	13338	21	1240	1240	0	23329	22837	0	2450	2450	0	36175	3690	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
873	92	857	Friday	14:18:19	4307	2475	830.55	11297	11297	0	3281	3281	0	19720	19411	0	6059	6059	0	30708	9340	29	Connection Failure	UA approaches Emergency landing site
88	150	128	Thursday	19:34:00	4341	475	1356.69	13193	13193	0	1385	1385	0	23072	22573	0	2707	2707	0	35766	4092	39	Short Circuit / Overload	Central UA ground impact point below flight path
898	12	1957	Tuesday	07:03:02	2920	4415	105.08	12318	12318	10	2260	2260	2	22427	21980	0	3352	3352	0	34298	5612	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
900	64	1429	Thursday	11:46:16	3560	4220	577.11	11662	11662	0	2916	2916	0	21009	20631	0	4770	4770	0	32293	7686	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
905	48	2817	Tuesday	10:20:58	3148	1875	434.97	11953	11953	0	2625	2625	0	20752	20413	0	5027	5027	2	32366	7652	71	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate
906	41	1774	Wednesday	09:41:10	3096	4543	368.61	12391	12391	0	2187	2187	0	22041	21613	0	3738	3738	0	34004	5925	44	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
914	140	2711	Thursday	18:43:18	3030	2253	1272.19	10860	10860	0	3718	3718	0	18947	18726	0	6832	6832	0	29586	10550	63	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
917	150	139	Sunday	19:34:01	4350	488	1356.72	12901	12901	0	1677	1677	0	23072	22537	0	2707	2707	0	35438	4384	78	Degradation of altitude	Central UA ground impact point below flight path
918	104	456	Monday	15:23:16	4490	1131	938.78	11297	11297	0	3281	3281	0	19849	19575	0	5930	5930	0	30872	9211	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
931	79	2574	Sunday	13:09:55	2908	2750	716.55	10423	10423	11	4155	4155	0	18560	18365	0	7219	7219	0	28788	11374	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
938	150	3061	Sunday	19:38:27	3477	1102	1364.11	12901	12901	0	1677	1677	0	23072	22525	0	2707	2707	0	35426	4384	36	Short Circuit / Overload	Central UA ground impact point below flight path
948	79	3541	Wednesday	13:11:24	4150	380	719.00	11370	11370	0	3208	3208	0	20494	20176	0	5285	5285	0	31546	8493	67	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate
957	27	1883	Friday	08:24:51	2983	4492	241.44	12537	12537	0	2041	2041	0	21396	20994	0	4383	4383	0	33531	6424	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
958	12	1463	Saturday	07:02:18	3510	4283	103.83	13849	13849	4	729	729	1	24747	24091	0	1032	1032	0	37940	1761	20	Engine Fire	UA structural desintegration - Debris Impact
975	3	3170	Tuesday	06:15:43	3637	829	26.22	12318	12318	0	2260	2260	0	22427	21955	0	3352	3352	0	34273	5612	71	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate
977	15	1681	Thursday	07:19:01	3208	4528	131.69	12537	12537	0	2041	2041	0	22427	21979	0	3352	3352	0	34516	5393	77	Degradation of altitude	Central UA ground impact point below flight path
978	22	3197	Friday	07:59:33	3677	769	199.25	12537	12537	0	2041	2041	0	21396	21008	0	4383	4383	0	33545	6424	5	Engine Out	No Ground Effect
984	109	2789	Thursday	15:54:06	3115	1974	990.19	11370	11370	0	3208	3208	0	19978	19699	0	5801	5801	0	31069	9009	70	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate
990	106	1341	Wednesday	15:35:32	3690	4028	959.22	11370	11370	0	3208	3208	0	20494	20130	0	5285	5285	0	31500	8493	31	Connection Failure	UA ground impact tangential to trajectory

997	100	1915	Wednesday	15:03:37	2954	4462	906.05	11370	11370	0	3208	3208	0	20494	20150	0	5285	5285	0	31520	8493	67	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate

O.R.C.U.S. 02.00 - tTest of the Simulation

nProbes	200
nEvents	184
nEvents_cor	172
tMission	14
x_cross_ATB	1.975
x_cross_OTW	0.445
x_cross_TOT	2.42
s2ATB	3.706184
sATB	1.9251452
tATB	14.434909
s2OTW	0.1817926
sOTW	0.4263715
tOTW	14.428331
s2TOT	5.4319824
sTOT	2.3306614
tTOT	14.623552

UADay/Prot	HIT_TOT_ATB	HIT_TOT_OTW	UADay/Prot cor	HIT_TOT_mean_ATB	HIT_TOT_mean_OTW	HIT_TOT_mean_ATB/Fh	HIT_TOT_mean_OTW/Fh	x_i-x_cross ATB	x_i-x_cross OTW	(x_i-x_cross ATB)^2	(x_i-x_cross OTW)^2
4	0	0	4	0	0	0	0	-1.975	-0.445	3.900625	0.198025
23	0	0	23	0	0	0	0	-1.975	-0.445	3.900625	0.198025
23	0	0	25	0	0	0	0	-1.975	-0.445	3.900625	0.198025
25	0	0	33	10	1	0.714285714	0.071428571	-1.260714286	-0.373571429	1.58940051	0.139555612
33	10	1	44	2	0	0.142857143	0	-1.832142857	-0.445	3.356747449	0.198025
44	2	0	45	0	0	0	0	-1.975	-0.445	3.900625	0.198025
45	0	0	47	0	0	0	0	-1.975	-0.445	3.900625	0.198025
47	0	0	48	0	0	0	0	-1.975	-0.445	3.900625	0.198025
48	0	0	57	0	0	0	0	-1.975	-0.445	3.900625	0.198025
57	0	0	68	0	0	0	0	-1.975	-0.445	3.900625	0.198025
68	0	0	76	0	0	0	0	-1.975	-0.445	3.900625	0.198025
76	0	0	82	0	0	0	0	-1.975	-0.445	3.900625	0.198025
82	0	0	86	21	0	1.5	0	-0.475	-0.445	0.225625	0.198025
86	21	0	88	0	0	0	0	-1.975	-0.445	3.900625	0.198025
88	0	0	100	0	0	0	0	-1.975	-0.445	3.900625	0.198025
100	0	0	109	0	0	0	0	-1.975	-0.445	3.900625	0.198025
109	0	0	114	0	0	0	0	-1.975	-0.445	3.900625	0.198025
114	0	0	117	0	0	0	0	-1.975	-0.445	3.900625	0.198025
117	0	0	128	0	0	0	0	-1.975	-0.445	3.900625	0.198025
128	0	0	139	0	0	0	0	-1.975	-0.445	3.900625	0.198025
139	0	0	140	16	6	1.142857143	0.428571429	-0.832142857	-0.016428571	0.692461735	0.000269898
140	16	6	143	0	0	0	0	-1.975	-0.445	3.900625	0.198025
143	0	0	145	0	0	0	0	-1.975	-0.445	3.900625	0.198025
145	0	0	156	0	0	0	0	-1.975	-0.445	3.900625	0.198025
156	0	0	170	0	0	0	0	-1.975	-0.445	3.900625	0.198025
170	0	0	178	0	0	0	0	-1.975	-0.445	3.900625	0.198025
170	0	0	204	9	4	0.642857143	0.285714286	-1.332142857	-0.159285714	1.774604592	0.025371939
178	0	0	207	0	0	0	0	-1.975	-0.445	3.900625	0.198025
204	9	4	214	2	0	0.142857143	0	-1.832142857	-0.445	3.356747449	0.198025
207	0	0	219	3	0	0.214285714	0	-1.760714286	-0.445	3.100114796	0.198025
214	2	0	225	0	0	0	0	-1.975	-0.445	3.900625	0.198025
219	3	0	236	0	0	0	0	-1.975	-0.445	3.900625	0.198025
225	0	0	242	0	0	0	0	-1.975	-0.445	3.900625	0.198025
236	0	0	305	64	1	4.571428571	0.071428571	2.596428571	-0.373571429	6.741441327	0.139555612
242	0	0	307	0	0	0	0	-1.975	-0.445	3.900625	0.198025
305	64	1	308	0	0	0	0	-1.975	-0.445	3.900625	0.198025
307	0	0	317	0	2	0	0.142857143	-1.975	-0.302142857	3.900625	0.091290306
308	0	0	325	0	0	0	0	-1.975	-0.445	3.900625	0.198025
317	0	0	333	0	0	0	0	-1.975	-0.445	3.900625	0.198025
317	0	2	339	0	0	0	0	-1.975	-0.445	3.900625	0.198025
325	0	0	348	0	0	0	0	-1.975	-0.445	3.900625	0.198025
333	0	0	353	0	9	0	0.642857143	-1.975	0.197857143	3.900625	0.039147449
339	0	0	359	0	1	0	0.071428571	-1.975	-0.373571429	3.900625	0.139555612
348	0	0	366	52	0	3.714285714	0	1.739285714	-0.445	3.025114796	0.198025
353	0	9	368	0	0	0	0	-1.975	-0.445	3.900625	0.198025
353	0	0	382	0	0	0	0	-1.975	-0.445	3.900625	0.198025
359	0	1	389	0	0	0	0	-1.975	-0.445	3.900625	0.198025
366	52	0	397	0	0	0	0	-1.975	-0.445	3.900625	0.198025
368	0	0	412	0	0	0	0	-1.975	-0.445	3.900625	0.198025
382	0	0	417	12	1	0.857142857	0.071428571	-1.117857143	-0.373571429	1.249604592	0.139555612
389	0	0	430	5	0	0.357142857	0	-1.617857143	-0.445	2.617461735	0.198025
397	0	0	433	0	0	0	0	-1.975	-0.445	3.900625	0.198025
412	0	0	458	0	0	0	0	-1.975	-0.445	3.900625	0.198025
417	12	1	463	0	0	0	0	-1.975	-0.445	3.900625	0.198025
417	0	0	471	0	0	0	0	-1.975	-0.445	3.900625	0.198025
430	5	0	480	0	0	0	0	-1.975	-0.445	3.900625	0.198025
433	0	0	503	0	0	0	0	-1.975	-0.445	3.900625	0.198025
458	0	0	516	0	3	0	0.214285714	-1.975	-0.230714286	3.900625	0.053229082
463	0	0	517	0	0	0	0	-1.975	-0.445	3.900625	0.198025
471	0	0	522	0	0	0	0	-1.975	-0.445	3.900625	0.198025
480	0	0	525	0	0	0	0	-1.975	-0.445	3.900625	0.198025
503	0	0	526	0	0	0	0	-1.975	-0.445	3.900625	0.198025
516	0	3	538	0	0	0	0	-1.975	-0.445	3.900625	0.198025
517	0	0	544	0	0	0	0	-1.975	-0.445	3.900625	0.198025
522	0	0	547	24	3	1.714285714	0.214285714	-0.260714286	-0.230714286	0.067971939	0.053229082
525	0	0	558	0	0	0	0	-1.975	-0.445	3.900625	0.198025
526	0	0	561	0	1	0	0.071428571	-1.975	-0.373571429	3.900625	0.139555612
538	0	0	564	0	0	0	0	-1.975	-0.445	3.900625	0.198025
544	0	0	572	0	0	0	0	-1.975	-0.445	3.900625	0.198025
547	24	3	576	0	0	0	0	-1.975	-0.445	3.900625	0.198025
547	0	0	579	0	0	0	0	-1.975	-0.445	3.900625	0.198025
558	0	0	582	0	0	0	0	-1.975	-0.445	3.900625	0.198025
561	0	1	588	5	0	0.357142857	0	-1.617857143	-0.445	2.617461735	0.198025
564	0	0	601	0	7	0	0.5	-1.975	0.055	3.900625	0.003025
572	0	0	603	0	0	0	0	-1.975	-0.445	3.900625	0.198025
576	0	0	623	0	0	0	0	-1.975	-0.445	3.900625	0.198025
579	0	0	633	0	0	0	0	-1.975	-0.445	3.900625	0.198025
582	0	0	639	12	1	0.857142857	0.071428571	-1.117857143	-0.373571429	1.249604592	0.139555612
588	5	0	646	5	1	0.357142857	0.071428571	-1.617857143	-0.373571429	2.617461735	0.139555612
601	0	7	648	24	2	1.714285714	0.142857143	-0.260714286	-0.302142857	0.067971939	0.091290306
603	0	0	670	0	0	0	0	-1.975	-0.445	3.900625	0.198025
623	0	0	673	6	2	0.428571429	0.142857143	-1.546428571	-0.302142857	2.391441327	0.091290306
633	0	0	678	5	9	0.357142857	0.642857143	-1.617857143	0.197857143	2.617461735	0.039147449
639	12	1	682	0	0	0	0	-1.975	-0.445	3.900625	0.198025
646	5	1	692	0	0	0	0	-1.975	-0.445	3.900625	0.198025
648	24	2	694	0	6	0	0.428571429	-1.975	-0.016428571	3.900625	0.000269898
670	0	0	696	0	0	0	0	-1.975	-0.445	3.900625	0.198025
673	6	2	701	0	5	0	0.357142857	-1.975	-0.087857143	3.900625	0.007718878
678	5	9	709	0	0	0	0	-1.975	-0.445	3.900625	0.198025
682	0	0	715	0	0	0	0	-1.975	-0.445	3.900625	0.198025
692	0	0	729	0	0	0	0	-1.975	-0.445	3.900625	0.198025
694	0	6	741	0	0	0	0	-1.975	-0.445	3.900625	0.198025
696	0	0	748	0	0	0	0	-1.975	-0.445	3.900625	0.198025
701	0	5	760	0	0	0	0	-1.975	-0.445	3.900625	0.198025
709	0	0	761	0	0	0	0	-1.975	-0.445	3.900625	0.198025
715	0	0	773	0	0	0	0	-1.975	-0.445	3.900625	0.198025
729	0	0	788	0	0	0	0	-1.975	-0.445	3.900625	0.198025
741	0	0	793	0	0	0	0	-1.975	-0.445	3.900625	0.198025
748	0	0	814	0	0	0	0	-1.975	-0.445	3.900625	0.198025
760	0	0	825	0	0	0	0	-1.975	-0.445	3.900625	0.198025
761	0	0	830	0	0	0	0	-1.975	-0.445	3.900625	0.198025
773	0	0	833	0	0	0	0	-1.975	-0.445	3.900625	0.198025
788	0	0	841	0	0	0	0	-1.975	-0.445	3.900625	0.198025
793	0	0	845	0	0	0	0	-1.975	-0.445	3.900625	0.198025
814	0	0	873	0	0	0	0	-1.975	-0.445	3.900625	0.198025
825	0	0	898	10	2	0.714285714	0.142857143	-1.260714286	-0.302142857	1.58940051	0.091290306
830	0	0	900	0	0	0	0	-1.975	-0.445	3.900625	0.198025
833	0	0	905	0	2	0	0.142857143	-1.975	-0.302142857	3.900625	0.091290306
841	0	0	906	0	0	0	0	-1.975	-0.445	3.900625	0.198025
845	0	0	914	0	0	0	0	-1.975	-0.445	3.900625	0.198025
873	0	0	917	0	0	0	0	-1.975	-0.445	3.900625	0.198025
898	10	2	918	0	0	0	0	-1.975	-0.445	3.900625	0.198025
900	0	0	931	11	0	0.785714286	0	-1.189285714	-0.445	1.41440051	0.198025
905	0	2	938	0	0	0	0	-1.975	-0.445	3.900625	0.198025
906	0	0	948	0	0	0	0	-1.975	-0.445	3.900625	0.198025
914	0	0	957	0	0	0	0	-1.975	-0.445	3.900625	0.198025
917	0	0	958	4	1	0.285714286	0.071428571	-1.689285714	-0.373571429	2.853686224	0.139555612
918	0	0	975	0	0	0	0	-1.975	-0.445	3.900625	0.198025
931	11	0	977	0	0	0	0	-1.975	-0.445	3.900625	0.198025
938	0	0	978	0	0	0	0	-1.975	-0.445	3.900625	0.198025
948	0	0	984	0	0	0	0	-1.975	-0.445	3.900625	0.198025
957	0	0	990	0	0	0	0	-1.975	-0.445	3.900625	0.198025
958	4	1	997	0	0	0	0	-1.975	-0.445	3.900625	0.198025
975	0	0	1006	6	2	0.428571429	0.142857143	-1.546428571	-0.302142857	2.391441327	0.091290306
977	0	0	1014	0	0	0	0	-1.975	-0.445	3.900625	0.198025
978	0	0	1022	0	0	0	0	-1.975	-0.445	3.900625	0.198025
984	0	0	1035	0	0	0	0	-1.975	-0.445	3.900625	0.198025
990	0	0	1041	0	0	0	0	-1.975	-0.445	3.900625	0.198025
997	0	0	1046	0	0	0	0	-1.975	-0.445	3.900625	0.198025
1006	6	2	1049	0	1	0	0.071428571	-1.975	-0.373571429	3.900625	0.139555612
1014	0	0	1055	0	0	0	0	-1.975	-0.445	3.900625	0.198025
1022	0	0	1062	0	0	0	0	-1.975	-0.445	3.900625	0.198025
1035	0	0	1075	0	0	0	0	-1.975	-0.445	3.900625	0.198025
1041	0	0	1076	0	0	0	0	-1.975	-0.445	3.900625	0.198025
1046	0	0	1084	0	0	0	0	-1.975	-0.445	3.900625	0.198025
1049	0	1	1086	11	2	0.785714286	0.142857143	-1.189285714	-0.302142857	1.41440051	0.091290306
1055	0	0	1091	0	0	0	0	-1.975	-0.445	3.900625	0.198025
1062	0	0	1096	0	0	0	0	-1.975	-0.445	3.900625	0.198025
1075	0	0	1102	0	0	0	0	-1.975	-0.445	3.900625	0.198025
1076	0	0	1105	0	0	0	0	-1.975	-0.445	3.900625	0.198025
1084	0	0	1128	0	0	0	0	-1.975	-0.445	3.900625	0.198025
1086	11	2	1141	0	0	0	0	-1.975	-0.445	3.900625	0.198025
1091	0	0	1146	0	0	0	0	-1.975	-0.445	3.900625	0.198025
1091	0	0	1151	0	0	0	0	-1.975	-0.445	3.900625	0.198025
1096	0	0	1154	0	0	0	0	-1.975	-0.445	3.900625	0.198025
1102	0	0	1165	10	4	0.714285714	0.285714286	-1.260714286	-0.159285714	1.58940051	0.025371939
1105	0	0	1171	0	0	0	0	-1.975	-0.445	3.900625	0.198025
1128	0	0	1184	0	4	0	0.285714286	-1.975	-0.159285714	3.900625	0.025371939
1141	0	0	1189	0	0	0	0	-1.975	-0.445	3.900625	0.198025
1146	0	0	1192	61	1	4.357142857	0.071428571	2.382142857	-0.373571429	5.674604592	0.139555612
1146	0	0	1213	0	0	0	0	-1.975	-0.445	3.900625	0.198025
1151	0	0	1222	0	0	0	0	-1.975	-0.445	3.900625	0.198025
1154	0	0	1232	0	0	0	0	-1.975	-0.445	3.900625	0.198025
1165	10	4	1238	0	0	0	0	-1.975	-0.445	3.900625	0.198025
1171	0	0	1257	0	0	0	0	-1.975	-0.445	3.900625	0.198025
1171	0	0	1265	0	0	0	0	-1.975	-0.445	3.900625	0.198025
1184	0	4	1286	1	0	0.071428571	0	-1.903571429	-0.445	3.623584184	0.198025
1189	0	0	1292	0	0	0	0	-1.975	-0.445	3.900625	0.198025
1192	61	1	1295	0	0	0	0	-1.975	-0.445	3.900625	0.198025
1213	0	0	1296	0	0	0	0	-1.975	-0.445	3.900625	0.198025
1222	0	0	1300	0	0	0	0	-1.975	-0.445	3.900625	0.198025
1222	0	0	1310	2	0	0.142857143	0	-1.832142857	-0.445	3.356747449	0.198025
1232	0	0	1327	0	0	0	0	-1.975	-0.445	3.900625	0.198025
1238	0	0	1340	0	0	0	0	-1.975	-0.445	3.900625	0.198025
1257	0	0	1344	0	0	0	0	-1.975	-0.445	3.900625	0.198025
1265	0	0	1345	0	0	0	0	-1.975	-0.445	3.900625	0.198025
1286	1	0	1352	0	0	0	0	-1.975	-0.445	3.900625	0.198025
1286	0	0	1387	0	0	0	0	-1.975	-0.445	3.900625	0.198025
1292	0	0	1394	0	0	0	0	-1.975	-0.445	3.900625	0.198025
1295	0	0	1395	2	5	0.142857143	0.357142857	-1.832142857	-0.087857143	3.356747449	0.007718878
1296	0	0	1396	0	0	0	0	-1.975	-0.445	3.900625	0.198025
1300	0	0	1397	0	0	0	0	-1.975	-0.445	3.900625	0.198025
1310	2	0									
1327	0	0									
1340	0	0									
1344	0	0									
1345	0	0									
1352	0	0									
1387	0	0									
1394	0	0									
1395	2	5									
1396	0	0									
1396	0	0									
1397	0	0									

11.4.7 Georgensgmuend – R77

11.4.7.1 Georgensgmuend – R77 – Phase 1

O.R.C.U.S. 02.00 - Simulation Summary

UA Parameters

MTOW [kg]	Wingspan [m]	Length [m]	L/D
90	5	4	8

v [km/h]	Alt [m]	CCF [m]
100	100	9931.0777

P_CumCat [1/Fh]	Engine [%]	ESys [%]	FCS [%]	NavSys [%]	Struct [%]
0.01	20	20	20	20	20

General map parameters

	Name	Area [km2]	PPL	PPL/km2
City	Georgensgmuend	46.89	6680	142
County	Roth	895.15	126101	141
FS	BY	70542.03	12997204	184

Mission specific map parameters

	Area [km2]	PPL	Tourists	Total PPL
City-SMP	12.9739	6680	0	6680
SurM	53.8816	7598	0	7598
Map total	66.8555	14278	0	14278

PPL MOD NA

Sim FH [Fh] 19600 Ev/Fh [1/Fh] 0.00984694

Events total 193

Hits due to UA impacts		Hits/Fh [1/Fh]
City-SMP ATB	70	0.0035714
SurM ATB	0	0
Total ATB	70	0.0035714
City-SMP OTW	52	0.0026531
SurM OTW	3	0.0001531
Total OTW	55	0.0028061
Total	125	0.0063776

Prot	cyc	k_UA	Day	Time of impact	UA X Pos	UA Y Pos	Travelled Distance [km]	PPL_TD_CITY_ATB	PPL_CITY_ATB_COUNT	HIT_CITY_ATB_COUNT	PPL_TD_CITY_OTW	PPL_CITY_OTW_COUNT	HIT_CITY_OTW_COUNT
1004	49	948	Wednesday	10:47:35	7708	3248	479.31	5544	5544	0	1136	1136	0
101	88	3110	Wednesday	14:43:32	7129	1289	872.58	5344	5344	6	1336	1336	1
102	1	141	Thursday	06:00:14	7891	707	0.39	5711	5711	0	969	969	0
1023	127	449	Monday	18:31:31	8005	1377	1252.55	4876	4876	13	1804	1804	2
1024	90	3492	Tuesday	14:56:05	7649	616	893.50	5243	5243	0	1437	1437	0
1024	97	1915	Tuesday	15:35:11	6491	5147	958.67	5243	5243	2	1437	1437	0
1033	112	2078	Thursday	17:04:50	6392	4888	1108.08	4976	4976	2	1704	1704	2
1033	83	3207	Thursday	14:13:55	7269	1034	823.20	5310	5310	0	1370	1370	0
1033	92	864	Thursday	15:03:40	7795	2910	906.11	5310	5310	0	1370	1370	1
1035	4	3267	Saturday	06:23:17	7354	903	38.81	6346	6346	0	334	334	0
1035	75	1547	Saturday	13:23:30	6898	5061	739.17	5277	5277	0	1403	1403	2
104	101	1834	Saturday	15:58:54	6561	5209	998.17	5243	5243	0	1437	1437	0
1044	121	138	Monday	17:55:15	7889	703	1192.11	4876	4876	0	1804	1804	0
1045	25	126	Tuesday	08:23:12	7880	689	238.69	5678	5678	0	1002	1002	0
105	26	3565	Sunday	08:34:52	7731	598	258.11	5878	5878	0	802	802	0
1057	21	1164	Sunday	08:01:05	7438	4067	201.83	5878	5878	0	802	802	0
108	136	543	Wednesday	19:25:18	7993	1680	1342.19	6045	6045	0	635	635	0
1089	65	854	Thursday	12:22:46	7805	2869	637.94	5544	5544	0	1136	1136	0
1096	73	3269	Thursday	13:14:26	7357	899	724.06	5310	5310	0	1370	1370	0
1103	111	150	Thursday	16:55:41	7898	718	1092.83	4976	4976	0	1704	1704	0
1105	36	1448	Saturday	09:30:56	7035	4882	351.58	5678	5678	0	1002	1002	0
1108	46	3168	Tuesday	10:33:22	7213	1130	455.64	5344	5344	0	1336	1336	0

941	45	556	Wednesday	10:23:06	7990	1725	438.50	5544	5544	0	1136	1136	0	6268	6268	0	1330	1330	0	11812	2466	23	Generator Failure	Central UA ground impact point below flight path
948	62	1433	Wednesday	12:05:50	7056	4849	609.75	5544	5544	0	1136	1136	0	6268	6268	0	1330	1330	0	11812	2466	37	Short Circuit / Overload	Central UA ground impact point below flight path
969	30	2245	Wednesday	08:56:30	6357	4459	294.19	5811	5811	0	869	869	0	6420	6420	0	1178	1178	0	12231	2047	29	Connection Failure	UA approaches Emergency landing site
971	73	2574	Friday	13:13:16	6489	3276	722.14	5110	5110	0	1570	1570	0	5774	5774	0	1824	1824	0	10884	3394	69	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
977	126	646	Thursday	18:25:54	7955	2050	1243.17	4976	4976	0	1704	1704	0	5660	5660	0	1938	1938	0	10636	3642	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
979	104	1919	Saturday	16:16:55	6488	5143	1028.19	5243	5243	0	1437	1437	0	5964	5964	0	1634	1634	0	11207	3071	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
986	29	408	Saturday	08:47:31	8003	1257	279.20	5678	5678	0	1002	1002	0	6306	6306	0	1292	1292	0	11984	2294	74	Degradation of altitude	Central UA ground impact point below flight path
986	66	3114	Saturday	12:32:27	7135	1277	654.11	4876	4876	0	1804	1804	0	5394	5394	0	2204	2204	0	10270	4008	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
991	127	983	Thursday	18:32:24	7669	3387	1254.03	4976	4976	0	1704	1704	0	5660	5660	0	1938	1938	0	10636	3642	37	Short Circuit / Overload	Central UA ground impact point below flight path
997	109	2185	Wednesday	16:47:09	6362	4631	1078.58	4943	4943	0	1737	1737	0	5660	5660	0	1938	1938	0	10603	3675	37	Short Circuit / Overload	Central UA ground impact point below flight path

O.R.C.U.S. 02.00 - tTest of the Simulation

nProbes	1400
nEvents	193
nEvents_cor	177
tMission	14
x_cross_ATB	0.05
x_cross_OTW	0.0392857
x_cross_TOT	0.0892857
s2ATB	0.0044419
sATB	0.0666479
tATB	22.456251
s2OTW	0.0018599
sOTW	0.0431269
tOTW	25.408068
s2TOT	0.0105177
sTOT	0.1025559
tTOT	28.926656

UADay/Prot	HIT_TOT_ATB	HIT_TOT_OTW	UADay/Prot cor	HIT_TOT_mean_ATB	HIT_TOT_mean_OTW	HIT_TOT_mean_ATB/Fh	HIT_TOT_mean_OTW/Fh	x_i-x_cross ATB	x_i-x_cross OTW	(x_i-x_cross ATB)^2	(x_i-x_cross OTW)^2
8	0	0	8	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
25	0	0	25	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
31	0	0	31	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
44	0	0	44	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
48	0	0	48	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
49	0	0	49	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
52	0	0	52	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
53	0	0	53	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
61	0	1	61	0	1	0	0.071428571	-0.05	0.032142857	0.0025	0.001033163
65	0	0	65	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
73	0	0	73	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
78	0	0	78	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
80	0	0	80	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
86	0	0	86	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
101	6	1	101	6	1	0.428571429	0.071428571	0.378571429	0.032142857	0.143316327	0.001033163
102	0	0	102	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
104	0	0	104	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
105	0	0	105	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
108	0	0	108	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
113	10	2	113	10	2	0.714285714	0.142857143	0.664285714	0.103571429	0.44127551	0.010727041
114	0	0	114	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
117	0	0	117	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
130	0	0	130	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
131	0	0	131	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
145	0	0	145	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
170	0	0	170	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
176	0	0	176	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
180	0	0	180	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
188	0	0	188	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
188	0	0	192	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
192	0	0	204	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
204	0	0	206	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
204	0	0	214	0	2	0	0.142857143	-0.05	0.103571429	0.0025	0.010727041
206	0	0	217	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
214	0	0	222	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
214	0	2	238	2	1	0.142857143	0.071428571	0.092857143	0.032142857	0.008622449	0.001033163
217	0	0	243	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
222	0	0	244	0	3	0	0.214285714	-0.05	0.175	0.0025	0.030625
238	0	0	254	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
238	2	1	256	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
243	0	0	259	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
244	0	3	264	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
244	0	0	267	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
254	0	0	268	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
256	0	0	272	0	1	0	0.071428571	-0.05	0.032142857	0.0025	0.001033163
259	0	0	274	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
264	0	0	281	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
267	0	0	289	1	0	0.071428571	0	0.021428571	-0.039285714	0.000459184	0.001543367
268	0	0	300	6	3	0.428571429	0.214285714	0.378571429	0.175	0.143316327	0.030625
272	0	1	301	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
274	0	0	302	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
281	0	0	318	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
289	1	0	334	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
300	6	3	338	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
301	0	0	347	0	1	0	0.071428571	-0.05	0.032142857	0.0025	0.001033163
302	0	0	355	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
318	0	0	356	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
334	0	0	365	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
338	0	0	367	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
347	0	1	375	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
355	0	0	384	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
356	0	0	403	0	1	0	0.071428571	-0.05	0.032142857	0.0025	0.001033163
365	0	0	409	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
367	0	0	442	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
375	0	0	451	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
384	0	0	457	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
403	0	1	458	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
409	0	0	466	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
442	0	0	468	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
451	0	0	470	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
457	0	0	476	0	2	0	0.142857143	-0.05	0.103571429	0.0025	0.010727041
458	0	0	502	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
466	0	0	504	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
468	0	0	515	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
470	0	0	521	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
476	0	2	522	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
502	0	0	529	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
504	0	0	536	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
515	0	0	537	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
521	0	0	549	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
522	0	0	567	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
529	0	0	575	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
529	0	0	603	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
536	0	0	607	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
537	0	0	611	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
549	0	0	631	0	1	0	0.071428571	-0.05	0.032142857	0.0025	0.001033163
567	0	0	632	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
575	0	0	640	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
603	0	0	651	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
607	0	0	660	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
611	0	0	662	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
631	0	1	679	1	0	0.071428571	0	0.021428571	-0.039285714	0.000459184	0.001543367
632	0	0	680	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
640	0	0	682	0	2	0	0.142857143	-0.05	0.103571429	0.0025	0.010727041
651	0	0	704	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
660	0	0	737	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
662	0	0	741	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
679	1	0	754	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
680	0	0	761	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
682	0	0	762	0	1	0	0.071428571	-0.05	0.032142857	0.0025	0.001033163
682	0	2	765	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
704	0	0	780	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
737	0	0	797	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
741	0	0	803	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
754	0	0	829	0	2	0	0.142857143	-0.05	0.103571429	0.0025	0.010727041
761	0	0	859	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
762	0	1	873	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
765	0	0	880	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
780	0	0	892	1	4	0.071428571	0.285714286	0.021428571	0.246428571	0.000459184	0.060727041
797	0	0	895	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
803	0	0	896	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
829	0	2	900	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
859	0	0	903	3	4	0.214285714	0.285714286	0.164285714	0.246428571	0.026989796	0.060727041
873	0	0	919	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
880	0	0	921	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
892	1	4	926	0	3	0	0.214285714	-0.05	0.175	0.0025	0.030625
895	0	0	941	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
896	0	0	948	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
900	0	0	969	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
903	3	4	971	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
919	0	0	977	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
921	0	0	979	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
926	0	3	986	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
941	0	0	991	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
948	0	0	997	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
969	0	0	1004	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
971	0	0	1023	13	2	0.928571429	0.142857143	0.878571429	0.103571429	0.771887755	0.010727041
977	0	0	1024	2	0	0.142857143	0	0.092857143	-0.039285714	0.008622449	0.001543367
979	0	0	1033	2	3	0.142857143	0.214285714	0.092857143	0.175	0.008622449	0.030625
986	0	0	1035	0	2	0	0.142857143	-0.05	0.103571429	0.0025	0.010727041
986	0	0	1044	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
991	0	0	1045	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
997	0	0	1057	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
1004	0	0	1089	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
1023	13	2	1096	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
1024	0	0	1103	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
1024	2	0	1105	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
1033	2	2	1108	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
1033	0	0	1118	12	0	0.857142857	0	0.807142857	-0.039285714	0.651479592	0.001543367
1033	0	1	1123	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
1035	0	0	1128	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
1035	0	2	1147	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
1044	0	0	1148	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
1045	0	0	1152	0	3	0	0.214285714	-0.05	0.175	0.0025	0.030625
1057	0	0	1158	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
1089	0	0	1159	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
1096	0	0	1161	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
1103	0	0	1169	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
1105	0	0	1174	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
1108	0	0	1178	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
1118	0	0	1189	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
1118	0	0	1195	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
1118	12	0	1204	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
1123	0	0	1220	0	2	0	0.142857143	-0.05	0.103571429	0.0025	0.010727041
1128	0	0	1224	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
1147	0	0	1233	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
1148	0	0	1280	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
1152	0	3	1281	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
1158	0	0	1283	11	2	0.785714286	0.142857143	0.735714286	0.103571429	0.54127551	0.010727041
1159	0	0	1286	0	5	0	0.357142857	-0.05	0.317857143	0.0025	0.101033163
1161	0	0	1288	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
1169	0	0	1295	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
1174	0	0	1313	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
1178	0	0	1318	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
1189	0	0	1320	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
1195	0	0	1323	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
1204	0	0	1330	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
1220	0	2	1336	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
1224	0	0	1356	0	1	0	0.071428571	-0.05	0.032142857	0.0025	0.001033163
1224	0	0	1360	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
1233	0	0	1364	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
1280	0	0	1367	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
1281	0	0	1373	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
1283	11	2	1384	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
1286	0	5	1387	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
1288	0	0	1389	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
1295	0	0	1396	0	0	0	0	-0.05	-0.039285714	0.0025	0.001543367
1313	0	0									
1318	0	0									
1320	0	0									
1323	0	0									
1330	0	0									
1336	0	0									
1356	0	1									
1360	0	0									
1364	0	0									
1367	0	0									
1373	0	0									
1384	0	0									
1387	0	0									
1389	0	0									
1389	0	0									
1396	0	0									

11.4.7.2 Georgensgmuend – R77 – Phase 2

O.R.C.U.S. 02.00 - Simulation Summary

UA Parameters

MTOW [kg]	Wingspan [m]	Length [m]	L/D
90	5	4	8

v [km/h]	Alt [m]	CCF [m]
100	100	9931.0777

P_CumCat [1/Fh]	Engine [%]	ESys [%]	FCS [%]	NavSys [%]	Struct [%]
0.01	20	20	20	20	20

General map parameters

	Name	Area [km2]	PPL	PPL/km2
City	Georgensgmuend	46.89	6680	142
County	Roth	895.15	126101	141
FS	BY	70542.03	12997204	184

Mission specific map parameters

	Area [km2]	PPL	Tourists	Total PPL
City-SMP	12.9739	6680	0	6680
SurM	53.8816	7598	0	7598
Map total	66.8555	14278	0	14278

PPL MOD NA

Sim FH [Fh] 19600 Ev/Fh [1/Fh] 0.00994898
Events total 195

Hits due to UA impacts		Hits/Fh [1/Fh]
City-SMP ATB	126	0.0064286
SurM ATB	0	0
Total ATB	126	0.0064286
City-SMP OTW	50	0.002551
SurM OTW	4	0.0002041
Total OTW	54	0.0027551
Total	180	0.0091837

Prot	cyc	k_UA	Day	Time of impact	UA X Pos	UA Y Pos	Travelled Distance [km]	PPL_TD_CITY_ATB	PPL_CITY_ATB_COUNT	HIT_CITY_ATB_COUNT	PPL_TD_CITY_OTW	PPL_CITY_OTW_COUNT	HIT_CITY_OTW_COUNT	PPL_TD_SURM_ATB	PPL_SURM_ATB_COUNT	HIT_SURM_ATB_COUNT	PPL_TD_SURM_OTW	PPL_SURM_OTW_COUNT	HIT_SURM_OTW_COUNT	PPL_ALL_ATB_COUNT	PPL_ALL_OTW_COUNT	E	Case	Outcome
100	52	821	Tuesday	11:05:14	7835	2736	508.75	5344	5344	0	1336	1336	0	6306	6306	0	1292	1292	0	11650	2628	65	Degradation of lateral and horizontal navigation data accurracy.	UA approaches Emergency landing site
1001	107	3112	Sunday	16:36:46	7132	1283	1061.28	5043	5043	0	1637	1637	0	5546	5546	0	2052	2052	0	10589	3689	32	Connection Failure	UA approaches Emergency landing site
1010	86	2023	Tuesday	14:29:50	6419	4995	849.72	5243	5243	0	1437	1437	0	6002	6002	0	1596	1596	0	11245	3033	1	Engine Out	No Ground Effect
1013	92	965	Friday	15:03:50	7689	3315	906.39	5110	5110	0	1570	1570	0	5774	5774	0	1824	1824	0	10884	3394	42	Partial Lock of Flight Control Surfaces	Central UA ground impact point below flight path
1015	9	1821	Sunday	06:50:40	6573	5215	84.47	6513	6513	0	167	167	0	7332	7332	0	266	266	0	13845	433	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1026	53	776	Thursday	11:11:08	7872	2556	518.56	5544	5544	0	1136	1136	0	6230	6230	0	1368	1368	0	11774	2504	72	Degradation of altitude	UA approaches Emergency landing site
1028	52	2815	Saturday	11:08:33	6731	2311	514.25	4876	4876	0	1804	1804	0	5394	5394	0	2204	2204	0	10270	4008	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
1033	74	2176	Thursday	13:18:34	6363	4655	730.97	5310	5310	0	1370	1370	0	6040	6040	0	1558	1558	0	11350	2928	75	Degradation of altitude	UA approaches Emergency landing site
1036	121	2918	Sunday	17:59:52	6862	1922	1199.78	5043	5043	0	1637	1637	0	5546	5546	0	2052	2052	0	10589	3689	76	Degradation of altitude	Central UA ground impact point below flight path
1060	4	1364	Wednesday	06:20:08	7155	4683	33.56	5577	5577	0	1103	1103	0	6572	6572	0	1026	1026	0	12149	2129	74	Degradation of altitude	Central UA ground impact point below flight path
1068	33	1847	Thursday	09:13:44	6549	5202	322.89	5678	5678	0	1002	1002	0	6496	6496	0	1102	1102	0	12174	2104	39	Short Circuit / Overload	Central UA ground impact point below flight path
1078	92	471	Sunday	15:03:00	8004	1444	905.03	4709	4709	0	1971	1971	0	5470	5470	0	2128	2128	0	10179	4099	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
1081	98	782	Wednesday	15:39:16	7867	2580	965.47	5344	5344	0	1336	1336	0	5964	5964	0	1634	1634	0	11308	2970	55	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
1093	116	2742	Monday	17:29:46	6647	2600	1149.64	4876	4876	0	1804	1804	0	5736	5735	0	1862	1862	0	10611	3666	62	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
1093	69	1155	Monday	12:47:05	7450	4035	678.50	5277	5277	0	1403	1403	0	6306	6306	0	1292	1292	0	11583	2695	22	Generator Failure	UA approaches Emergency landing site
1100	14	1815	Monday	07:20:27	6579	5217	134.11	5644	5644	9	1036	1036	1	6534	6534	0	1064	1064	0	12178	2100	18	Engine Fire	UA structural desintegration - Debris Impact
1104	37	3185	Friday	09:39:46	7237	1087	366.31	5744	5744	0	936	936	0	6572	6572	0	1026	1026	0	12316	1962	37	Short Circuit / Overload	Central UA ground impact point below flight path
1106	3	322	Sunday	06:12:27	7986	1034	20.75	6513	6513	0	167	167	0	7332	7332	0	266	266	0	13845	433	72	Degradation of altitude	UA approaches Emergency landing site
1106	55	80	Sunday	11:21:53	7843	645	536.50	4943	4943	0	1737	1737	0	5660	5660	0	1938	1938	0	10603	3675	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
1107	16	3094	Monday	07:34:30	7107	1336	157.50	5644	5644	17	1036	1036	0	6534	6534	0	1064	1064	0	12178	2100	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
1120	36	1861	Sunday	09:31:37	6536	5193	352.72	5878	5878	12	802	802	1	6610	6610	0	988	988	0	12488	1790	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1122	67	1387	Tuesday	12:35:33	7122	4741	659.28	5344	5344	0	1336	1336	0	6306	6306	0	1292	1292	0	11650	2628	66	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point below flight path
1123	112	820	Wednesday	17:02:46	7835	2732	1104.61	4943	4943	0	1737	1737	0	5660	5660	0	1938	1938	0	10603	3675	13	Engine Anomaly	UA approaches Emergency landing site
1123	97	223	Wednesday	15:32:23	7943	829	954.00	5344	5344	0	1336	1336	0	5964	5964	0	1634	1634	1	11308	2970	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1126	42	2082	Saturday	10:07:45	6391	4880	412.92	4876	4876	0	1804	1804	0	5394	5394	0	2204	2204	0	10270	4008	29	Connection Failure	UA approaches Emergency landing site
1129	31	3327	Tuesday	09:04:15	7437	794	307.11	5678	5678	0	1002	1002	0	6420	6420	0	1178	1178	0	12098	2180	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1131	23	2120	Thursday	08:14:35	6377	4795	224.33	5678	5678	0	1002	1002	0	6496	6496	0	1102	1102	0	12174	2104	28	Generator Failure	UA ground impact tangential to trajectory
1133	113	1751	Saturday	17:10:15	6646	5225	1117.11	5243	5243	0	1437	1437	0	5964	5964	0	1634	1634	0	11207	3071	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1146	57	3443	Friday	11:39:22	7589	650	565.64	5344	5344	0	1336	1336	0	6116	6116	0	1482	1482	0	11460	2818	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1148	72	3395	Sunday	13:08:40	7528	699	714.47	4709	4709	1	1971	1971	2	5470	5470	0	2128	2128	1	10179	4099	21	Engine Fire	UA structural desintegration - Debris Impact
1149	130	1048	Monday	18:50:24	7590	3640	1284.00	4876	4876	0	1804	1804	0	5736	5736	0	1862	1862	0	10612	3666	49	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
1151	8	1373	Wednesday	06:43:58	7142	4706	73.31	5577	5577	0	1103	1103	0	6572	6572	0	1026	1026	0	12149	2129	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
116	23	3581	Thursday	08:17:01	7748	599	228.36	5678	5678	0	1002	1002	0	6496	6496	0	1102	1102	0	12174	2104	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
1172	136	1429	Wednesday	19:26:46	7062	4840	1344.64	6045	6045	0	635	635	0	6914	6914	0	684	684	0	12959	1319	5	Engine Out	No Ground Effect
1178	117	1488	Tuesday	17:33:39	6979	4962	1156.11	5010	5010	0	1670	1670	0	5736	5736	0	1862	1862	0	10746	3532	71	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate
1181	9	2073	Friday	06:51:06	6394	4899	85.17	5644	5644	0	1036	1036	0	6686	6686	0	912	912	0	12330	1948	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
1195	94	3270	Friday	15:19:33	7358	897	932.61	5110	5110	0	1570	1570	0	5774	5774	0	1824	1824	0	10884	3394	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
1200	18	2278	Wednesday	07:45:04	6358	4358	175.11	5577	5577	0	1103	1103	0	6572	6572	0	1026	1026	0	12149	2129	63	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
1203	108	1807	Saturday	16:40:33	6587	5220	1067.61	5243	5243	0	1437	1437	0	5964	5964	0	1634	1634	0	11207	3071	72	Degradation of altitude	UA approaches Emergency landing site
1212	110	1364	Monday	16:51:45	7155	4683	1086.25	4876	4876	0	1804	1804	0	5736	5736	0	1862	1862	0	10612	3666	65	Degradation of lateral and horizontal navigation data accurracy.	UA approaches Emergency landing site
1213	90	532	Tuesday	14:51:12	7996	1643	885.33	5243	5243	0	1437	1437	0	6002	6002	0	1596	1596	0	11245	3033	53	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
1214	62	3568	Wednesday	12:09:22	7735	598	615.64	5544	5544	0	1136	1136	0	6268	6268	0	1330	1330	0	11812	2466	2	Engine Out	UA approaches Emergency landing site
1218	131	630	Sunday	18:55:40	7963	1991	1292.78	6078	6078	0	602	602	0	6686	6686	0	912	912	0	12764	1514	37	Short Circuit / Overload	Central UA ground impact point below flight path
1220	125	1970	Tuesday	18:22:07	6451	5079	1236.89	5010	5010	0	1670	1670	0	5736	5736	0	1862	1862	0	10746	3532	76	Degradation of altitude	Central UA ground impact point below flight path
1229	70	12	Thursday	12:51:09	7780	606	685.28	5544	5544	0	1136	1136	0	6230	6230	0	1368	1368	0	11774	2504	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
123	51	383	Thursday	10:58:33	8000	1188	497.61	5544	5544	0	1136	1136	0	6230	6230	0	1368	1368	0	11774	2504	2	Engine Out	UA approaches Emergency landing site
1246	37	1604	Sunday	09:37:09	6822	5136	361.94	5878	5878	0	802	802	0	6610	6610	0	988	988	0	12488	1790	78	Degradation of altitude	Central UA ground impact point below flight path
1257	113	825	Thursday	17:08:44	7831	2752	1114.56	4976	4976	0	1704	1704	1	5660	5660	0	1938	1938	0	10636	3642	31	Connection Failure	UA ground impact tangential to trajectory
1285	138	754	Thursday	19:37:34	7889	2468	1362.64	6112	6112	0	568	568	0	6876	6876	0	722	722	0	12988	1290	29	Connection Failure	UA approaches Emergency landing site
1287	136	1419	Saturday	19:26:45	7076	4818	1344.61	6112	6112	0	568	568	0	6838	6838	0	760	760	0	12950	1328	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1301	99	1945	Saturday	15:47:10	6468	5112	978.61	5277	5277	0	1403	1403	0	5850	5850	0	1748	1748	0	11127	3151	67	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate
1305	114	1675	Wednesday	17:16:05	6733	5198	1126.83	4943	4943	0	1737	1737	0	5660	5660	0	1938	1938	0	10603	3675	33	Connection Failure	Central UA ground impact point below flight path
1306	4	3126	Thursday	06:23:03	7152	1243	38.42	5711	5711	5	969	969	0	6610	6610	0	988	988	0	12321	1957	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1312	128	2670	Wednesday	18:41:10	6573	2890	1268.61	4943	4943	0	1737	1737	0	5660	5660	0	1938	1938	0	10603	3675	55	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
1314	133	2895	Friday	19:11:19	6832	2006	1318.89	6112	6112	3	568	568	0	6952	6952	0	646	646	0	13064	1214	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1323	71	37	Sunday	12:57:09	7804	616	695.28	4709	4709	0	1971	1971	0	5470	5470	0	2128	2128	0	10179	4099	25	Generator Failure	UA approaches Emergency landing site
1337	138	2607	Sunday	19:40:38	6515	3144	1367.75	6078	6078	0	602	602	0	6686	6686	0	912	912	0	12764	1514	40	Short Circuit / Overload	Central UA ground impact point below flight path
1342	61	2284	Friday	12:01:17	6359	4339	602.17	5344	5344	0	1336	1336	0	6116	6116	0	1482	1482	0	11460	2818	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1353	23	1839	Tuesday	08:14:08	6556	5207	223.56	5678	5678	0	1002	1002	0	6420	6420	0	1178	1178	0	12098	2180	53	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
1357	106	1959	Saturday	16:28:54	6458	5094	1048.17	5243	5243	0	1437	1437	0	5964	5964	0	1634	1634	0	11207	3071	30	Connection Failure	Central UA ground impact point below flight path
1365	64	1796	Sunday	12:18:22	6598	5223	630.61	4943	4943	0	1737	1737	0	5660	5660	0	1938	1938	0	10603	3675	71	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate
1368	35	2289	Wednesday	09:26:22	6359	4323	343.97	5811	5811	0	869	869	0	6420	6420	0	1178	1178	0	12231	2047	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
1377	122	3506	Friday	18:06:47	7665	610	1211.33	5110	5110	0	1570	1570	0	5964	5964	0	1634	1634	0	11074	3204	72	Degradation of altitude	UA approaches Emergency landing site
14	140	1469	Sunday	19:50:41	7005	4925	1384.47	6078	6078	0	602	602	0	6686	6686	0	912	912	0	12764	1514	50	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
149	75	3460	Tuesday	13:26:40	7610	636	744.44	5243	5243	0	1437	1437	0	6002	6002	0	1596	1596	0	11245	3033	37	Short Circuit / Overload	Central UA ground impact point below flight path
151	109	2004	Thursday	16:46:51	6429	5027	1078.08	4976	4976	0	1704	1704	0	5660	5660	0	1938	1938	0	10636	3642	19	Engine Fire	Central UA ground impact point below flight path
151	5	936	Thursday	06:25:23	7721	3200	42.31	5711	5711	0	969	969	0	6610	6610	0	988	988	0	12321	1957	29	Connection Failure	UA approaches Emergency landing site
154	63	1056	Sunday	12:11:11	7580	3671	618.64	4943	4943	3	1737	1737	3	5660	5660	0	1938	1938	0	10603	3675	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
156	123	188	Tuesday	18:07:15	7923	772	1212.11	5010	5010	0	1670	1670	0	5736	5736	0	1862	1862	0	10746	3532	52	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
161	139	2068	Sunday	19:45:42	6396	4909	1376.19	6078	6078	0	602	602	0	6686	6686	0	912	912	0	12764	1514	76	Degradation of altitude	Central UA ground impact point below flight path
181	121	3280	Saturday	18:00:27	7372	878	1200.78	5243	5243	0	1437	1437	0	5964	5964	0	1634	1634	0	11207	3071	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
188	125	3310	Saturday	18:24:21	7414	823	1240.58	5243	5243	0	1437	1437	0	5964	5964	0	1634	1634	0	11207	3071	65	Degradation of lateral and horizontal navigation data accurracy.	UA approaches Emergency landing site
199	80	1531	Wednesday	13:53:16	6919	5036	788.78	5344	5344	0	1336	1336	0	5964	5964	0	1634	1634	0	11308	2970	2	Engine Out	UA approaches Emergency landing site
2	115	371	Tuesday	17:19:53	7998	1156	1133.17	5010	5010	0	1670	1670	0	5736	5736	0	1862	1862	0	10746	3532	35	Connection Failure	UA ground impact tangential to trajectory
2	139	3015	Tuesday	19:47:17	6994	1583	1378.81	6045	6045	0	635	635	0	6952	6952	0	646	646	0	12997	1281	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
201	118	1805	Friday	17:40:08	6589	5220	1166.92	5110	5110	6	1570	1570	3	5964	5964	0	1634	1634	0	11074	3204	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
208	20	3586	Friday	07:59:08	7754	600	198.58	5644	5644	0	1036	1036	0	6686	6686	0	912	912	0	12330	1948	28	Generator Failure	UA ground impact tangential to trajectory
213	124	807	Wednesday	18:14:14	7847	2680	1223.75	4943	4943	0	1737	1737	0	5660	5660	0	1938	1938	0	10603	3675	72	Degradation of altitude	UA approaches Emergency landing site
220	84	2960	Wednesday	14:19:28	6918	1771	832.45	5344	5344	0	1336	1336	0	5964	5964	0	1634	1634	0	11308	2970	74	Degradation of altitude	Central UA ground impact point below flight path
222	86	70	Friday	14:26:36	7834	637	844.33	5110	5110	0	1570	1570	0	5774	5774	0	1824	1824	1	10884	3394	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
241	83	1817	Wednesday	14:11:36	6577	5216	819.36	5344	5344	0	1336	1336	0	5964	5964	0	1634	1634	0	11308	2970	31	Connection Failure	UA ground impact tangential to trajectory
252	12	2228	Sunday	07:09:13	6357	4510	115.39	6513	6513	0	167	167	0	7332	7332	0	266	266	0	13845	433	44	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
254	118	3437	Tuesday	17:42:51	7582	655	1171.42	5010	5010	0	1670	1670	0	5736	5736	0	1862	1862	0	10746	3532	37	Short Circuit / Overload	Central UA ground impact point below flight path
256	61	2335	Thursday	12:01:23	6367	4171	602.31	5544	5544	0	1136	1136	0	6230	6229	0	1368	1368	0	11773	2504	65	Degradation of lateral and horizontal navigation data accurracy.	UA approaches Emergency landing site
262	14	2399	Wednesday	07:21:25	6386	3947	135.72	5577	5577	0	1103	1103	0	6572	6572	0	1026	1026	0	12149	2129	66	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point below flight path
269	63	180	Wednesday	12:09:44	7918	760	616.22	5544	5544	0	1136	1136	0	6268	6268	0	1330	1330	0	11812	2466	66	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point below flight path
27	45	817	Saturday	10:23:31	7838	2720	439.22	4876	4876	0	1804	1804	0	5394	5394	0	2204	2204	0	10270	4008	67	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate
275	22	706	Tuesday	08:06:18	7921	2280	210.50	5678	5678	4	1002	1002	1	6420	6420	0	1178	1178	0	12098	2180	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
276	27	911	Wednesday	08:36:25	7748	3099	260.72	5811	5811	0	869	869	0	6420	6420	0	1178	1178	0	12231	2047	9	Engine Out	UA ground impact tangential to trajectory
292	1	1742	Friday	06:02:52	6656	5224	4.81	5644	5644	0	1036	1036	0	6686	6686	0	912	912	0	12330	1948	65	Degradation of lateral and horizontal navigation data accurracy.	UA approaches Emergency landing site
295	119	2535	Monday	17:47:18	6460	3431	1178.86	4876	4876	0	1804	1804	0	5736	5736	0	1862	1862	0	10612	3666	71	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate
307	138	1651	Saturday	19:39:04	6763	5181	1365.11	6112	6112	0	568	568	0	6838	6838	0	760	760	0	12950	1328	77	Degradation of altitude	Central UA ground impact point below flight path
310	125	470	Tuesday	18:19:39	8004	1441	1232.75	5010	5010	0	1670	1670	0	5736	5736	0	1862	1862	0	10746	3532	78	Degradation of altitude	Central UA ground impact point below flight path
312	115	1791	Thursday	17:22:15	6603	5224	1137.08	4976	4976	1	1704	1704	4	5660	5660	0	1938	1938	0	10636	3642	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
312	96	3270	Thursday	15:31:29	7358	897	952.47	5310	5310	0	1370	1370	0	6040	6040	0	1558	1558	0	11350	2928	29	Connection Failure	UA approaches Emergency landing site
32	4	1233	Thursday	06:19:55	7342	4300	33.19	5711	5711	0	969	969	0	6610	6609	0	988	988	0	12320	1957	27	Generator Failure	UA ground impact tangential to trajectory
335	15	732	Saturday	07:24:37	7904	2381	141.05	6346	6346	0	334	334	0	7256	7256	0	342	342	0	13602	676	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
338	140	1852	Tuesday	19:51:19	6544	5199	1385.53	6045	6045	4	635	635	1	6952	6952	0	646	646	0	12997	1281	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
36	105	111	Monday	16:19:52	7868	673	1033.14	4876	4876	0	1804	1804	0	5736	5736	0	1862	1862	0	10612	3666	34	Connection Failure	UA ground impact tangential to trajectory
367	133	499	Wednesday	19:07:22	8001	1534	1312.28	6045	6045	1	635	635	0	6914	6914	0	684	684	0	12959	1319	11	Engine Anomaly	Central UA ground impact point below flight path
374	81	1203	Wednesday	13:58:40	7384	4201	797.80	5344	5344	1	1336	1336	1	5964	5964	0	1634	1634	0	11308	2970	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
379	81	2512	Monday	14:00:50	6444	3521	801.42	5277	5277	0	1403	1403	0	6002	6002	0	1596	1596	0	11279	2999	28	Generator Failure	UA ground impact tangential to trajectory
380	104	479	Tuesday	16:14:32	8004	1470	1024.22	5010	5010	0	1670	1670	0	5736	5736	0	1862	1862	0	10746	3532	68	Degradation of lateral and horizontal navigation data accurracy.	UA approaches Emergency landing site
400	93	3124	Monday	15:13:21	7150	1249	922.28	5277	5277	15	1403	1403	3	6002	6002	0	1596	1596	0	11279	2999	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
405	57	825	Saturday	11:35:02	7831	2752	558.42	4876	4876	7	1804	1804	1	5394	5394	0	2204	2204	0	10270	4008	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
405	68	1352	Saturday	12:41:28	7172	4652	669.11	4876	4876	0	1804	1804	0	5394	5394	0	2204	2204	0	10270	4008	31	Connection Failure	UA ground impact tangential to trajectory
410	69	1931	Thursday	12:48:23	6478	5129	680.64	5544	5544	0	1136	1136	0	6230	6230	0	1368	1368	0	11774	2504	25	Generator Failure	UA approaches Emergency landing site
410	84	2215	Thursday	14:18:14	6358	4547	830.39	5310	5310	0	1370	1370	0	6040	6040	0	1558	1558	0	11350	2928	17	Engine Fire	Central UA ground impact point below flight path
423	108	1968	Wednesday	16:40:49	6452	5082	1068.05	4943	4943	0	1737	1737	0	5660	5659	0	1938	1938	0	10602	3675	71	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate
434	47	3133	Sunday	10:39:17	7163	1224	465.47	4943	4943	0	1737	1737	0	5660	5660	0	1938	1938	0	10603	3675	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
438	22	2488	Thursday	08:09:14	6430	3614	215.42	5678	5678	0	1002	1002	0	6496	6496	0	1102	1102	0	12174	2104	73	Degradation of altitude	Central UA ground impact point below flight path
439	99	2005	Friday	15:47:15	6429	5025	978.78	5110	5110	0	1570	1570	0	5774	5774	0	1824	1824	0	10884	3394	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
440	116	1907	Saturday	17:28:24	6497	5155	1147.33	5243	5243	0	1437	1437	0	5964	5964	0	1634	1634	0	11207	3071	35	Connection Failure	UA ground impact tangential to trajectory
445	120	3507	Thursday	17:54:53	7667	610	1191.47	4976	4976	0	1704	1704	0	5660	5660	0	1938	1938	0	10636	3642	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
478	23	3067	Tuesday	08:16:10	7068	1417	226.94	5678	5678	0	1002	1002	0	6420	6420	0	1178	1178	0	12098	2180	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
482	105	182	Saturday	16:20:00	7919	763	1033.33	5243	5243	0	1437	1437	0	5964	5964	0	1634	1634	0	11207	3071	22	Generator Failure	UA approaches Emergency landing site
489	65	2455	Saturday	12:25:25	6411	3740	642.36	4876	4876	0	1804	1804	0	5394	5394	0	2204	2204	0	10270	4008	72	Degradation of altitude	UA approaches Emergency landing site
5	30	1772	Friday	08:55:44	6623	5226	292.89	5744	5744	5	936	936	0	6572	6572	0	1026	1026	0	12316	1962	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
50	116	406	Monday	17:25:54	8003	1251	1143.19	4876	4876	0	1804	1804	0	5736	5736	0	1862	1862	0	10612	3666	69	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point below flight path
50	41	355	Monday	09:58:56	7995	1115	398.22	5277	5277	0	1403	1403	0	6306	6306	0	1292	1292	0	11583	2695	76	Degradation of altitude	Central UA ground impact point below flight path
501	31	2310	Thursday	09:02:34	6362	4254	304.30	5678	5678	0	1002	1002	0	6496	6496	0	1102	1102	0	12174	2104	63	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
503	8	2390	Saturday	06:45:39	6383	3979	76.11	6346	6346	1	334	334	0	7256	7256	0	342	342	0	13602	676	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
508	118	1483	Thursday	17:39:36	6986	4952	1166.03	4976	4976	0	1704	1704	0	5660	5660	0	1938	1938	0	10636	3642	10	Engine Anomaly	UA approaches Emergency landing site
513	68	1462	Tuesday	12:41:38	7015	4911	669.42	5344	5344	0	1336	1336	0	6306	6306	0	1292	1292	0	11650	2628	12	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
524	10	889	Saturday	06:55:05	7771	3011	91.83	6346	6346	0	334	334	0	7256	7256	0	342	342	0	13602	676	51	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
529	21	258	Thursday	07:59:35	7961	895	199.33	5678	5678	0	1002	1002	0	6496	6496	0	1102	1102	0	12174	2104	23	Generator Failure	Central UA ground impact point below flight path
53	96	1175	Thursday	15:28:00	7423	4105	946.69	5310	5310	0	1370	1370	0	6040	6040	0	1558	1558	0	11350	2928	22	Generator Failure	UA approaches Emergency landing site
533	68	3557	Monday	12:45:07	7723	598	675.19	5277	5277	0	1403	1403	0	6306	6306	0	1292	1292	0	11583	2695	78	Degradation of altitude	Central UA ground impact point below flight path
538	80	1480	Saturday	13:53:10	6990	4946	788.64	5277	5277	0	1403	1403	0	5850	5850	0	1748	1748	0	11127	3151	22	Generator Failure	UA approaches Emergency landing site
54	44	3098	Friday	10:21:20	7112	1324	435.58	5344	5344	0	1336	1336	0	6116	6116	0	1482	1482	0	11460	2818	78	Degradation of altitude	Central UA ground impact point below flight path
548	12	1795	Tuesday	07:08:30	6599	5223	114.19	5611	5611	0	1069	1069	0	6572	6572	0	1026	1026	0	12183	2095	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
551	51	796	Friday	10:59:14	7856	2636	498.75	5344	5344	0	1336	1336	0	6116	6116	0	1482	1482	0	11460	2818	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
551	90	2445	Friday	14:54:21	6406	3777	890.61	5110	5110	0	1570	1570	0	5774	5774	0	1824	1824	0	10884	3394	12	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
553	81	2683	Sunday	14:01:07	6585	2838	801.89	4709	4709	0	1971	1971	0	5470	5470	0	2128	2128	0	10179	4099	75	Degradation of altitude	UA approaches Emergency landing site
556	7	3151	Wednesday	06:40:58	7188	1175	68.28	5577	5577	0	1103	1103	2	6572	6572	0	1026	1026	0	12149	2129	18	Engine Fire	UA structural desintegration - Debris Impact
560	129	3480	Sunday	18:48:28	7635	623	1280.78	5043	5043	0	1637	1637	0	5546	5546	0	2052	2052	0	10589	3689	78	Degradation of altitude	Central UA ground impact point below flight path
568	56	2663	Monday	11:32:07	6566	2918	553.56	5277	5277	0	1403	1403	0	6306	6306	0	1292	1292	0	11583	2695	71	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate
570	1	2618	Wednesday	06:04:19	6525	3100	7.22	5577	5577	0	1103	1103	1	6572	6572	0	1026	1026	0	12149	2129	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
576	129	2745	Tuesday	18:47:15	6650	2588	1278.75	5010	5010	0	1670	1670	0	5736	5736	0	1862	1862	0	10746	3532	15	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
576	18	2	Tuesday	07:41:18	7770	603	168.83	5611	5611	0	1069	1069	0	6572	6572	0	1026	1026	0	12183	2095	6	Engine Out	UA approaches Emergency landing site
577	138	2859	Wednesday	19:41:04	6786	2142	1368.44	6045	6045	0	635	635	0	6914	6914	0	684	684	0	12959	1319	2	Engine Out	UA approaches Emergency landing site
592	40	1045	Thursday	09:54:07	7594	3629	390.19	5678	5678	0	1002	1002	0	6496	6496	0	1102	1102	0	12174	2104	10	Engine Anomaly	UA approaches Emergency landing site
597	2	1435	Tuesday	06:08:20	7053	4854	13.89	5611	5611	0	1069	1069	0	6572	6572	0	1026	1026	0	12183	2095	51	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
606	129	1224	Thursday	18:44:43	7355	4270	1274.55	4976	4976	0	1704	1704	0	5660	5660	0	1938	1938	0	10636	3642	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
611	96	470	Tuesday	15:26:50	8004	1441	944.75	5243	5243	1	1437	1437	0	6002	6002	0	1596	1596	0	11245	3033	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
639	18	3113	Tuesday	07:46:26	7134	1280	177.42	5611	5611	10	1069	1069	1	6572	6572	0	1026	1026	0	12183	2095	21	Engine Fire	UA structural desintegration - Debris Impact
645	68	1493	Monday	12:41:42	6972	4971	669.50	5277	5277	0	1403	1403	0	6306	6306	0	1292	1292	0	11583	2695	35	Connection Failure	UA ground impact tangential to trajectory
651	108	1022	Sunday	16:39:16	7622	3540	1065.44	5043	5043	0	1637	1637	0	5546	5546	0	2052	2052	0	10589	3689	1	Engine Out	No Ground Effect
653	1	3172	Tuesday	06:05:15	7219	1120	8.75	5611	5611	0	1069	1069	0	6572	6572	0	1026	1026	0	12183	2095	27	Generator Failure	UA ground impact tangential to trajectory
654	46	2604	Wednesday	10:32:26	6513	3156	454.08	5544	5544	0	1136	1136	0	6268	6268	0	1330	1330	0	11812	2466	22	Generator Failure	UA approaches Emergency landing site
660	116	1292	Tuesday	17:27:22	7258	4483	1145.64	5010	5010	0	1670	1670	3	5736	5736	0	1862	1862	0	10746	3532	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
661	124	908	Wednesday	18:14:24	7751	3087	1224.03	4943	4943	0	1737	1737	0	5660	5660	0	1938	1938	0	10603	3675	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
665	42	2666	Sunday	10:08:43	6569	2906	414.53	4943	4943	3	1737	1737	4	5660	5660	0	1938	1938	0	10603	3675	21	Engine Fire	UA structural desintegration - Debris Impact
669	28	987	Thursday	08:42:31	7664	3403	270.86	5678	5678	0	1002	1002	0	6496	6496	0	1102	1102	0	12174	2104	29	Connection Failure	UA approaches Emergency landing site
669	93	234	Thursday	15:08:34	7949	849	914.30	5310	5310	0	1370	1370	0	6040	6040	0	1558	1558	0	11350	2928	58	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
684	20	163	Friday	07:53:29	7907	735	189.14	5644	5644	0	1036	1036	0	6686	6686	0	912	912	1	12330	1948	21	Engine Fire	UA structural desintegration - Debris Impact
692	101	1109	Saturday	15:57:42	7512	3869	996.17	5243	5243	0	1437	1437	0	5964	5964	0	1634	1634	0	11207	3071	1	Engine Out	No Ground Effect
70	124	3395	Sunday	18:18:31	7528	699	1230.89	5043	5043	0	1637	1637	0	5546	5546	0	2052	2052	0	10589	3689	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
715	30	2134	Monday	08:56:19	6373	4762	293.89	5678	5678	0	1002	1002	0	6420	6420	0	1178	1178	0	12098	2180	28	Generator Failure	UA ground impact tangential to trajectory
726	61	1851	Friday	12:00:34	6545	5200	600.97	5344	5344	6	1336	1336	0	6116	6116	0	1482	1482	0	11460	2818	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
727	12	1674	Saturday	07:08:18	6734	5197	113.86	6346	6346	0	334	334	0	7256	7256	0	342	342	0	13602	676	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
728	83	730	Sunday	14:09:49	7906	2373	816.36	4709	4709	0	1971	1971	2	5470	5470	0	2128	2128	0	10179	4099	21	Engine Fire	UA structural desintegration - Debris Impact
731	117	3160	Wednesday	17:36:26	7201	1151	1160.72	4943	4943	0	1737	1737	0	5660	5660	0	1938	1938	0	10603	3675	39	Short Circuit / Overload	Central UA ground impact point below flight path
745	73	7	Wednesday	13:09:02	7775	604	715.06	5344	5344	0	1336	1336	0	5964	5964	0	1634	1634	0	11308	2970	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
750	74	2821	Monday	13:19:39	6738	2288	732.75	5277	5277	3	1403	1403	3	6002	6002	0	1596	1596	0	11279	2999	63	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
765	138	2335	Tuesday	19:40:11	6367	4171	1367.00	6045	6045	0	635	635	0	6952	6952	0	646	646	0	12997	1281	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
779	117	3452	Tuesday	17:36:55	7601	642	1161.53	5010	5010	0	1670	1670	0	5736	5736	0	1862	1862	0	10746	3532	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
784	52	26	Sunday	11:03:56	7793	611	506.56	4943	4943	0	1737	1737	0	5660	5660	0	1938	1938	0	10603	3675	17	Engine Fire	Central UA ground impact point below flight path
798	126	1139	Sunday	18:26:42	7472	3978	1244.53	5043	5043	0	1637	1637	0	5546	5546	0	2052	2052	0	10589	3689	31	Connection Failure	UA ground impact tangential to trajectory
807	109	2205	Tuesday	16:47:11	6359	4575	1078.64	5010	5010	0	1670	1670	0	5736	5736	0	1862	1862	0	10746	3532	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
808	130	3163	Wednesday	18:53:54	7206	1143	1289.83	4943	4943	0	1737	1737	0	5660	5660	0	1938	1938	0	10603	3675	55	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
812	5	301	Sunday	06:24:19	7979	985	40.55	6513	6513	0	167	167	0	7332	7332	0	266	266	0	13845	433	71	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate
825	50	3097	Saturday	10:57:05	7111	1327	495.17	4876	4876	0	1804	1804	0	5394	5394	0	2204	2204	0	10270	4008	45	Partial Lock of Flight Control Surfaces	Central UA ground impact point below flight path
830	91	2641	Thursday	15:00:38	6545	3007	901.08	5310	5310	0	1370	1370	4	6040	6040	0	1558	1558	0	11350	2928	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
831	140	1932	Friday	19:51:26	6478	5128	1385.75	6112	6112	0	568	568	1	6952	6952	0	646	646	0	13064	1214	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
835	60	1313	Tuesday	11:53:44	7228	4544	589.56	5344	5344	0	1336	1336	0	6306	6306	0	1292	1292	0	11650	2628	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
851	31	2038	Thursday	09:02:07	6411	4968	303.55	5678	5678	0	1002	1002	4	6496	6496	0	1102	1102	0	12174	2104	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
861	13	3431	Sunday	07:17:10	7574	661	128.64	6513	6513	0	167	167	0	7332	7332	0	266	266	0	13845	433	29	Connection Failure	UA approaches Emergency landing site
871	38	2062	Wednesday	09:43:52	6399	4921	373.14	5811	5811	0	869	869	0	6420	6420	0	1178	1178	0	12231	2047	67	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate
875	112	568	Sunday	17:02:20	7986	1767	1103.92	5043	5043	0	1637	1637	0	5546	5546	0	2052	2052	0	10589	3689	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
876	24	1652	Monday	08:19:46	6761	5182	232.97	5678	5678	0	1002	1002	0	6420	6420	0	1178	1178	0	12098	2180	37	Short Circuit / Overload	Central UA ground impact point below flight path
90	4	1283	Saturday	06:19:59	7271	4456	33.33	6346	6346	0	334	334	0	7256	7256	0	342	342	0	13602	676	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
908	116	1111	Friday	17:27:04	7509	3877	1145.14	5110	5110	0	1570	1570	1	5964	5964	0	1634	1634	0	11074	3204	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact

919	113	492	Tuesday	17:08:10	8002	1511	1113.64	5010	5010	0	1670	1670	0	5736	5736	0	1862	1862	0	10746	3532	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
925	108	3569	Monday	16:43:28	7736	598	1072.47	4876	4876	0	1804	1804	0	5736	5736	0	1862	1862	0	10612	3666	58	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
925	135	2703	Monday	19:22:55	6606	2757	1338.22	6112	6112	0	568	568	0	6914	6914	0	684	684	0	13026	1252	30	Connection Failure	Central UA ground impact point below flight path
93	73	1839	Tuesday	13:12:03	6556	5207	720.11	5243	5243	0	1437	1437	0	6002	6002	0	1596	1596	0	11245	3033	72	Degradation of altitude	UA approaches Emergency landing site
960	139	1766	Monday	19:45:12	6629	5226	1375.36	6112	6112	0	568	568	0	6914	6914	0	684	684	0	13026	1252	76	Degradation of altitude	Central UA ground impact point below flight path
965	85	196	Saturday	14:20:51	7928	784	834.75	5277	5277	0	1403	1403	0	5850	5850	0	1748	1748	0	11127	3151	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
972	28	2094	Saturday	08:44:20	6386	4854	273.92	5678	5678	8	1002	1002	1	6306	6306	0	1292	1292	0	11984	2294	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
972	99	1401	Saturday	15:46:15	7102	4776	977.11	5277	5277	0	1403	1403	1	5850	5850	0	1748	1748	0	11127	3151	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
976	105	1511	Wednesday	16:22:12	6947	5003	1037.00	4943	4943	0	1737	1737	0	5660	5660	0	1938	1938	0	10603	3675	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
983	8	2702	Wednesday	06:46:10	6605	2761	76.97	5577	5577	0	1103	1103	0	6572	6572	0	1026	1026	0	12149	2129	28	Generator Failure	UA ground impact tangential to trajectory
990	24	3364	Wednesday	08:22:37	7487	738	237.69	5811	5811	0	869	869	0	6420	6420	0	1178	1178	0	12231	2047	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
994	104	116	Sunday	16:13:55	7872	678	1023.22	5043	5043	0	1637	1637	0	5546	5546	0	2052	2052	0	10589	3689	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site

O.R.C.U.S. 02.00 - tTest of the Simulation

nProbes	200
nEvents	195
nEvents_cor	181
tMission	14
x_cross_ATB	0.63
x_cross_OTW	0.27
x_cross_TOT	0.9
s2ATB	0.3713424
sATB	0.6093787
tATB	14.388629
s2OTW	0.0664916
sOTW	0.2578597
tOTW	14.259517
s2TOT	0.7392575
sTOT	0.8598009
tTOT	14.638856

UADay/Prot	HIT_TOT_ATB	HIT_TOT_OTW	UADay/Prot cor	HIT_TOT_mean_ATB	HIT_TOT_mean_OTW	HIT_TOT_mean_ATB/Fh	HIT_TOT_mean_OTW/Fh	x_i-x_cross ATB	x_i-x_cross OTW	(x_i-x_cross ATB)^2	(x_i-x_cross OTW)^2
2	0	0	2	0	0	0	0	-0.63	-0.27	0.3969	0.0729
2	0	0	5	5	0	0.357142857	0	-0.272857143	-0.27	0.07445102	0.0729
5	5	0	14	0	0	0	0	-0.63	-0.27	0.3969	0.0729
14	0	0	27	0	0	0	0	-0.63	-0.27	0.3969	0.0729
27	0	0	32	0	0	0	0	-0.63	-0.27	0.3969	0.0729
32	0	0	36	0	0	0	0	-0.63	-0.27	0.3969	0.0729
36	0	0	50	0	0	0	0	-0.63	-0.27	0.3969	0.0729
50	0	0	53	0	0	0	0	-0.63	-0.27	0.3969	0.0729
50	0	0	54	0	0	0	0	-0.63	-0.27	0.3969	0.0729
53	0	0	70	0	0	0	0	-0.63	-0.27	0.3969	0.0729
54	0	0	90	0	0	0	0	-0.63	-0.27	0.3969	0.0729
70	0	0	93	0	0	0	0	-0.63	-0.27	0.3969	0.0729
90	0	0	100	0	0	0	0	-0.63	-0.27	0.3969	0.0729
93	0	0	116	0	0	0	0	-0.63	-0.27	0.3969	0.0729
100	0	0	123	0	0	0	0	-0.63	-0.27	0.3969	0.0729
116	0	0	149	0	0	0	0	-0.63	-0.27	0.3969	0.0729
123	0	0	151	0	0	0	0	-0.63	-0.27	0.3969	0.0729
149	0	0	154	3	3	0.214285714	0.214285714	-0.415714286	-0.055714286	0.172818367	0.003104082
151	0	0	156	0	0	0	0	-0.63	-0.27	0.3969	0.0729
151	0	0	161	0	0	0	0	-0.63	-0.27	0.3969	0.0729
154	3	3	181	0	0	0	0	-0.63	-0.27	0.3969	0.0729
156	0	0	188	0	0	0	0	-0.63	-0.27	0.3969	0.0729
161	0	0	199	0	0	0	0	-0.63	-0.27	0.3969	0.0729
181	0	0	201	6	3	0.428571429	0.214285714	-0.201428571	-0.055714286	0.040573469	0.003104082
188	0	0	208	0	0	0	0	-0.63	-0.27	0.3969	0.0729
199	0	0	213	0	0	0	0	-0.63	-0.27	0.3969	0.0729
201	6	3	220	0	0	0	0	-0.63	-0.27	0.3969	0.0729
208	0	0	222	0	1	0	0.071428571	-0.63	-0.198571429	0.3969	0.039430612
213	0	0	241	0	0	0	0	-0.63	-0.27	0.3969	0.0729
220	0	0	252	0	0	0	0	-0.63	-0.27	0.3969	0.0729
222	0	1	254	0	0	0	0	-0.63	-0.27	0.3969	0.0729
241	0	0	256	0	0	0	0	-0.63	-0.27	0.3969	0.0729
252	0	0	262	0	0	0	0	-0.63	-0.27	0.3969	0.0729
254	0	0	269	0	0	0	0	-0.63	-0.27	0.3969	0.0729
256	0	0	275	4	1	0.285714286	0.071428571	-0.344285714	-0.198571429	0.118532653	0.039430612
262	0	0	276	0	0	0	0	-0.63	-0.27	0.3969	0.0729
269	0	0	292	0	0	0	0	-0.63	-0.27	0.3969	0.0729
275	4	1	295	0	0	0	0	-0.63	-0.27	0.3969	0.0729
276	0	0	307	0	0	0	0	-0.63	-0.27	0.3969	0.0729
292	0	0	310	0	0	0	0	-0.63	-0.27	0.3969	0.0729
295	0	0	312	1	4	0.071428571	0.285714286	-0.558571429	0.015714286	0.312002041	0.000246939
307	0	0	335	0	0	0	0	-0.63	-0.27	0.3969	0.0729
310	0	0	338	4	1	0.285714286	0.071428571	-0.344285714	-0.198571429	0.118532653	0.039430612
312	1	4	367	1	0	0.071428571	0	-0.558571429	-0.27	0.312002041	0.0729
312	0	0	374	1	1	0.071428571	0.071428571	-0.558571429	-0.198571429	0.312002041	0.039430612
335	0	0	379	0	0	0	0	-0.63	-0.27	0.3969	0.0729
338	4	1	380	0	0	0	0	-0.63	-0.27	0.3969	0.0729
367	1	0	400	15	3	1.071428571	0.214285714	0.441428571	-0.055714286	0.194859184	0.003104082
374	1	1	405	7	1	0.5	0.071428571	-0.13	-0.198571429	0.0169	0.039430612
379	0	0	410	0	0	0	0	-0.63	-0.27	0.3969	0.0729
380	0	0	423	0	0	0	0	-0.63	-0.27	0.3969	0.0729
400	15	3	434	0	0	0	0	-0.63	-0.27	0.3969	0.0729
405	7	1	438	0	0	0	0	-0.63	-0.27	0.3969	0.0729
405	0	0	439	0	0	0	0	-0.63	-0.27	0.3969	0.0729
410	0	0	440	0	0	0	0	-0.63	-0.27	0.3969	0.0729
410	0	0	445	0	0	0	0	-0.63	-0.27	0.3969	0.0729
423	0	0	478	0	0	0	0	-0.63	-0.27	0.3969	0.0729
434	0	0	482	0	0	0	0	-0.63	-0.27	0.3969	0.0729
438	0	0	489	0	0	0	0	-0.63	-0.27	0.3969	0.0729
439	0	0	501	0	0	0	0	-0.63	-0.27	0.3969	0.0729
440	0	0	503	1	0	0.071428571	0	-0.558571429	-0.27	0.312002041	0.0729
445	0	0	508	0	0	0	0	-0.63	-0.27	0.3969	0.0729
478	0	0	513	0	0	0	0	-0.63	-0.27	0.3969	0.0729
482	0	0	524	0	0	0	0	-0.63	-0.27	0.3969	0.0729
489	0	0	529	0	0	0	0	-0.63	-0.27	0.3969	0.0729
501	0	0	533	0	0	0	0	-0.63	-0.27	0.3969	0.0729
503	1	0	538	0	0	0	0	-0.63	-0.27	0.3969	0.0729
508	0	0	548	0	0	0	0	-0.63	-0.27	0.3969	0.0729
513	0	0	551	0	0	0	0	-0.63	-0.27	0.3969	0.0729
524	0	0	553	0	0	0	0	-0.63	-0.27	0.3969	0.0729
529	0	0	556	0	2	0	0.142857143	-0.63	-0.127142857	0.3969	0.016165306
533	0	0	560	0	0	0	0	-0.63	-0.27	0.3969	0.0729
538	0	0	568	0	0	0	0	-0.63	-0.27	0.3969	0.0729
548	0	0	570	0	1	0	0.071428571	-0.63	-0.198571429	0.3969	0.039430612
551	0	0	576	0	0	0	0	-0.63	-0.27	0.3969	0.0729
551	0	0	577	0	0	0	0	-0.63	-0.27	0.3969	0.0729
553	0	0	592	0	0	0	0	-0.63	-0.27	0.3969	0.0729
556	0	2	597	0	0	0	0	-0.63	-0.27	0.3969	0.0729
560	0	0	606	0	0	0	0	-0.63	-0.27	0.3969	0.0729
568	0	0	611	1	0	0.071428571	0	-0.558571429	-0.27	0.312002041	0.0729
570	0	1	639	10	1	0.714285714	0.071428571	0.084285714	-0.198571429	0.007104082	0.039430612
576	0	0	645	0	0	0	0	-0.63	-0.27	0.3969	0.0729
576	0	0	651	0	0	0	0	-0.63	-0.27	0.3969	0.0729
577	0	0	653	0	0	0	0	-0.63	-0.27	0.3969	0.0729
592	0	0	654	0	0	0	0	-0.63	-0.27	0.3969	0.0729
597	0	0	660	0	3	0	0.214285714	-0.63	-0.055714286	0.3969	0.003104082
606	0	0	661	0	0	0	0	-0.63	-0.27	0.3969	0.0729
611	1	0	665	3	4	0.214285714	0.285714286	-0.415714286	0.015714286	0.172818367	0.000246939
639	10	1	669	0	0	0	0	-0.63	-0.27	0.3969	0.0729
645	0	0	684	0	1	0	0.071428571	-0.63	-0.198571429	0.3969	0.039430612
651	0	0	692	0	0	0	0	-0.63	-0.27	0.3969	0.0729
653	0	0	715	0	0	0	0	-0.63	-0.27	0.3969	0.0729
654	0	0	726	6	0	0.428571429	0	-0.201428571	-0.27	0.040573469	0.0729
660	0	3	727	0	0	0	0	-0.63	-0.27	0.3969	0.0729
661	0	0	728	0	2	0	0.142857143	-0.63	-0.127142857	0.3969	0.016165306
665	3	4	731	0	0	0	0	-0.63	-0.27	0.3969	0.0729
669	0	0	745	0	0	0	0	-0.63	-0.27	0.3969	0.0729
669	0	0	750	3	3	0.214285714	0.214285714	-0.415714286	-0.055714286	0.172818367	0.003104082
684	0	1	765	0	0	0	0	-0.63	-0.27	0.3969	0.0729
692	0	0	779	0	0	0	0	-0.63	-0.27	0.3969	0.0729
715	0	0	784	0	0	0	0	-0.63	-0.27	0.3969	0.0729
726	6	0	798	0	0	0	0	-0.63	-0.27	0.3969	0.0729
727	0	0	807	0	0	0	0	-0.63	-0.27	0.3969	0.0729
728	0	2	808	0	0	0	0	-0.63	-0.27	0.3969	0.0729
731	0	0	812	0	0	0	0	-0.63	-0.27	0.3969	0.0729
745	0	0	825	0	0	0	0	-0.63	-0.27	0.3969	0.0729
750	3	3	830	0	4	0	0.285714286	-0.63	0.015714286	0.3969	0.000246939
765	0	0	831	0	1	0	0.071428571	-0.63	-0.198571429	0.3969	0.039430612
779	0	0	835	0	0	0	0	-0.63	-0.27	0.3969	0.0729
784	0	0	851	0	4	0	0.285714286	-0.63	0.015714286	0.3969	0.000246939
798	0	0	861	0	0	0	0	-0.63	-0.27	0.3969	0.0729
807	0	0	871	0	0	0	0	-0.63	-0.27	0.3969	0.0729
808	0	0	875	0	0	0	0	-0.63	-0.27	0.3969	0.0729
812	0	0	876	0	0	0	0	-0.63	-0.27	0.3969	0.0729
825	0	0	908	0	1	0	0.071428571	-0.63	-0.198571429	0.3969	0.039430612
830	0	4	919	0	0	0	0	-0.63	-0.27	0.3969	0.0729
831	0	1	925	0	0	0	0	-0.63	-0.27	0.3969	0.0729
835	0	0	960	0	0	0	0	-0.63	-0.27	0.3969	0.0729
851	0	4	965	0	0	0	0	-0.63	-0.27	0.3969	0.0729
861	0	0	972	8	2	0.571428571	0.142857143	-0.058571429	-0.127142857	0.003430612	0.016165306
871	0	0	976	0	0	0	0	-0.63	-0.27	0.3969	0.0729
875	0	0	983	0	0	0	0	-0.63	-0.27	0.3969	0.0729
876	0	0	990	0	0	0	0	-0.63	-0.27	0.3969	0.0729
908	0	1	994	0	0	0	0	-0.63	-0.27	0.3969	0.0729
919	0	0	1001	0	0	0	0	-0.63	-0.27	0.3969	0.0729
925	0	0	1010	0	0	0	0	-0.63	-0.27	0.3969	0.0729
925	0	0	1013	0	0	0	0	-0.63	-0.27	0.3969	0.0729
960	0	0	1015	0	0	0	0	-0.63	-0.27	0.3969	0.0729
965	0	0	1026	0	0	0	0	-0.63	-0.27	0.3969	0.0729
972	8	1	1028	0	0	0	0	-0.63	-0.27	0.3969	0.0729
972	0	1	1033	0	0	0	0	-0.63	-0.27	0.3969	0.0729
976	0	0	1036	0	0	0	0	-0.63	-0.27	0.3969	0.0729
983	0	0	1060	0	0	0	0	-0.63	-0.27	0.3969	0.0729
990	0	0	1068	0	0	0	0	-0.63	-0.27	0.3969	0.0729
994	0	0	1078	0	0	0	0	-0.63	-0.27	0.3969	0.0729
1001	0	0	1081	0	0	0	0	-0.63	-0.27	0.3969	0.0729
1010	0	0	1093	0	0	0	0	-0.63	-0.27	0.3969	0.0729
1013	0	0	1100	9	1	0.642857143	0.071428571	0.012857143	-0.198571429	0.000165306	0.039430612
1015	0	0	1104	0	0	0	0	-0.63	-0.27	0.3969	0.0729
1026	0	0	1106	0	0	0	0	-0.63	-0.27	0.3969	0.0729
1028	0	0	1107	17	0	1.214285714	0	0.584285714	-0.27	0.341389796	0.0729
1033	0	0	1120	12	1	0.857142857	0.071428571	0.227142857	-0.198571429	0.051593878	0.039430612
1036	0	0	1122	0	0	0	0	-0.63	-0.27	0.3969	0.0729
1060	0	0	1123	0	1	0	0.071428571	-0.63	-0.198571429	0.3969	0.039430612
1068	0	0	1126	0	0	0	0	-0.63	-0.27	0.3969	0.0729
1078	0	0	1129	0	0	0	0	-0.63	-0.27	0.3969	0.0729
1081	0	0	1131	0	0	0	0	-0.63	-0.27	0.3969	0.0729
1093	0	0	1133	0	0	0	0	-0.63	-0.27	0.3969	0.0729
1093	0	0	1146	0	0	0	0	-0.63	-0.27	0.3969	0.0729
1100	9	1	1148	1	3	0.071428571	0.214285714	-0.558571429	-0.055714286	0.312002041	0.003104082
1104	0	0	1149	0	0	0	0	-0.63	-0.27	0.3969	0.0729
1106	0	0	1151	0	0	0	0	-0.63	-0.27	0.3969	0.0729
1106	0	0	1172	0	0	0	0	-0.63	-0.27	0.3969	0.0729
1107	17	0	1178	0	0	0	0	-0.63	-0.27	0.3969	0.0729
1120	12	1	1181	0	0	0	0	-0.63	-0.27	0.3969	0.0729
1122	0	0	1195	0	0	0	0	-0.63	-0.27	0.3969	0.0729
1123	0	0	1200	0	0	0	0	-0.63	-0.27	0.3969	0.0729
1123	0	1	1203	0	0	0	0	-0.63	-0.27	0.3969	0.0729
1126	0	0	1212	0	0	0	0	-0.63	-0.27	0.3969	0.0729
1129	0	0	1213	0	0	0	0	-0.63	-0.27	0.3969	0.0729
1131	0	0	1214	0	0	0	0	-0.63	-0.27	0.3969	0.0729
1133	0	0	1218	0	0	0	0	-0.63	-0.27	0.3969	0.0729
1146	0	0	1220	0	0	0	0	-0.63	-0.27	0.3969	0.0729
1148	1	3	1229	0	0	0	0	-0.63	-0.27	0.3969	0.0729
1149	0	0	1246	0	0	0	0	-0.63	-0.27	0.3969	0.0729
1151	0	0	1257	0	1	0	0.071428571	-0.63	-0.198571429	0.3969	0.039430612
1172	0	0	1285	0	0	0	0	-0.63	-0.27	0.3969	0.0729
1178	0	0	1287	0	0	0	0	-0.63	-0.27	0.3969	0.0729
1181	0	0	1301	0	0	0	0	-0.63	-0.27	0.3969	0.0729
1195	0	0	1305	0	0	0	0	-0.63	-0.27	0.3969	0.0729
1200	0	0	1306	5	0	0.357142857	0	-0.272857143	-0.27	0.07445102	0.0729
1203	0	0	1312	0	0	0	0	-0.63	-0.27	0.3969	0.0729
1212	0	0	1314	3	0	0.214285714	0	-0.415714286	-0.27	0.172818367	0.0729
1213	0	0	1323	0	0	0	0	-0.63	-0.27	0.3969	0.0729
1214	0	0	1337	0	0	0	0	-0.63	-0.27	0.3969	0.0729
1218	0	0	1342	0	0	0	0	-0.63	-0.27	0.3969	0.0729
1220	0	0	1353	0	0	0	0	-0.63	-0.27	0.3969	0.0729
1229	0	0	1357	0	0	0	0	-0.63	-0.27	0.3969	0.0729
1246	0	0	1365	0	0	0	0	-0.63	-0.27	0.3969	0.0729
1257	0	1	1368	0	0	0	0	-0.63	-0.27	0.3969	0.0729
1285	0	0	1377	0	0	0	0	-0.63	-0.27	0.3969	0.0729
1287	0	0									
1301	0	0									
1305	0	0									
1306	5	0									
1312	0	0									
1314	3	0									
1323	0	0									
1337	0	0									
1342	0	0									
1353	0	0									
1357	0	0									
1365	0	0									
1368	0	0									
1377	0	0									

11.4.8 Frankfurt am Main – C1

11.4.8.1 Frankfurt am Main – C1 – Phase 1

O.R.C.U.S. 02.00 - Simulation Summary

UA Parameters

MTOW [kg]	Wingspan [m]	Length [m]	L/D
90	5	4	8

v [km/h]	Alt [m]	CCF [m]
100	100	4715.4293

P_CumCat [1/Fh]	Engine [%]	ESys [%]	FCS [%]	NavSys [%]	Struct [%]
0.01	20	20	20	20	20

General map parameters

	Name	Area [km2]	PPL	PPL/km2
City	Frankfurt am Main, Stadt	248.31	746878	3008
County	Frankfurt am Main, Stadt	248.31	746878	3008
FS	HE	21115.67	6243262	296

Mission specific map parameters

	Area [km2]	PPL	Tourists	Total PPL
City	66.8555	201102	0	201102
Map total	66.8555	201102	0	201102

PPL MOD NA

Sim FH [Fh]	19600	Ev/Fh [1/Fh]	0.0095918
Events total	188		

Hits due to UA impacts		Hits/Fh [1/Fh]
City ATB	1343	0.0685204
City OTW	252	0.0128571
Total	1595	0.0813776

Prot	cyc	k_UA	Day	Time of impact	UA X Pos	UA Y Pos	Travelled Distance [km]	PPL_TD_CITY_ATB	PPL_CITY_ATB_COUNT	HIT_CITY_ATB_COUNT	PPL_TD_CITY_OTW	PPL_CITY_OTW_COUNT	HIT_CITY_OTW_COUNT	PPL_ALL_ATB_COUNT	PPL_ALL_OTW_COUNT	E	Case	Outcome
10	227	1108	Wednesday	16:40:16	6977	2375	1067.14	144793	144793	29	56309	56309	10	144793	56309	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
100	4	3536	Tuesday	06:11:16	7137	3942	18.78	177975	177975	0	23127	23127	1	177975	23127	35	Connection Failure	UA ground impact tangential to trajectory
1007	220	1963	Saturday	16:21:09	7150	1668	1035.25	156859	156859	0	44243	44243	0	156859	44243	49	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
1017	51	344	Tuesday	08:21:43	7038	3748	236.22	164903	164903	0	36199	36199	1	164903	36199	35	Connection Failure	UA ground impact tangential to trajectory
1021	285	1388	Saturday	19:24:35	7014	1912	1341.00	180991	180991	2	20111	20111	0	180991	20111	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
1022	103	3243	Sunday	10:51:07	7205	3729	485.22	152837	152837	0	48265	48265	0	152837	48265	57	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
1027	277	53	Friday	19:00:55	7108	3945	1301.53	180991	180991	0	20111	20111	0	180991	20111	74	Degradation of altitude	Central UA ground impact point below flight path
1041	104	2273	Friday	10:53:11	7218	1995	488.67	165909	165909	5	35193	35193	0	165909	35193	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
1042	199	1218	Saturday	15:21:09	6988	2175	935.25	152837	152837	0	48265	48265	0	152837	48265	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
1048	242	2734	Friday	17:23:59	7261	2852	1140.00	152837	152837	0	48265	48265	0	152837	48265	78	Degradation of altitude	Central UA ground impact point below flight path
1055	210	2187	Friday	15:53:02	7201	1876	988.39	153843	153843	2	47259	47259	0	153843	47259	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
1058	196	3577	Monday	15:14:30	7127	3949	924.19	155854	155854	0	45248	45248	0	155854	45248	46	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
1065	221	2116	Monday	16:24:05	7186	1793	1040.17	146804	146804	1	54298	54298	0	146804	54298	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1068	74	2202	Thursday	09:28:15	7204	1895	347.11	165909	165909	2	35193	35193	0	165909	35193	28	Generator Failure	UA ground impact tangential to trajectory
1077	149	1552	Saturday	12:59:56	7048	1731	699.92	152837	152837	0	48265	48265	0	152837	48265	75	Degradation of altitude	UA approaches Emergency landing site
1083	109	1748	Friday	11:06:56	7096	1627	511.56	165909	165909	30	35193	35193	6	165909	35193	18	Engine Fire	UA structural desintegration - Debris Impact
110	213	2033	Friday	16:01:24	7167	1716	1002.33	152837	152837	2	48265	48265	0	152837	48265	8	Engine Out	UA ground impact tangential to trajectory
1108	94	355	Tuesday	10:23:23	7036	3735	439.00	166914	166914	0	34188	34188	0	166914	34188	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1110	271	2948	Thursday	18:46:12	7250	3272	1277.03	146804	146804	0	54298	54298	0	146804	54298	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
1111	89	2789	Friday	10:11:09	7260	2963	418.61	165909	165909	0	35193	35193	1	165909	35193	36	Short Circuit / Overload	Central UA ground impact point below flight path
1129	6	2104	Tuesday	06:15:47	7183	1781	26.33	177975	177975	1	23127	23127	0	177975	23127	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1148	245	1774	Sunday	17:31:43	7102	1624	1152.89	148815	148815	0	52287	52287	0	148815	52287	78	Degradation of altitude	Central UA ground impact point below flight path
1159	208	2876	Thursday	15:47:54	7256	3135	979.86	155854	155854	0	45248	45248	0	155854	45248	57	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
1162	223	2466	Sunday	16:30:01	7246	2321	1050.06	148815	148815	0	52287	52287	0	148815	52287	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
1172	286	1457	Wednesday	19:27:29	7028	1826	1345.81	180991	180991	0	20111	20111	0	180991	20111	50	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
1175	250	2203	Saturday	17:46:12	7204	1897	1177.03	156859	156859	1	44243	44243	1	156859	44243	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1180	75	1487	Thursday	09:30:32	7034	1793	350.89	165909	165909	0	35193	35193	0	165909	35193	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
1183	242	3413	Sunday	17:24:32	7168	3887	1140.89	148815	148815	0	52287	52287	0	148815	52287	24	Generator Failure	UA ground impact tangential to trajectory
1188	145	3567	Friday	12:50:12	7130	3948	683.69	165909	165909	0	35193	35193	0	165909	35193	67	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
119	98	2412	Sunday	10:36:20	7239	2223	460.56	152837	152837	0	48265	48265	0	152837	48265	51	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
1194	222	2694	Thursday	16:27:22	7260	2771	1045.64	146804	146804	0	54298	54298	0	146804	54298	72	Degradation of altitude	UA approaches Emergency landing site
1196	142	795	Saturday	12:39:33	6973	3001	665.92	143787	143787	0	57315	57315	1	143787	57315	31	Connection Failure	UA ground impact tangential to trajectory
1196	254	506	Saturday	17:56:11	7007	3527	1193.67	156859	156859	0	44243	44243	1	156859	44243	24	Generator Failure	UA ground impact tangential to trajectory
1197	10	2337	Sunday	06:27:17	7229	2095	45.50	198085	198085	0	3017	3017	0	198085	3017	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
1198	275	3245	Monday	18:57:46	7205	3732	1296.28	146804	146804	0	54298	54298	0	146804	54298	10	Engine Anomaly	UA approaches Emergency landing site
12	270	3219	Friday	18:43:36	7210	3700	1272.67	152837	152837	0	48265	48265	0	152837	48265	29	Connection Failure	UA approaches Emergency landing site
1202	87	3097	Friday	10:05:45	7231	3527	409.58	165909	165909	0	35193	35193	0	165909	35193	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1205	191	1282	Monday	14:58:33	6997	2069	897.61	155854	155854	0	45248	45248	0	155854	45248	73	Degradation of altitude	Central UA ground impact point below flight path
1209	7	3488	Friday	06:19:43	7149	3927	32.86	180991	180991	0	20111	20111	0	180991	20111	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
1210	141	90	Saturday	12:36:10	7098	3936	660.28	143787	143787	0	57315	57315	1	143787	57315	19	Engine Fire	Central UA ground impact point below flight path
1213	293	2893	Tuesday	19:48:25	7254	3168	1380.69	179986	179986	1	21116	21116	0	179986	21116	24	Generator Failure	UA ground impact tangential to trajectory
1233	11	964	Monday	06:29:03	6970	2659	48.42	178980	178980	0	22122	22122	0	178980	22122	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
1235	8	1330	Wednesday	06:20:51	7004	1994	34.75	179986	179986	48	21116	21116	6	179986	21116	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1239	241	1902	Sunday	17:20:30	7135	1640	1134.19	148815	148815	0	52287	52287	0	148815	52287	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
1240	266	1438	Monday	18:30:53	7024	1849	1251.47	146804	146804	65	54298	54298	5	146804	54298	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1252	136	64	Saturday	12:22:00	7105	3943	636.67	143787	143787	29	57315	57315	15	143787	57315	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1259	288	1891	Saturday	19:33:28	7132	1637	1355.81	180991	180991	0	20111	20111	0	180991	20111	30	Connection Failure	Central UA ground impact point below flight path
1259	53	630	Saturday	08:27:36	6988	3317	246.03	178980	178980	6	22122	22122	0	178980	22122	28	Generator Failure	UA ground impact tangential to trajectory
1268	9	2459	Monday	06:24:33	7245	2308	40.94	178980	178980	0	22122	22122	0	178980	22122	74	Degradation of altitude	Central UA ground impact point below flight path
1272	139	2985	Friday	12:32:47	7246	3339	654.64	165909	165909	0	35193	35193	0	165909	35193	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1281	176	1204	Sunday	14:16:03	6986	2200	826.78	142782	142782	0	58320	58320	0	142782	58320	75	Degradation of altitude	UA approaches Emergency landing site
129	66	40	Wednesday	09:03:55	7111	3947	306.56	163898	163898	21	37204	37204	15	163898	37204	18	Engine Fire	UA structural desintegration - Debris Impact
1300	230	2799	Friday	16:50:05	7259	2983	1083.50	152837	152837	0	48265	48265	0	152837	48265	75	Degradation of altitude	UA approaches Emergency landing site
1306	185	3435	Thursday	14:43:16	7162	3901	872.14	155854	155854	2	45248	45248	0	155854	45248	39	Short Circuit / Overload	Central UA ground impact point below flight path
1313	193	3244	Thursday	15:05:46	7205	3731	909.61	155854	155854	0	45248	45248	0	155854	45248	68	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
1316	248	1154	Sunday	17:39:44	6981	2289	1166.22	148815	148815	1	52287	52287	1	148815	52287	34	Connection Failure	UA ground impact tangential to trajectory
1319	77	2812	Wednesday	09:37:14	7259	3009	362.06	163898	163898	44	37204	37204	7	163898	37204	18	Engine Fire	UA structural desintegration - Debris Impact
1333	211	2425	Wednesday	15:56:02	7241	2246	993.42	158870	158870	5	42232	42232	0	158870	42232	23	Generator Failure	Central UA ground impact point below flight path
1336	7	773	Saturday	06:17:34	6974	3045	29.31	196074	196074	51	5028	5028	2	196074	5028	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1342	215	919	Friday	16:06:11	6969	2750	1010.31	152837	152837	1	48265	48265	0	152837	48265	30	Connection Failure	Central UA ground impact point below flight path
1342	80	2509	Friday	09:45:28	7250	2403	375.81	165909	165909	0	35193	35193	0	165909	35193	22	Generator Failure	UA approaches Emergency landing site
136	107	2882	Wednesday	11:02:09	7255	3147	503.61	168925	168925	58	32177	32177	6	168925	32177	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1363	268	49	Friday	18:35:27	7109	3946	1259.08	152837	152837	0	48265	48265	0	152837	48265	72	Degradation of altitude	UA approaches Emergency landing site
1363	55	747	Friday	08:33:22	6976	3096	255.61	165909	165909	2	35193	35193	0	165909	35193	9	Engine Out	UA ground impact tangential to trajectory
1364	86	1862	Saturday	10:01:57	7124	1629	403.25	143787	143787	0	57315	57315	0	143787	57315	50	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
1367	275	1357	Tuesday	18:56:16	7009	1955	1293.81	143787	143787	0	57315	57315	1	143787	57315	40	Short Circuit / Overload	Central UA ground impact point below flight path
147	162	2298	Sunday	13:37:18	7222	2033	762.19	142782	142782	0	58320	58320	0	142782	58320	3	Engine Out	Central UA ground impact point below flight path
159	129	452	Friday	12:02:30	7016	3608	604.17	165909	165909	0	35193	35193	0	165909	35193	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
166	194	1255	Friday	15:07:01	6993	2113	911.72	153843	153843	0	47259	47259	1	153843	47259	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
172	108	1234	Thursday	11:03:42	6990	2148	506.17	165909	165909	0	35193	35193	0	165909	35193	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
172	68	2468	Thursday	09:11:29	7246	2325	319.17	165909	165909	0	35193	35193	0	165909	35193	10	Engine Anomaly	UA approaches Emergency landing site
180	44	2704	Friday	08:03:46	7260	2791	206.31	165909	165909	0	35193	35193	0	165909	35193	22	Generator Failure	UA approaches Emergency landing site
181	194	2931	Saturday	15:08:21	7251	3240	913.92	152837	152837	0	48265	48265	6	152837	48265	18	Engine Fire	UA structural desintegration - Debris Impact
191	42	2927	Tuesday	07:58:17	7252	3233	197.17	177975	177975	0	23127	23127	0	177975	23127	78	Degradation of altitude	Central UA ground impact point below flight path
192	187	434	Wednesday	14:46:34	7020	3633	877.64	158870	158870	0	42232	42232	0	158870	42232	75	Degradation of altitude	UA approaches Emergency landing site
222	177	2503	Friday	14:19:54	7250	2391	833.19	153843	153843	0	47259	47259	0	153843	47259	45	Partial Lock of Flight Control Surfaces	Central UA ground impact point below flight path
226	125	3124	Tuesday	11:53:16	7227	3569	588.81	166914	166914	0	34188	34188	1	166914	34188	24	Generator Failure	UA ground impact tangential to trajectory
226	90	2922	Tuesday	10:14:06	7252	3223	423.50	166914	166914	2	34188	34188	5	166914	34188	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
227	51	3313	Wednesday	08:24:03	7190	3805	240.11	163898	163897	0	37204	37204	0	163897	37204	5	Engine Out	No Ground Effect
237	12	2199	Saturday	06:32:51	7204	1891	54.75	196074	196074	0	5028	5028	0	196074	5028	72	Degradation of altitude	UA approaches Emergency landing site
239	274	1013	Monday	18:53:11	6971	2561	1288.64	146804	146804	0	54298	54298	0	146804	54298	34	Connection Failure	UA ground impact tangential to trajectory
243	238	529	Friday	17:10:56	7003	3490	1118.25	152837	152837	0	48265	48265	0	152837	48265	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
243	42	1082	Friday	07:56:50	6975	2425	194.75	180991	180991	36	20111	20111	1	180991	20111	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
245	193	1483	Sunday	15:04:22	7033	1797	907.30	142782	142782	53	58320	58320	7	142782	58320	18	Engine Fire	UA structural desintegration - Debris Impact
252	139	2200	Sunday	12:32:09	7204	1893	653.61	152837	152837	0	48265	48265	0	152837	48265	52	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
253	145	1956	Monday	12:48:57	7148	1664	681.58	164903	164903	0	36199	36199	0	164903	36199	72	Degradation of altitude	UA approaches Emergency landing site
256	161	512	Thursday	13:33:05	7006	3517	755.14	155854	155854	0	45248	45248	0	155854	45248	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
260	270	526	Monday	18:41:29	7003	3495	1269.14	146804	146804	0	54298	54298	0	146804	54298	55	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
264	183	1835	Friday	14:36:22	7118	1624	860.61	153843	153843	0	47259	47259	0	153843	47259	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
270	129	855	Thursday	12:02:49	6970	2880	604.69	165909	165909	0	35193	35193	0	165909	35193	36	Short Circuit / Overload	Central UA ground impact point below flight path
275	8	2496	Tuesday	06:21:45	7249	2378	36.28	177975	177975	1	23127	23127	0	177975	23127	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
276	85	118	Wednesday	09:57:45	7091	3926	396.25	168925	168925	0	32177	32177	0	168925	32177	22	Generator Failure	UA approaches Emergency landing site
277	162	3528	Thursday	13:38:16	7139	3940	763.81	155854	155854	14	45248	45248	14	155854	45248	21	Engine Fire	UA structural desintegration - Debris Impact
280	218	1295	Sunday	16:14:57	6999	2048	1024.94	148815	148815	0	52287	52287	0	148815	52287	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
298	244	2914	Thursday	17:29:47	7253	3208	1149.67	146804	146804	0	54298	54298	0	146804	54298	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
3	88	3208	Wednesday	10:08:39	7212	3686	414.44	168925	168925	0	32177	32177	0	168925	32177	66	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
300	284	2931	Saturday	19:22:59	7251	3240	1338.31	180991	180991	0	20111	20111	2	180991	20111	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
302	153	1000	Monday	13:10:49	6971	2587	718.06	155854	155854	0	45248	45248	0	155854	45248	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
304	250	1928	Wednesday	17:46:00	7141	1651	1176.67	144793	144793	0	56309	56309	0	144793	56309	3	Engine Out	Central UA ground impact point below flight path
323	110	1011	Monday	11:09:11	6971	2565	515.31	164903	164903	0	36199	36199	0	164903	36199	30	Connection Failure	Central UA ground impact point below flight path
329	187	710	Sunday	14:46:47	6980	3167	878.00	142782	142782	0	58320	58320	1	142782	58320	34	Connection Failure	UA ground impact tangential to trajectory
330	256	3231	Monday	18:03:59	7207	3715	1206.67	146804	146804	0	54298	54298	0	146804	54298	70	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
335	115	1673	Saturday	11:23:51	7077	1651	539.75	143787	143787	1	57315	57315	0	143787	57315	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
336	2	1977	Sunday	06:04:22	7153	1677	7.30	198085	198085	0	3017	3017	0	198085	3017	29	Connection Failure	UA approaches Emergency landing site
344	295	3200	Monday	19:54:18	7213	3676	1390.53	179986	179986	0	21116	21116	0	179986	21116	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
351	40	2577	Monday	07:52:21	7256	2535	187.28	178980	178980	2	22122	22122	0	178980	22122	66	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
359	197	1653	Tuesday	15:15:50	7072	1661	926.39	156859	156859	0	44243	44243	0	156859	44243	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
40	147	1054	Friday	12:53:53	6973	2480	689.83	165909	165909	0	35193	35193	0	165909	35193	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
400	158	1959	Monday	13:25:43	7149	1666	742.89	155854	155854	0	45248	45248	0	155854	45248	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
400	236	1304	Monday	17:05:54	7000	2034	1109.83	146804	146804	0	54298	54298	0	146804	54298	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
403	246	2988	Thursday	17:35:30	7245	3344	1159.19	146804	146804	0	54298	54298	0	146804	54298	77	Degradation of altitude	Central UA ground impact point below flight path
410	280	790	Thursday	19:09:59	6973	3011	1316.64	176969	176969	0	24133	24133	0	176969	24133	5	Engine Out	No Ground Effect
415	17	359	Tuesday	06:45:33	7035	3730	75.92	177975	177975	0	23127	23127	4	177975	23127	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
416	100	2295	Wednesday	10:41:54	7222	2028	469.83	168925	168925	3	32177	32177	0	168925	32177	78	Degradation of altitude	Central UA ground impact point below flight path
427	224	33	Sunday	16:30:57	7113	3948	1051.58	148815	148815	0	52287	52287	0	148815	52287	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
428	282	1203	Monday	19:15:58	6986	2201	1326.61	179986	179986	0	21116	21116	0	179986	21116	73	Degradation of altitude	Central UA ground impact point below flight path
433	21	2330	Saturday	06:58:24	7227	2083	97.36	196074	196074	48	5028	5028	1	196074	5028	21	Engine Fire	UA structural desintegration - Debris Impact
444	274	1755	Wednesday	18:53:45	7097	1626	1289.61	144793	144793	0	56309	56309	0	144793	56309	53	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
459	5	2078	Thursday	06:12:57	7177	1755	21.58	178980	178980	0	22122	22122	0	178980	22122	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
469	290	1478	Sunday	19:38:49	7032	1803	1364.70	177975	177975	90	23127	23127	2	177975	23127	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
472	33	2181	Wednesday	07:32:15	7200	1869	153.75	179986	179986	41	21116	21116	4	179986	21116	18	Engine Fire	UA structural desintegration - Debris Impact
474	153	873	Friday	13:10:43	6970	2844	717.89	153843	153843	50	47259	47259	11	153843	47259	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
476	213	3093	Sunday	16:02:14	7232	3521	1003.72	148815	148815	0	52287	52287	0	148815	52287	78	Degradation of altitude	Central UA ground impact point below flight path
490	25	1482	Sunday	07:09:04	7033	1798	115.11	198085	198085	0	3017	3017	0	198085	3017	5	Engine Out	No Ground Effect
495	135	2858	Friday	12:21:21	7257	3100	635.61	165909	165909	0	35193	35193	0	165909	35193	9	Engine Out	UA ground impact tangential to trajectory
514	240	222	Wednesday	17:16:22	7066	3864	1127.28	144793	144793	0	56309	56309	0	144793	56309	28	Generator Failure	UA ground impact tangential to trajectory
522	195	3360	Thursday	15:11:30	7180	3848	919.19	155854	155854	0	45248	45248	0	155854	45248	36	Short Circuit / Overload	Central UA ground impact point below flight path
531	148	1759	Saturday	12:57:16	7098	1625	695.47	143787	143787	0	57315	57315	0	143787	57315	10	Engine Anomaly	UA approaches Emergency landing site
560	108	1191	Sunday	11:03:39	6985	2222	506.11	152837	152837	0	48265	48265	21	152837	48265	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
563	188	1967	Wednesday	14:50:37	7151	1671	884.36	158870	158870	0	42232	42232	0	158870	42232	37	Short Circuit / Overload	Central UA ground impact point below flight path
564	190	1807	Thursday	14:56:08	7111	1622	893.58	155854	155854	0	45248	45248	0	155854	45248	37	Short Circuit / Overload	Central UA ground impact point below flight path
568	82	2774	Monday	09:51:20	7260	2933	385.58	164903	164903	45	36199	36199	14	164903	36199	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
584	187	1855	Wednesday	14:47:41	7123	1627	879.50	158870	158870	0	42232	42232	0	158870	42232	22	Generator Failure	UA approaches Emergency landing site
593	253	2685	Friday	17:55:04	7260	2753	1191.81	152837	152837	0	48265	48265	0	152837	48265	6	Engine Out	UA approaches Emergency landing site
595	209	3454	Sunday	15:51:12	7158	3911	985.33	142782	142782	0	58320	58320	0	142782	58320	74	Degradation of altitude	Central UA ground impact point below flight path
603	28	1540	Monday	07:17:36	7046	1741	129.33	178980	178980	0	22122	22122	0	178980	22122	49	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
604	260	1640	Tuesday	18:14:03	7069	1668	1223.44	143787	143787	0	57315	57315	0	143787	57315	14	Engine Anomaly	Central UA ground impact point below flight path
606	249	2240	Thursday	17:43:24	7212	1947	1172.36	146804	146804	62	54298	54298	3	146804	54298	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
664	188	206	Saturday	14:49:13	7070	3876	882.06	152837	152837	0	48265	48265	0	152837	48265	55	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
671	154	2851	Saturday	13:15:07	7257	3086	725.20	152837	152837	51	48265	48265	5	152837	48265	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
672	38	2122	Sunday	07:46:21	7187	1800	177.25	198085	198085	0	3017	3017	0	198085	3017	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site

676	271	3054	Thursday	18:46:17	7237	3458	1277.17	146804	146804	0	54298	54298	0	146804	54298	47	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
682	281	1325	Wednesday	19:13:14	7004	2002	1322.06	180991	180991	40	20111	20111	4	180991	20111	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
684	188	2073	Friday	14:50:42	7176	1751	884.50	153843	153843	0	47259	47259	0	153843	47259	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
695	109	1536	Tuesday	11:06:46	7045	1745	511.28	166914	166914	1	34188	34188	0	166914	34188	33	Connection Failure	Central UA ground impact point below flight path
695	125	431	Tuesday	11:51:10	7020	3638	585.28	166914	166914	0	34188	34188	0	166914	34188	66	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
697	264	3145	Thursday	18:26:33	7223	3600	1244.28	146804	146804	0	54298	54298	2	146804	54298	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
712	240	518	Friday	17:16:35	7005	3508	1127.67	152837	152837	0	48265	48265	2	152837	48265	24	Generator Failure	UA ground impact tangential to trajectory
717	188	567	Wednesday	14:49:31	6997	3427	882.53	158870	158870	0	42232	42232	0	158870	42232	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
719	291	910	Friday	19:41:11	6969	2768	1368.67	180991	180990	0	20111	20111	0	180990	20111	35	Connection Failure	UA ground impact tangential to trajectory
721	34	2780	Sunday	07:35:33	7260	2945	159.25	198085	198085	3	3017	3017	0	198085	3017	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
725	235	1659	Thursday	17:03:21	7074	1658	1105.58	146804	146804	2	54298	54298	0	146804	54298	9	Engine Out	UA ground impact tangential to trajectory
731	108	2845	Wednesday	11:04:57	7257	3075	508.28	168925	168925	0	32177	32177	0	168925	32177	35	Connection Failure	UA ground impact tangential to trajectory
731	116	745	Wednesday	11:25:57	6977	3100	543.25	168925	168925	0	32177	32177	0	168925	32177	5	Engine Out	No Ground Effect
731	7	2470	Wednesday	06:18:55	7246	2329	31.53	179986	179986	0	21116	21116	0	179986	21116	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
737	64	2723	Tuesday	09:00:22	7261	2830	300.64	164903	164903	0	36199	36199	0	164903	36199	3	Engine Out	Central UA ground impact point below flight path
738	108	1764	Wednesday	11:04:07	7100	1625	506.86	168925	168925	1	32177	32177	0	168925	32177	35	Connection Failure	UA ground impact tangential to trajectory
739	151	735	Thursday	13:04:57	6977	3119	708.28	155854	155854	1	45248	45248	0	155854	45248	35	Connection Failure	UA ground impact tangential to trajectory
780	46	2354	Wednesday	08:09:09	7231	2123	215.28	163898	163898	56	37204	37204	7	163898	37204	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
781	295	316	Thursday	19:52:03	7044	3779	1386.75	176969	176969	2	24133	24133	1	176969	24133	62	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
784	191	1897	Sunday	14:59:02	7133	1638	898.42	142782	142782	0	58320	58320	2	142782	58320	9	Engine Out	UA ground impact tangential to trajectory
785	61	1541	Monday	08:50:57	7046	1740	284.94	164903	164903	74	36199	36199	3	164903	36199	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
803	222	3394	Friday	16:27:55	7172	3874	1046.56	152837	152837	0	48265	48265	0	152837	48265	10	Engine Anomaly	UA approaches Emergency landing site
810	74	400	Friday	09:26:51	7026	3679	344.75	165909	165909	0	35193	35193	0	165909	35193	78	Degradation of altitude	Central UA ground impact point below flight path
819	36	2599	Sunday	07:41:03	7257	2579	168.44	198085	198085	0	3017	3017	0	198085	3017	66	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
827	155	3259	Monday	13:18:16	7202	3748	730.44	155854	155854	0	45248	45248	0	155854	45248	40	Short Circuit / Overload	Central UA ground impact point below flight path
83	289	1621	Saturday	19:36:06	7064	1679	1360.17	180991	180991	2	20111	20111	0	180991	20111	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
831	290	2305	Friday	19:39:28	7223	2044	1365.78	180991	180991	30	20111	20111	7	180991	20111	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
833	165	469	Sunday	13:44:22	7013	3583	773.94	142782	142782	0	58320	58320	0	142782	58320	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
839	265	266	Saturday	18:27:07	7055	3828	1245.22	156859	156859	0	44243	44243	0	156859	44243	70	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
85	233	1649	Monday	16:57:41	7071	1663	1096.14	146804	146804	0	54298	54298	0	146804	54298	72	Degradation of altitude	UA approaches Emergency landing site
879	195	1027	Thursday	15:09:40	6972	2533	916.14	155854	155854	2	45248	45248	0	155854	45248	28	Generator Failure	UA ground impact tangential to trajectory
883	111	3327	Monday	11:13:49	7187	3819	523.06	164903	164903	49	36199	36199	0	164903	36199	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
902	159	2007	Saturday	13:28:36	7161	1696	747.67	152837	152837	0	48265	48265	0	152837	48265	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
930	104	2379	Saturday	10:53:16	7235	2165	488.81	143787	143787	54	57315	57315	5	143787	57315	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
933	189	1420	Tuesday	14:53:00	7021	1871	888.36	156859	156859	0	44243	44243	0	156859	44243	50	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
935	262	1120	Thursday	18:19:18	6978	2353	1232.19	146804	146804	0	54298	54298	0	146804	54298	78	Degradation of altitude	Central UA ground impact point below flight path
941	194	3397	Wednesday	15:08:42	7171	3876	914.53	158870	158870	33	42232	42232	11	158870	42232	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
943	142	1558	Friday	12:40:08	7050	1726	666.92	165909	165909	0	35193	35193	0	165909	35193	28	Generator Failure	UA ground impact tangential to trajectory
948	285	1494	Wednesday	19:24:40	7036	1786	1341.14	180991	180991	0	20111	20111	0	180991	20111	75	Degradation of altitude	UA approaches Emergency landing site
954	69	692	Tuesday	09:12:56	6981	3202	321.56	164903	164903	0	36199	36199	0	164903	36199	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
957	163	946	Friday	13:39:04	6970	2695	765.14	153843	153843	0	47259	47259	0	153843	47259	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
957	278	1012	Friday	19:04:29	6971	2563	1307.50	180991	180991	44	20111	20111	2	180991	20111	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
963	3	1474	Thursday	06:06:49	7031	1807	11.36	178980	178980	4	22122	22122	0	178980	22122	78	Degradation of altitude	Central UA ground impact point below flight path
967	98	2157	Monday	10:36:07	7195	1839	460.22	164903	164903	0	36199	36199	0	164903	36199	70	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
97	138	1177	Saturday	12:28:31	6983	2248	647.56	143787	143787	0	57315	57315	16	143787	57315	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
982	39	961	Tuesday	07:48:16	6970	2665	180.45	177975	177975	37	23127	23127	6	177975	23127	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
983	18	3	Wednesday	06:48:05	7120	3950	80.17	179986	179986	0	21116	21116	0	179986	21116	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path

O.R.C.U.S. 02.00 - tTest of the Simulation

nProbes	1400
nEvents	188
nEvents_cor	176
tMission	14
x_cross_ATB	0.959285714
x_cross_OTW	0.18
x_cross_TOT	1.139285714
s2ATB	1.029339032
sATB	1.014563469
tATB	35.00916418
s2OTW	0.036828347
sOTW	0.191907131
tOTW	33.14529031
s2TOT	1.414538081
sTOT	1.189343551
tTOT	35.52716314

UADay/Prot	HIT_TOT_ATB	HIT_TOT_OTW	UADay/Prot cor	HIT_TOT_mean_ATB	HIT_TOT_mean_OTW	HIT_TOT_mean_ATB/Fh	HIT_TOT_mean_OTW/Fh	x_i-x_cross ATB	x_i-x_cross OTW	(x_i-x_cross ATB)^2	(x_i-x_cross OTW)^2
3	0	0	3	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
10	29	10	10	29	10	2.071428571	0.714285714	1.112142857	0.534285714	1.236861735	0.285461224
12	0	0	12	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
40	0	0	40	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
83	2	0	83	2	0	0.142857143	0	-0.816428571	-0.18	0.666555612	0.0324
85	0	0	85	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
97	0	16	97	0	16	0	1.142857143	-0.959285714	0.962857143	0.920229082	0.927093878
100	0	1	100	0	1	0	0.071428571	-0.959285714	-0.108571429	0.920229082	0.011787755
110	2	0	110	2	0	0.142857143	0	-0.816428571	-0.18	0.666555612	0.0324
119	0	0	119	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
129	21	15	129	21	15	1.5	1.071428571	0.540714286	0.891428571	0.292371939	0.794644898
136	58	6	136	58	6	4.142857143	0.428571429	3.183571429	0.248571429	10.13512704	0.061787755
147	0	0	147	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
159	0	0	159	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
166	0	1	166	0	1	0	0.071428571	-0.959285714	-0.108571429	0.920229082	0.011787755
172	0	0	172	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
172	0	0	180	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
180	0	0	181	0	6	0	0.428571429	-0.959285714	0.248571429	0.920229082	0.061787755
181	0	6	191	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
191	0	0	192	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
192	0	0	222	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
222	0	0	226	2	6	0.142857143	0.428571429	-0.816428571	0.248571429	0.666555612	0.061787755
226	0	1	227	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
226	2	5	237	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
227	0	0	239	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
237	0	0	243	36	1	2.571428571	0.071428571	1.612142857	-0.108571429	2.599004592	0.011787755
239	0	0	245	53	7	3.785714286	0.5	2.826428571	0.32	7.988698469	0.1024
243	0	0	252	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
243	36	1	253	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
245	53	7	256	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
252	0	0	260	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
253	0	0	264	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
256	0	0	270	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
260	0	0	275	1	0	0.071428571	0	-0.887857143	-0.18	0.788290306	0.0324
264	0	0	276	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
270	0	0	277	14	14	1	1	0.040714286	0.82	0.001657653	0.6724
275	1	0	280	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
276	0	0	298	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
277	14	14	300	0	2	0	0.142857143	-0.959285714	-0.037142857	0.920229082	0.001379592
280	0	0	302	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
298	0	0	304	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
300	0	2	323	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
302	0	0	329	0	1	0	0.071428571	-0.959285714	-0.108571429	0.920229082	0.011787755
304	0	0	330	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
323	0	0	335	1	0	0.071428571	0	-0.887857143	-0.18	0.788290306	0.0324
329	0	1	336	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
330	0	0	344	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
335	1	0	351	2	0	0.142857143	0	-0.816428571	-0.18	0.666555612	0.0324
336	0	0	359	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
344	0	0	400	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
351	2	0	403	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
359	0	0	410	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
400	0	0	415	0	4	0	0.285714286	-0.959285714	0.105714286	0.920229082	0.01117551
400	0	0	416	3	0	0.214285714	0	-0.745	-0.18	0.555025	0.0324
403	0	0	427	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
410	0	0	428	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
415	0	4	433	48	1	3.428571429	0.071428571	2.469285714	-0.108571429	6.097371939	0.011787755
416	3	0	444	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
427	0	0	459	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
428	0	0	469	90	2	6.428571429	0.142857143	5.469285714	-0.037142857	29.91308622	0.001379592
433	48	1	472	41	4	2.928571429	0.285714286	1.969285714	0.105714286	3.878086224	0.01117551
444	0	0	474	50	11	3.571428571	0.785714286	2.612142857	0.605714286	6.823290306	0.366889796
459	0	0	476	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
469	90	2	490	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
472	41	4	495	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
474	50	11	514	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
476	0	0	522	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
490	0	0	531	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
495	0	0	560	0	21	0	1.5	-0.959285714	1.32	0.920229082	1.7424
514	0	0	563	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
522	0	0	564	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
531	0	0	568	45	14	3.214285714	1	2.255	0.82	5.085025	0.6724
560	0	21	584	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
563	0	0	593	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
564	0	0	595	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
568	45	14	603	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
584	0	0	604	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
593	0	0	606	62	3	4.428571429	0.214285714	3.469285714	0.034285714	12.03594337	0.00117551
595	0	0	664	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
603	0	0	671	51	5	3.642857143	0.357142857	2.683571429	0.177142857	7.201555612	0.031379592
604	0	0	672	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
606	62	3	676	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
664	0	0	682	40	4	2.857142857	0.285714286	1.897857143	0.105714286	3.601861735	0.01117551
671	51	5	684	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
672	0	0	695	1	0	0.071428571	0	-0.887857143	-0.18	0.788290306	0.0324
676	0	0	697	0	2	0	0.142857143	-0.959285714	-0.037142857	0.920229082	0.001379592
682	40	4	712	0	2	0	0.142857143	-0.959285714	-0.037142857	0.920229082	0.001379592
684	0	0	717	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
695	1	0	719	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
695	0	0	721	3	0	0.214285714	0	-0.745	-0.18	0.555025	0.0324
697	0	2	725	2	0	0.142857143	0	-0.816428571	-0.18	0.666555612	0.0324
712	0	2	731	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
717	0	0	737	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
719	0	0	738	1	0	0.071428571	0	-0.887857143	-0.18	0.788290306	0.0324
721	3	0	739	1	0	0.071428571	0	-0.887857143	-0.18	0.788290306	0.0324
725	2	0	780	56	7	4	0.5	3.040714286	0.32	9.245943367	0.1024
731	0	0	781	2	1	0.142857143	0.071428571	-0.816428571	-0.108571429	0.666555612	0.011787755
731	0	0	784	0	2	0	0.142857143	-0.959285714	-0.037142857	0.920229082	0.001379592
731	0	0	785	74	3	5.285714286	0.214285714	4.326428571	0.034285714	18.71798418	0.00117551
737	0	0	803	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
738	1	0	810	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
739	1	0	819	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
780	56	7	827	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
781	2	1	831	30	7	2.142857143	0.5	1.183571429	0.32	1.400841327	0.1024
784	0	2	833	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
785	74	3	839	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
803	0	0	879	2	0	0.142857143	0	-0.816428571	-0.18	0.666555612	0.0324
810	0	0	883	49	0	3.5	0	2.540714286	-0.18	6.455229082	0.0324
819	0	0	902	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
827	0	0	930	54	5	3.857142857	0.357142857	2.897857143	0.177142857	8.39757602	0.031379592
831	30	7	933	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
833	0	0	935	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
839	0	0	941	33	11	2.357142857	0.785714286	1.397857143	0.605714286	1.954004592	0.366889796
879	2	0	943	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
883	49	0	948	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
902	0	0	954	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
930	54	5	957	44	2	3.142857143	0.142857143	2.183571429	-0.037142857	4.767984184	0.001379592
933	0	0	963	4	0	0.285714286	0	-0.673571429	-0.18	0.453698469	0.0324
935	0	0	967	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
941	33	11	982	37	6	2.642857143	0.428571429	1.683571429	0.248571429	2.834412755	0.061787755
943	0	0	983	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
948	0	0	1007	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
954	0	0	1017	0	1	0	0.071428571	-0.959285714	-0.108571429	0.920229082	0.011787755
957	0	0	1021	2	0	0.142857143	0	-0.816428571	-0.18	0.666555612	0.0324
957	44	2	1022	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
963	4	0	1027	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
967	0	0	1041	5	0	0.357142857	0	-0.602142857	-0.18	0.36257602	0.0324
982	37	6	1042	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
983	0	0	1048	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
1007	0	0	1055	2	0	0.142857143	0	-0.816428571	-0.18	0.666555612	0.0324
1017	0	1	1058	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
1021	2	0	1065	1	0	0.071428571	0	-0.887857143	-0.18	0.788290306	0.0324
1022	0	0	1068	2	0	0.142857143	0	-0.816428571	-0.18	0.666555612	0.0324
1027	0	0	1077	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
1041	5	0	1083	30	6	2.142857143	0.428571429	1.183571429	0.248571429	1.400841327	0.061787755
1042	0	0	1108	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
1048	0	0	1110	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
1055	2	0	1111	0	1	0	0.071428571	-0.959285714	-0.108571429	0.920229082	0.011787755
1058	0	0	1129	1	0	0.071428571	0	-0.887857143	-0.18	0.788290306	0.0324
1065	1	0	1148	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
1068	2	0	1159	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
1077	0	0	1162	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
1083	30	6	1172	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
1108	0	0	1175	1	1	0.071428571	0.071428571	-0.887857143	-0.108571429	0.788290306	0.011787755
1110	0	0	1180	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
1111	0	1	1183	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
1129	1	0	1188	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
1148	0	0	1194	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
1159	0	0	1196	0	2	0	0.142857143	-0.959285714	-0.037142857	0.920229082	0.001379592
1162	0	0	1197	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
1172	0	0	1198	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
1175	1	1	1202	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
1180	0	0	1205	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
1183	0	0	1209	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
1188	0	0	1210	0	1	0	0.071428571	-0.959285714	-0.108571429	0.920229082	0.011787755
1194	0	0	1213	1	0	0.071428571	0	-0.887857143	-0.18	0.788290306	0.0324
1196	0	1	1233	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
1196	0	1	1235	48	6	3.428571429	0.428571429	2.469285714	0.248571429	6.097371939	0.061787755
1197	0	0	1239	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
1198	0	0	1240	65	5	4.642857143	0.357142857	3.683571429	0.177142857	13.56869847	0.031379592
1202	0	0	1252	29	15	2.071428571	1.071428571	1.112142857	0.891428571	1.236861735	0.794644898
1205	0	0	1259	6	0	0.428571429	0	-0.530714286	-0.18	0.281657653	0.0324
1209	0	0	1268	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
1210	0	1	1272	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
1213	1	0	1281	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
1233	0	0	1300	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
1235	48	6	1306	2	0	0.142857143	0	-0.816428571	-0.18	0.666555612	0.0324
1239	0	0	1313	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
1240	65	5	1316	1	1	0.071428571	0.071428571	-0.887857143	-0.108571429	0.788290306	0.011787755
1252	29	15	1319	44	7	3.142857143	0.5	2.183571429	0.32	4.767984184	0.1024
1259	0	0	1333	5	0	0.357142857	0	-0.602142857	-0.18	0.36257602	0.0324
1259	6	0	1336	51	2	3.642857143	0.142857143	2.683571429	-0.037142857	7.201555612	0.001379592
1268	0	0	1342	1	0	0.071428571	0	-0.887857143	-0.18	0.788290306	0.0324
1272	0	0	1363	2	0	0.142857143	0	-0.816428571	-0.18	0.666555612	0.0324
1281	0	0	1364	0	0	0	0	-0.959285714	-0.18	0.920229082	0.0324
1300	0	0	1367	0	1	0	0.071428571	-0.959285714	-0.108571429	0.920229082	0.011787755
1306	2	0									
1313	0	0									
1316	1	1									
1319	44	7									
1333	5	0									
1336	51	2									
1342	1	0									
1342	0	0									
1363	0	0									
1363	2	0									
1364	0	0									
1367	0	1									

11.4.8.2 Frankfurt am Main – C1 – Phase 2

O.R.C.U.S. 02.00 - Simulation Summary

UA Parameters

MTOW [kg]	Wingspan [m]	Length [m]	L/D
90	5	4	8

v [km/h]	Alt [m]	CCF [m]
100	100	4715.4293

P_CumCat [1/Fh]	Engine [%]	ESys [%]	FCS [%]	NavSys [%]	Struct [%]
0.01	20	20	20	20	20

General map parameters

	Name	Area [km2]	PPL	PPL/km2
City	Frankfurt am Main, Stadt	248.31	746878	3008
County	Frankfurt am Main, Stadt	248.31	746878	3008
FS	HE	21115.67	6243262	296

Mission specific map parameters

	Area [km2]	PPL	Tourists	Total PPL
City	66.85547561	201102	0	201102
Map total	66.85547561	201102	0	201102

PPL MOD NA

Sim FH [Fh]	19600	Ev/Fh [1/Fh]	0.010102
Events total	198		

Hits due to UA impacts		Hits/Fh [1/Fh]
City ATB	2012	0.1026531
City OTW	351	0.0179082
Total	2363	0.1205612

Prot	cyc	k_UA	Day	Time of impact	UA X Pos	UA Y Pos	Travelled Distance [km]	PPL_TD_CITY_ATB	PPL_CITY_ATB_COUNT	HIT_CITY_ATB_COUNT	PPL_TD_CITY_OTW	PPL_CITY_OTW_COUNT	HIT_CITY_OTW_COUNT	PPL_ALL_ATB_COUNT	PPL_ALL_OTW_COUNT	E	Case	Outcome
1	233	2157	Monday	16:58:04	7195	1839	1096.80	146804	146804	0	54298	54298	0	146804	54298	22	Generator Failure	UA approaches Emergency landing site
1003	232	3382	Tuesday	16:56:12	7175	3865	1093.69	143787	143787	27	57315	57315	10	143787	57315	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1011	29	2605	Wednesday	07:21:15	7257	2591	135.44	179986	179986	0	21116	21116	0	179986	21116	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
1028	168	209	Saturday	13:52:39	7069	3874	787.75	152837	152837	42	48265	48265	9	152837	48265	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1032	16	1753	Wednesday	06:43:48	7097	1626	73.03	179986	179986	0	21116	21116	0	179986	21116	30	Connection Failure	Central UA ground impact point below flight path
1034	190	1044	Friday	14:55:33	6973	2499	892.58	153843	153843	25	47259	47259	13	153843	47259	18	Engine Fire	UA structural desintegration - Debris Impact
1034	38	1528	Friday	07:45:53	7043	1752	176.47	180991	180991	2	20111	20111	0	180991	20111	54	Wrong commands to the flight control surfaces (Oscillations)	UA structural desintegration - Debris Impact
104	97	880	Saturday	10:32:18	6970	2829	453.83	143787	143787	0	57315	57315	0	143787	57315	51	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
1040	115	2139	Thursday	11:24:12	7191	1819	540.36	165909	165909	1	35193	35193	0	165909	35193	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
1056	189	954	Saturday	14:52:39	6970	2679	887.75	152837	152837	25	48265	48265	11	152837	48265	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1058	90	3091	Monday	10:14:13	7232	3518	423.72	164903	164903	0	36199	36199	0	164903	36199	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1058	98	1436	Monday	10:35:33	7024	1851	459.28	164903	164903	72	36199	36199	1	164903	36199	18	Engine Fire	UA structural desintegration - Debris Impact
1064	272	324	Sunday	18:46:59	7042	3770	1278.31	148815	148815	0	52287	52287	0	148815	52287	11	Engine Anomaly	Central UA ground impact point below flight path
109	241	1075	Thursday	17:19:52	6974	2439	1133.11	146804	146804	0	54298	54298	0	146804	54298	62	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
1096	242	1589	Thursday	17:23:05	7057	1701	1138.50	146804	146804	2	54298	54298	0	146804	54298	28	Generator Failure	UA ground impact tangential to trajectory
1102	40	2026	Wednesday	07:51:55	7165	1711	186.56	179986	179986	0	21116	21116	0	179986	21116	22	Generator Failure	UA approaches Emergency landing site
1109	200	14	Wednesday	15:23:01	7118	3949	938.39	158870	158870	0	42232	42232	0	158870	42232	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1117	144	699	Thursday	12:45:07	6981	3189	675.22	165909	165909	1	35193	35193	0	165909	35193	66	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point below flight path
1120	170	1131	Sunday	13:59:02	6979	2332	798.39	142782	142782	0	58320	58320	0	142782	58320	51	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
1121	40	1411	Monday	07:51:26	7019	1882	185.75	178980	178980	0	22122	22122	0	178980	22122	58	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
1122	120	3310	Tuesday	11:39:16	7191	3802	565.47	166914	166914	41	34188	34188	6	166914	34188	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
1124	161	1360	Thursday	13:33:45	7009	1951	756.25	155854	155854	61	45248	45248	4	155854	45248	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
1136	219	579	Tuesday	16:17:13	6995	3407	1028.72	143787	143787	0	57315	57315	0	143787	57315	57	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
114	190	2062	Tuesday	14:56:21	7174	1741	893.92	156859	156859	1	44243	44243	0	156859	44243	73	Degradation of altitude	Central UA ground impact point below flight path
1148	66	846	Sunday	09:04:33	6971	2898	307.61	179986	179986	0	21116	21116	0	179986	21116	50	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
1157	148	253	Tuesday	12:56:05	7058	3839	693.50	166914	166914	1	34188	34188	0	166914	34188	17	Engine Fire	Central UA ground impact point below flight path
1158	253	1837	Wednesday	17:54:24	7118	1625	1190.69	144793	144793	0	56309	56309	0	144793	56309	65	Degradation of lateral and horizontal navigation data accurracy.	UA approaches Emergency landing site
1163	94	3557	Monday	10:25:54	7132	3946	443.19	164903	164903	0	36199	36199	0	164903	36199	37	Short Circuit / Overload	Central UA ground impact point below flight path
1170	151	3089	Monday	13:06:48	7232	3515	711.36	155854	155854	0	45248	45248	0	155854	45248	39	Short Circuit / Overload	Central UA ground impact point below flight path
1174	203	2638	Friday	15:33:34	7259	2658	955.97	153843	153843	0	47259	47259	0	153843	47259	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
1180	140	403	Thursday	12:33:35	7026	3675	655.97	165909	165909	0	35193	35193	0	165909	35193	18	Engine Fire	UA structural desintegration - Debris Impact
1191	255	172	Monday	17:58:45	7078	3898	1197.94	146804	146803	0	54298	54298	0	146803	54298	5	Engine Out	No Ground Effect
1192	93	1474	Tuesday	10:21:27	7031	1807	435.75	166914	166914	60	34188	34188	3	166914	34188	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
12	165	787	Friday	13:44:37	6974	3017	774.36	153843	153843	0	47259	47259	0	153843	47259	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
120	228	2683	Monday	16:44:21	7260	2749	1073.92	146804	146804	39	54298	54298	12	146804	54298	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
1201	228	1135	Thursday	16:43:08	6979	2325	1071.89	146804	146804	20	54298	54298	18	146804	54298	20	Engine Fire	UA structural desintegration - Debris Impact
1203	248	2871	Saturday	17:41:04	7256	3126	1168.47	156859	156859	50	44243	44243	8	156859	44243	63	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
1213	84	2360	Tuesday	09:56:40	7232	2133	394.47	164903	164903	0	36199	36199	0	164903	36199	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
122	79	2610	Wednesday	09:42:43	7258	2601	371.22	163898	163898	70	37204	37204	9	163898	37204	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1222	60	412	Thursday	08:47:14	7024	3663	278.75	165909	165909	0	35193	35193	0	165909	35193	24	Generator Failure	UA ground impact tangential to trajectory
1230	77	3066	Friday	09:37:25	7235	3478	362.39	165909	165909	0	35193	35193	0	165909	35193	68	Degradation of lateral and horizontal navigation data accurracy.	UA approaches Emergency landing site
1239	166	92	Sunday	13:46:53	7098	3935	778.17	142782	142782	23	58320	58320	12	142782	58320	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
1254	66	1440	Monday	09:05:02	7024	1846	308.39	164903	164903	75	36199	36199	1	164903	36199	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1271	231	154	Thursday	16:50:51	7082	3909	1084.75	146804	146804	2	54298	54298	0	146804	54298	43	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
1276	79	171	Tuesday	09:40:48	7078	3899	368.03	164903	164903	0	36199	36199	0	164903	36199	47	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
1293	7	1876	Friday	06:18:26	7128	1632	30.75	180991	180991	51	20111	20111	5	180991	20111	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1296	182	2147	Monday	14:33:46	7193	1828	856.30	155854	155854	0	45248	45248	0	155854	45248	35	Connection Failure	UA ground impact tangential to trajectory
1297	162	2977	Tuesday	13:37:51	7247	3324	763.08	156859	156859	0	44243	44243	0	156859	44243	6	Engine Out	UA approaches Emergency landing site
1312	183	1283	Wednesday	14:35:55	6997	2067	859.89	158870	158870	37	42232	42232	4	158870	42232	21	Engine Fire	UA structural desintegration - Debris Impact
1312	277	2513	Wednesday	19:02:51	7251	2410	1304.75	180991	180991	69	20111	20111	3	180991	20111	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
1313	211	2234	Thursday	15:55:53	7210	1939	993.17	155854	155854	66	45248	45248	5	155854	45248	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1329	161	278	Saturday	13:32:53	7053	3817	754.83	152837	152837	0	48265	48265	0	152837	48265	22	Generator Failure	UA approaches Emergency landing site
1329	261	2154	Saturday	18:17:17	7194	1836	1228.83	156859	156859	0	44243	44243	0	156859	44243	36	Short Circuit / Overload	Central UA ground impact point below flight path
133	193	784	Sunday	15:03:50	6974	3023	906.39	142782	142782	0	58320	58320	0	142782	58320	2	Engine Out	UA approaches Emergency landing site
1334	123	1884	Thursday	11:46:39	7130	1634	577.75	165909	165909	0	35193	35193	0	165909	35193	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
1337	52	2131	Sunday	08:25:58	7189	1810	243.28	179986	179986	0	21116	21116	0	179986	21116	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
1349	142	519	Friday	12:39:19	7004	3506	665.56	165909	165909	0	35193	35193	1	165909	35193	28	Generator Failure	UA ground impact tangential to trajectory
1350	14	3100	Saturday	06:39:12	7230	3532	65.36	196074	196074	0	5028	5028	0	196074	5028	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1353	127	1693	Tuesday	11:57:49	7082	1643	596.36	166914	166914	0	34188	34188	0	166914	34188	1	Engine Out	No Ground Effect
1376	291	316	Thursday	19:40:43	7044	3779	1367.89	176969	176968	0	24133	24133	0	176968	24133	47	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
1386	3	3001	Sunday	06:08:01	7244	3367	13.36	198085	198085	0	3017	3017	0	198085	3017	10	Engine Anomaly	UA approaches Emergency landing site
1391	269	1475	Friday	18:39:24	7032	1806	1265.67	152837	152837	67	48265	48265	6	152837	48265	18	Engine Fire	UA structural desintegration - Debris Impact
1398	70	167	Friday	09:15:21	7079	3901	325.58	165909	165909	51	35193	35193	5	165909	35193	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
140	119	3560	Sunday	11:36:39	7131	3947	561.08	152837	152837	0	48265	48265	0	152837	48265	13	Engine Anomaly	UA approaches Emergency landing site
147	31	898	Sunday	07:25:35	6970	2793	142.64	198085	198085	0	3017	3017	0	198085	3017	32	Connection Failure	UA approaches Emergency landing site
151	206	2569	Thursday	15:42:01	7255	2520	970.03	155854	155854	1	45248	45248	0	155854	45248	37	Short Circuit / Overload	Central UA ground impact point below flight path
156	9	211	Tuesday	06:22:47	7068	3873	38.00	177975	177975	0	23127	23127	0	177975	23127	17	Engine Fire	Central UA ground impact point below flight path
157	104	2103	Wednesday	10:53:03	7183	1780	488.44	168925	168925	0	32177	32177	0	168925	32177	22	Generator Failure	UA approaches Emergency landing site
158	77	1370	Thursday	09:36:06	7011	1937	360.17	165909	165909	65	35193	35193	2	165909	35193	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
16	192	651	Tuesday	15:00:53	6986	3278	901.50	156859	156859	0	44243	44243	0	156859	44243	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
165	12	2411	Thursday	06:33:00	7239	2221	55.03	178980	178980	87	22122	22122	1	178980	22122	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
174	102	1521	Saturday	10:46:57	7041	1759	478.25	143787	143787	0	57315	57315	0	143787	57315	1	Engine Out	No Ground Effect
185	56	264	Wednesday	08:35:48	7056	3830	259.69	163898	163898	0	37204	37204	1	163898	37204	77	Degradation of altitude	Central UA ground impact point below flight path
203	31	3527	Sunday	07:27:38	7140	3940	146.08	198085	198085	0	3017	3017	0	198085	3017	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
216	57	842	Saturday	08:39:06	6971	2906	265.17	178980	178980	0	22122	22122	0	178980	22122	71	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate
229	146	243	Friday	12:50:25	7061	3848	684.06	165909	165909	0	35193	35193	0	165909	35193	70	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate
230	179	2302	Saturday	14:25:25	7223	2039	842.36	152837	152837	0	48265	48265	0	152837	48265	65	Degradation of lateral and horizontal navigation data accurracy.	UA approaches Emergency landing site
240	264	685	Tuesday	18:24:37	6982	3215	1241.06	143787	143787	0	57315	57315	0	143787	57315	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
240	36	924	Tuesday	07:39:45	6969	2740	166.25	177975	177975	2	23127	23127	0	177975	23127	19	Engine Fire	Central UA ground impact point below flight path
248	105	2469	Wednesday	10:56:10	7246	2327	493.64	168925	168925	3	32177	32177	0	168925	32177	30	Connection Failure	Central UA ground impact point below flight path
250	107	1992	Friday	11:01:28	7157	1686	502.44	165909	165909	0	35193	35193	0	165909	35193	78	Degradation of altitude	Central UA ground impact point below flight path
254	277	3128	Tuesday	19:03:20	7226	3575	1305.56	179986	179986	0	21116	21116	0	179986	21116	71	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate
262	50	2438	Wednesday	08:20:32	7243	2270	234.25	163898	163898	59	37204	37204	6	163898	37204	21	Engine Fire	UA structural desintegration - Debris Impact
265	1	21	Saturday	06:00:00	7116	3949	0.03	196074	196074	0	5028	5028	0	196074	5028	47	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
277	217	2753	Thursday	16:13:16	7260	2891	1022.14	146804	146804	0	54298	54298	0	146804	54298	73	Degradation of altitude	Central UA ground impact point below flight path
284	221	2519	Thursday	16:24:24	7251	2422	1040.69	146804	146804	0	54298	54298	0	146804	54298	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
284	255	257	Thursday	17:58:50	7058	3836	1198.06	146804	146804	0	54298	54298	0	146804	54298	72	Degradation of altitude	UA approaches Emergency landing site
291	248	1133	Thursday	17:39:43	6979	2328	1166.20	146804	146804	0	54298	54298	0	146804	54298	13	Engine Anomaly	UA approaches Emergency landing site
291	251	385	Thursday	17:47:37	7029	3698	1179.36	146804	146804	0	54298	54298	0	146804	54298	22	Generator Failure	UA approaches Emergency landing site
291	64	1133	Thursday	08:59:08	6979	2328	298.56	165909	165909	0	35193	35193	0	165909	35193	22	Generator Failure	UA approaches Emergency landing site
298	188	3260	Thursday	14:51:37	7202	3749	886.06	155854	155854	0	45248	45248	1	155854	45248	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
305	182	1024	Thursday	14:32:54	6972	2539	854.83	155854	155854	0	45248	45248	0	155854	45248	47	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
328	170	558	Saturday	13:58:34	6998	3442	797.64	152837	152837	0	48265	48265	0	152837	48265	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
333	35	1300	Thursday	07:37:12	7000	2040	162.03	178980	178980	28	22122	22122	11	178980	22122	21	Engine Fire	UA structural desintegration - Debris Impact
339	137	3165	Wednesday	12:27:15	7220	3628	645.44	168925	168925	0	32177	32177	4	168925	32177	18	Engine Fire	UA structural desintegration - Debris Impact
34	164	676	Saturday	13:41:42	6983	3232	769.50	152837	152837	0	48265	48265	0	152837	48265	77	Degradation of altitude	Central UA ground impact point below flight path
343	32	1412	Sunday	07:28:49	7019	1881	148.03	198085	198085	2	3017	3017	0	198085	3017	50	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
350	257	2240	Sunday	18:06:03	7212	1947	1210.08	148815	148815	1	52287	52287	0	148815	52287	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
36	253	2410	Monday	17:54:52	7239	2219	1191.44	146804	146804	0	54298	54298	0	146804	54298	42	Partial Lock of Flight Control Surfaces	Central UA ground impact point below flight path
36	68	3507	Monday	09:12:18	7145	3934	320.53	164903	164903	11	36199	36199	5	164903	36199	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
377	204	2452	Saturday	15:36:15	7244	2295	960.44	152837	152837	55	48265	48265	7	152837	48265	18	Engine Fire	UA structural desintegration - Debris Impact
391	192	2623	Saturday	15:02:26	7258	2627	904.08	152837	152837	86	48265	48265	3	152837	48265	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
393	147	57	Monday	12:53:06	7107	3944	688.53	164903	164903	26	36199	36199	7	164903	36199	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
399	23	2956	Sunday	07:04:34	7249	3286	107.61	198085	198085	0	3017	3017	0	198085	3017	72	Degradation of altitude	UA approaches Emergency landing site
399	73	2643	Sunday	09:25:47	7259	2668	342.97	179986	179986	0	21116	21116	0	179986	21116	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
411	296	3	Friday	19:54:38	7120	3950	1391.06	180991	180991	19	20111	20111	7	180991	20111	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
417	161	215	Thursday	13:32:51	7068	3870	754.75	155854	155854	49	45248	45248	9	155854	45248	21	Engine Fire	UA structural desintegration - Debris Impact
420	162	1747	Sunday	13:36:53	7095	1628	761.47	142782	142782	26	58320	58320	14	142782	58320	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
43	18	1636	Monday	06:49:22	7068	1670	82.31	178980	178980	29	22122	22122	9	178980	22122	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
430	116	1084	Wednesday	11:26:12	6975	2421	543.69	168925	168925	0	32177	32177	0	168925	32177	65	Degradation of lateral and horizontal navigation data accurracy.	UA approaches Emergency landing site
432	52	2894	Friday	08:26:33	7254	3170	244.28	165909	165909	0	35193	35193	1	165909	35193	53	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
433	34	616	Saturday	07:33:50	6990	3342	156.42	196074	196074	0	5028	5028	0	196074	5028	78	Degradation of altitude	Central UA ground impact point below flight path
437	276	1787	Wednesday	18:59:27	7105	1623	1299.08	180991	180991	0	20111	20111	0	180991	20111	32	Connection Failure	UA approaches Emergency landing site
44	281	1176	Tuesday	19:13:06	6983	2249	1321.86	179986	179986	0	21116	21116	0	179986	21116	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
47	157	767	Friday	13:21:58	6975	3056	736.61	153843	153843	40	47259	47259	11	153843	47259	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
470	215	1407	Monday	16:06:34	7018	1887	1010.94	146804	146804	65	54298	54298	4	146804	54298	21	Engine Fire	UA structural desintegration - Debris Impact
479	225	3473	Wednesday	16:36:28	7153	3921	1060.81	144793	144793	1	56309	56309	0	144793	56309	38	Short Circuit / Overload	Central UA ground impact point below flight path
479	259	1274	Wednesday	18:10:56	6996	2081	1218.25	144793	144793	1	56309	56309	0	144793	56309	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
49	95	1696	Sunday	10:27:16	7083	1642	445.47	152837	152837	23	48265	48265	13	152837	48265	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
496	115	1948	Saturday	11:24:03	7146	1660	540.11	143787	143787	1	57315	57315	0	143787	57315	35	Connection Failure	UA ground impact tangential to trajectory
502	118	2664	Friday	11:33:07	7260	2710	555.19	165909	165909	1	35193	35193	0	165909	35193	57	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
512	26	3014	Monday	07:13:06	7242	3390	121.83	178980	178980	0	22122	22122	0	178980	22122	29	Connection Failure	UA approaches Emergency landing site
521	246	2501	Wednesday	17:35:08	7250	2387	1158.56	144793	144793	1	56309	56309	0	144793	56309	67	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate
523	67	88	Friday	09:06:48	7099	3936	311.33	165909	165909	0	35193	35193	0	165909	35193	39	Short Circuit / Overload	Central UA ground impact point below flight path
536	74	1672	Thursday	09:27:50	7077	1652	346.42	165909	165909	0	35193	35193	0	165909	35193	67	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate
545	278	1076	Saturday	19:04:32	6974	2437	1307.58	180991	180991	0	20111	20111	0	180991	20111	75	Degradation of altitude	UA approaches Emergency landing site
545	83	1846	Saturday	09:53:26	7120	1626	389.08	178980	178980	0	22122	22122	0	178980	22122	58	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
555	4	2751	Tuesday	06:10:38	7260	2887	17.75	177975	177975	0	23127	23127	0	177975	23127	29	Connection Failure	UA approaches Emergency landing site
556	251	533	Wednesday	17:47:43	7002	3484	1179.56	144793	144793	0	56309	56309	0	144793	56309	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
560	59	2019	Sunday	08:45:41	7163	1705	276.14	179986	179986	0	21116	21116	0	179986	21116	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
579	105	455	Friday	10:54:36	7016	3604	491.00	165909	165909	0	35193	35193	0	165909	35193	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
59	269	1729	Wednesday	18:39:35	7091	1632	1266.00	144793	144793	0	56309	56309	0	144793	56309	75	Degradation of altitude	UA approaches Emergency landing site
597	154	1896	Tuesday	13:14:21	7133	1638	723.94	156859	156859	0	44243	44243	0	156859	44243	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
597	79	2165	Tuesday	09:42:23	7196	1849	370.64	164903	164903	1	36199	36199	0	164903	36199	36	Short Circuit / Overload	Central UA ground impact point below flight path
601	5	1654	Saturday	06:12:37	7072	1661	21.03	196074	196074	0	5028	5028	0	196074	5028	71	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate
607	176	2583	Friday	14:17:09	7256	2547	828.58	153843	153843	31	47259	47259	7	153843	47259	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
613	1	1887	Thursday	06:01:28	7131	1635	2.47	178980	178980	0	22122	22122	0	178980	22122	65	Degradation of lateral and horizontal navigation data accurracy.	UA approaches Emergency landing site
614	108	1785	Friday	11:04:08	7105	1623	506.89	165909	165909	0	35193	35193	0	165909	35193	26	Generator Failure	Central UA ground impact point below flight path
618	8	1733	Tuesday	06:21:10	7092	1631	35.28	177975	177975	24	23127	23127	3	177975	23127	18	Engine Fire	UA structural desintegration - Debris Impact
620	19	772	Thursday	06:51:32	6975	3047	85.89	178980	178980	0	22122	22122	0	178980	22122	72	Degradation of altitude	UA approaches Emergency landing site
625	60	2193	Tuesday	08:48:38	7202	1884	281.08	164903	164903	1	36199	36199	0	164903	36199	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path

630	8	800	Sunday	06:20:26	6973	2991	34.06	198085	198085	0	3017	3017	0	198085	3017	24	Generator Failure	UA ground impact tangential to trajectory
632	261	649	Tuesday	18:16:07	6986	3282	1226.86	143787	143787	0	57315	57315	0	143787	57315	17	Engine Fire	Central UA ground impact point below flight path
675	42	2333	Wednesday	07:57:49	7228	2088	196.39	179986	179986	0	21116	21116	0	179986	21116	31	Connection Failure	UA ground impact tangential to trajectory
675	49	185	Wednesday	08:15:56	7075	3890	226.58	163898	163898	0	37204	37204	0	163898	37204	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
682	137	727	Wednesday	12:25:21	6978	3135	642.25	168925	168925	1	32177	32177	0	168925	32177	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
684	175	3362	Friday	14:14:55	7179	3850	824.89	153843	153843	1	47259	47259	0	153843	47259	78	Degradation of altitude	Central UA ground impact point below flight path
693	68	2426	Sunday	09:11:28	7241	2248	319.11	179986	179986	0	21116	21116	0	179986	21116	72	Degradation of altitude	UA approaches Emergency landing site
7	88	1893	Sunday	10:07:37	7132	1637	412.72	152837	152837	0	48265	48265	0	152837	48265	74	Degradation of altitude	Central UA ground impact point below flight path
709	96	26	Tuesday	10:28:47	7115	3949	448.00	166914	166914	0	34188	34188	0	166914	34188	72	Degradation of altitude	UA approaches Emergency landing site
71	191	3467	Monday	15:00:17	7155	3918	900.47	155854	155854	1	45248	45248	0	155854	45248	73	Degradation of altitude	Central UA ground impact point below flight path
71	214	1592	Monday	16:03:52	7058	1699	1006.47	146804	146804	0	54298	54298	0	146804	54298	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
710	61	2411	Wednesday	08:51:39	7239	2221	286.08	163898	163898	0	37204	37204	0	163898	37204	33	Connection Failure	Central UA ground impact point below flight path
721	66	719	Sunday	09:04:28	6979	3150	307.44	179986	179986	0	21116	21116	0	179986	21116	58	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
723	102	799	Tuesday	10:46:22	6973	2993	477.30	166914	166914	0	34188	34188	0	166914	34188	30	Connection Failure	Central UA ground impact point below flight path
726	91	2927	Friday	10:16:56	7252	3233	428.22	165909	165909	0	35193	35193	0	165909	35193	4	Engine Out	Central ground impact point below flight path with B/G Ratio.
734	96	3038	Saturday	10:31:10	7239	3431	451.95	143787	143787	1	57315	57315	0	143787	57315	27	Generator Failure	UA ground impact tangential to trajectory
751	191	2788	Tuesday	14:59:45	7260	2961	899.58	156859	156859	0	44243	44243	0	156859	44243	51	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
754	52	3594	Friday	08:27:07	7123	3950	245.19	165909	165909	9	35193	35193	12	165909	35193	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
757	97	2725	Monday	10:33:45	7261	2834	456.25	164903	164903	0	36199	36199	0	164903	36199	34	Connection Failure	UA ground impact tangential to trajectory
76	61	311	Saturday	08:49:59	7045	3784	283.33	178980	178980	0	22122	22122	0	178980	22122	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
760	225	2625	Thursday	16:35:49	7258	2631	1059.69	146804	146804	0	54298	54298	0	146804	54298	28	Generator Failure	UA ground impact tangential to trajectory
761	252	2638	Friday	17:52:13	7259	2658	1187.03	152837	152837	65	48265	48265	5	152837	48265	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
772	292	300	Tuesday	19:43:32	7048	3795	1372.58	179986	179986	5	21116	21116	0	179986	21116	28	Generator Failure	UA ground impact tangential to trajectory
773	22	88	Wednesday	06:59:29	7099	3936	99.14	179986	179986	0	21116	21116	0	179986	21116	6	Engine Out	UA approaches Emergency landing site
777	290	3598	Sunday	19:40:28	7122	3950	1367.47	177975	177975	0	23127	23127	0	177975	23127	45	Partial Lock of Flight Control Surfaces	Central UA ground impact point below flight path
777	67	3226	Sunday	09:09:15	7208	3709	315.44	179986	179986	0	21116	21116	0	179986	21116	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
777	71	2060	Sunday	09:19:40	7173	1739	332.78	179986	179986	32	21116	21116	5	179986	21116	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
780	270	547	Wednesday	18:41:30	7000	3461	1269.17	144793	144793	0	56309	56309	0	144793	56309	1	Engine Out	No Ground Effect
809	77	2875	Thursday	09:37:16	7256	3133	362.14	165909	165909	3	35193	35193	0	165909	35193	28	Generator Failure	UA ground impact tangential to trajectory
825	34	3585	Saturday	07:36:10	7125	3949	160.30	196074	196074	0	5028	5028	0	196074	5028	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
83	21	422	Saturday	06:56:55	7022	3650	94.86	196074	196074	0	5028	5028	0	196074	5028	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
831	112	2908	Friday	11:16:19	7253	3197	527.22	165909	165909	0	35193	35193	0	165909	35193	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
842	162	1429	Tuesday	13:36:38	7022	1860	761.06	156859	156859	0	44243	44243	0	156859	44243	65	Degradation of lateral and horizontal navigation data accurracy.	UA approaches Emergency landing site
847	158	3232	Sunday	13:26:44	7207	3716	744.56	142782	142782	0	58320	58320	0	142782	58320	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
863	81	2090	Tuesday	09:47:58	7180	1767	379.97	164903	164903	25	36199	36199	10	164903	36199	20	Engine Fire	UA structural desintegration - Debris Impact
870	196	205	Tuesday	15:11:51	7070	3877	919.78	156859	156859	0	44243	44243	0	156859	44243	57	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
874	91	3457	Saturday	10:17:21	7157	3913	428.92	143787	143787	0	57315	57315	0	143787	57315	70	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate
877	206	660	Tuesday	15:40:30	6985	3262	967.53	156859	156859	22	44243	44243	16	156859	44243	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
888	20	2262	Saturday	06:55:32	7216	1979	92.56	196074	196074	3	5028	5028	0	196074	5028	74	Degradation of altitude	Central UA ground impact point below flight path
894	67	257	Friday	09:06:55	7058	3836	311.55	165909	165909	0	35193	35193	0	165909	35193	68	Degradation of lateral and horizontal navigation data accurracy.	UA approaches Emergency landing site
901	293	2299	Friday	19:47:57	7222	2034	1379.92	180991	180991	2	20111	20111	0	180991	20111	62	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
903	88	3441	Sunday	10:08:50	7161	3904	414.75	152837	152837	3	48265	48265	0	152837	48265	9	Engine Out	UA ground impact tangential to trajectory
903	91	721	Sunday	10:15:11	6979	3146	425.33	152837	152837	46	48265	48265	10	152837	48265	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
91	240	2533	Sunday	17:18:10	7253	2449	1130.31	148815	148815	1	52287	52287	0	148815	52287	14	Engine Anomaly	Central UA ground impact point below flight path
921	157	1127	Thursday	13:22:14	6978	2339	737.08	155854	155854	2	45248	45248	0	155854	45248	71	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate
947	27	1810	Tuesday	07:14:58	7111	1622	124.97	177975	177975	0	23127	23127	0	177975	23127	10	Engine Anomaly	UA approaches Emergency landing site
950	121	2531	Friday	11:41:30	7252	2445	569.17	165909	165909	69	35193	35193	6	165909	35193	18	Engine Fire	UA structural desintegration - Debris Impact
952	262	1184	Sunday	18:19:22	6984	2235	1232.28	148815	148815	0	52287	52287	0	148815	52287	68	Degradation of lateral and horizontal navigation data accurracy.	UA approaches Emergency landing site
959	13	1950	Sunday	06:35:29	7147	1661	59.14	198085	198085	0	3017	3017	0	198085	3017	74	Degradation of altitude	Central UA ground impact point below flight path
964	265	3002	Friday	18:29:16	7244	3369	1248.81	152837	152837	0	48265	48265	0	152837	48265	36	Short Circuit / Overload	Central UA ground impact point below flight path
964	95	2863	Friday	10:28:12	7256	3110	447.00	165909	165909	0	35193	35193	0	165909	35193	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
97	63	3439	Saturday	08:58:07	7161	3903	296.86	178980	178980	0	22122	22122	0	178980	22122	43	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
970	24	819	Thursday	07:05:42	6972	2953	109.53	178980	178980	0	22122	22122	0	178980	22122	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
973	5	1972	Sunday	06:12:52	7152	1674	21.44	198085	198085	0	3017	3017	0	198085	3017	37	Short Circuit / Overload	Central UA ground impact point below flight path
975	158	1196	Tuesday	13:25:08	6985	2214	741.89	156859	156859	1	44243	44243	15	156859	44243	20	Engine Fire	UA structural desintegration - Debris Impact
98	140	572	Sunday	12:33:42	6996	3419	656.19	152837	152837	0	48265	48265	0	152837	48265	75	Degradation of altitude	UA approaches Emergency landing site
998	86	2371	Thursday	10:02:21	7234	2152	403.92	165909	165909	0	35193	35193	0	165909	35193	22	Generator Failure	UA approaches Emergency landing site

O.R.C.U.S. 02.00 - tTest of the Simulation

nProbes	200
nEvents	198
nEvents_cor	179
tMission	14
x_cross_ATB	10.06
x_cross_OTW	1.755
x_cross_TOT	11.815
s2ATB	90.051712
sATB	9.489558
tATB	14.977353
s2OTW	2.7416634
sOTW	1.6557969
tOTW	14.904018
s2TOT	123.85619
sTOT	11.12907
tTOT	15.001066

UADay/Prot	HIT_TOT_ATB	HIT_TOT_OTW	UADay/Prot cor	HIT_TOT_mean_ATB	HIT_TOT_mean_OTW	HIT_TOT_mean_ATB/Fh	HIT_TOT_mean_OTW/Fh	x_i-x_cross ATB	x_i-x_cross OTW	(x_i-x_cross ATB)^2	(x_i-x_cross OTW)^2
1	0	0	1	0	0	0	0	-10.06	-1.755	101.2036	3.080025
7	0	0	7	0	0	0	0	-10.06	-1.755	101.2036	3.080025
12	0	0	12	0	0	0	0	-10.06	-1.755	101.2036	3.080025
16	0	0	16	0	0	0	0	-10.06	-1.755	101.2036	3.080025
34	0	0	34	0	0	0	0	-10.06	-1.755	101.2036	3.080025
36	0	0	36	11	5	0.785714286	0.357142857	-9.274285714	-1.397857143	86.01237551	1.954004592
36	11	5	43	29	9	2.071428571	0.642857143	-7.988571429	-1.112142857	63.81727347	1.236861735
43	29	9	44	0	0	0	0	-10.06	-1.755	101.2036	3.080025
44	0	0	47	40	11	2.857142857	0.785714286	-7.202857143	-0.969285714	51.88115102	0.939514796
47	40	11	49	23	13	1.642857143	0.928571429	-8.417142857	-0.826428571	70.84829388	0.682984184
49	23	13	59	0	0	0	0	-10.06	-1.755	101.2036	3.080025
59	0	0	71	1	0	0.071428571	0	-9.988571429	-1.755	99.77155918	3.080025
71	1	0	76	0	0	0	0	-10.06	-1.755	101.2036	3.080025
71	0	0	83	0	0	0	0	-10.06	-1.755	101.2036	3.080025
76	0	0	91	1	0	0.071428571	0	-9.988571429	-1.755	99.77155918	3.080025
83	0	0	97	0	0	0	0	-10.06	-1.755	101.2036	3.080025
91	1	0	98	0	0	0	0	-10.06	-1.755	101.2036	3.080025
97	0	0	104	0	0	0	0	-10.06	-1.755	101.2036	3.080025
98	0	0	109	0	0	0	0	-10.06	-1.755	101.2036	3.080025
104	0	0	114	1	0	0.071428571	0	-9.988571429	-1.755	99.77155918	3.080025
109	0	0	120	39	12	2.785714286	0.857142857	-7.274285714	-0.897857143	52.91523265	0.806147449
114	1	0	122	70	9	5	0.642857143	-5.06	-1.112142857	25.6036	1.236861735
120	39	12	133	0	0	0	0	-10.06	-1.755	101.2036	3.080025
122	70	9	140	0	0	0	0	-10.06	-1.755	101.2036	3.080025
133	0	0	147	0	0	0	0	-10.06	-1.755	101.2036	3.080025
140	0	0	151	1	0	0.071428571	0	-9.988571429	-1.755	99.77155918	3.080025
147	0	0	156	0	0	0	0	-10.06	-1.755	101.2036	3.080025
151	1	0	157	0	0	0	0	-10.06	-1.755	101.2036	3.080025
156	0	0	158	65	2	4.642857143	0.142857143	-5.417142857	-1.612142857	29.34543673	2.599004592
157	0	0	165	87	1	6.214285714	0.071428571	-3.845714286	-1.683571429	14.78951837	2.834412755
158	65	2	174	0	0	0	0	-10.06	-1.755	101.2036	3.080025
165	87	1	185	0	1	0	0.071428571	-10.06	-1.683571429	101.2036	2.834412755
174	0	0	203	0	0	0	0	-10.06	-1.755	101.2036	3.080025
185	0	1	216	0	0	0	0	-10.06	-1.755	101.2036	3.080025
203	0	0	229	0	0	0	0	-10.06	-1.755	101.2036	3.080025
216	0	0	230	0	0	0	0	-10.06	-1.755	101.2036	3.080025
229	0	0	240	2	0	0.142857143	0	-9.917142857	-1.755	98.34972245	3.080025
230	0	0	248	3	0	0.214285714	0	-9.845714286	-1.755	96.9380898	3.080025
240	0	0	250	0	0	0	0	-10.06	-1.755	101.2036	3.080025
240	2	0	254	0	0	0	0	-10.06	-1.755	101.2036	3.080025
248	3	0	262	59	6	4.214285714	0.428571429	-5.845714286	-1.326428571	34.17237551	1.759412755
250	0	0	265	0	0	0	0	-10.06	-1.755	101.2036	3.080025
254	0	0	277	0	0	0	0	-10.06	-1.755	101.2036	3.080025
262	59	6	284	0	0	0	0	-10.06	-1.755	101.2036	3.080025
265	0	0	291	0	0	0	0	-10.06	-1.755	101.2036	3.080025
277	0	0	298	0	1	0	0.071428571	-10.06	-1.683571429	101.2036	2.834412755
284	0	0	305	0	0	0	0	-10.06	-1.755	101.2036	3.080025
284	0	0	328	0	0	0	0	-10.06	-1.755	101.2036	3.080025
291	0	0	333	28	11	2	0.785714286	-8.06	-0.969285714	64.9636	0.939514796
291	0	0	339	0	4	0	0.285714286	-10.06	-1.469285714	101.2036	2.15880051
291	0	0	343	2	0	0.142857143	0	-9.917142857	-1.755	98.34972245	3.080025
298	0	1	350	1	0	0.071428571	0	-9.988571429	-1.755	99.77155918	3.080025
305	0	0	377	55	7	3.928571429	0.5	-6.131428571	-1.255	37.59441633	1.575025
328	0	0	391	86	3	6.142857143	0.214285714	-3.917142857	-1.540714286	15.34400816	2.37380051
333	28	11	393	26	7	1.857142857	0.5	-8.202857143	-1.255	67.28686531	1.575025
339	0	4	399	0	0	0	0	-10.06	-1.755	101.2036	3.080025
343	2	0	411	19	7	1.357142857	0.5	-8.702857143	-1.255	75.73972245	1.575025
350	1	0	417	49	9	3.5	0.642857143	-6.56	-1.112142857	43.0336	1.236861735
377	55	7	420	26	14	1.857142857	1	-8.202857143	-0.755	67.28686531	0.570025
391	86	3	430	0	0	0	0	-10.06	-1.755	101.2036	3.080025
393	26	7	432	0	1	0	0.071428571	-10.06	-1.683571429	101.2036	2.834412755
399	0	0	433	0	0	0	0	-10.06	-1.755	101.2036	3.080025
399	0	0	437	0	0	0	0	-10.06	-1.755	101.2036	3.080025
411	19	7	470	65	4	4.642857143	0.285714286	-5.417142857	-1.469285714	29.34543673	2.15880051
417	49	9	479	2	0	0.142857143	0	-9.917142857	-1.755	98.34972245	3.080025
420	26	14	496	1	0	0.071428571	0	-9.988571429	-1.755	99.77155918	3.080025
430	0	0	502	1	0	0.071428571	0	-9.988571429	-1.755	99.77155918	3.080025
432	0	1	512	0	0	0	0	-10.06	-1.755	101.2036	3.080025
433	0	0	521	1	0	0.071428571	0	-9.988571429	-1.755	99.77155918	3.080025
437	0	0	523	0	0	0	0	-10.06	-1.755	101.2036	3.080025
470	65	4	536	0	0	0	0	-10.06	-1.755	101.2036	3.080025
479	1	0	545	0	0	0	0	-10.06	-1.755	101.2036	3.080025
479	1	0	555	0	0	0	0	-10.06	-1.755	101.2036	3.080025
496	1	0	556	0	0	0	0	-10.06	-1.755	101.2036	3.080025
502	1	0	560	0	0	0	0	-10.06	-1.755	101.2036	3.080025
512	0	0	579	0	0	0	0	-10.06	-1.755	101.2036	3.080025
521	1	0	597	1	0	0.071428571	0	-9.988571429	-1.755	99.77155918	3.080025
523	0	0	601	0	0	0	0	-10.06	-1.755	101.2036	3.080025
536	0	0	607	31	7	2.214285714	0.5	-7.845714286	-1.255	61.55523265	1.575025
545	0	0	613	0	0	0	0	-10.06	-1.755	101.2036	3.080025
545	0	0	614	0	0	0	0	-10.06	-1.755	101.2036	3.080025
555	0	0	618	24	3	1.714285714	0.214285714	-8.345714286	-1.540714286	69.65094694	2.37380051
556	0	0	620	0	0	0	0	-10.06	-1.755	101.2036	3.080025
560	0	0	625	1	0	0.071428571	0	-9.988571429	-1.755	99.77155918	3.080025
579	0	0	630	0	0	0	0	-10.06	-1.755	101.2036	3.080025
597	0	0	632	0	0	0	0	-10.06	-1.755	101.2036	3.080025
597	1	0	675	0	0	0	0	-10.06	-1.755	101.2036	3.080025
601	0	0	682	1	0	0.071428571	0	-9.988571429	-1.755	99.77155918	3.080025
607	31	7	684	1	0	0.071428571	0	-9.988571429	-1.755	99.77155918	3.080025
613	0	0	693	0	0	0	0	-10.06	-1.755	101.2036	3.080025
614	0	0	709	0	0	0	0	-10.06	-1.755	101.2036	3.080025
618	24	3	710	0	0	0	0	-10.06	-1.755	101.2036	3.080025
620	0	0	721	0	0	0	0	-10.06	-1.755	101.2036	3.080025
625	1	0	723	0	0	0	0	-10.06	-1.755	101.2036	3.080025
630	0	0	726	0	0	0	0	-10.06	-1.755	101.2036	3.080025
632	0	0	734	1	0	0.071428571	0	-9.988571429	-1.755	99.77155918	3.080025
675	0	0	751	0	0	0	0	-10.06	-1.755	101.2036	3.080025
675	0	0	754	9	12	0.642857143	0.857142857	-9.417142857	-0.897857143	88.68257959	0.806147449
682	1	0	757	0	0	0	0	-10.06	-1.755	101.2036	3.080025
684	1	0	760	0	0	0	0	-10.06	-1.755	101.2036	3.080025
693	0	0	761	65	5	4.642857143	0.357142857	-5.417142857	-1.397857143	29.34543673	1.954004592
709	0	0	772	5	0	0.357142857	0	-9.702857143	-1.755	94.14543673	3.080025
710	0	0	773	0	0	0	0	-10.06	-1.755	101.2036	3.080025
721	0	0	777	32	5	2.285714286	0.357142857	-7.774285714	-1.397857143	60.43951837	1.954004592
723	0	0	780	0	0	0	0	-10.06	-1.755	101.2036	3.080025
726	0	0	809	3	0	0.214285714	0	-9.845714286	-1.755	96.9380898	3.080025
734	1	0	825	0	0	0	0	-10.06	-1.755	101.2036	3.080025
751	0	0	831	0	0	0	0	-10.06	-1.755	101.2036	3.080025
754	9	12	842	0	0	0	0	-10.06	-1.755	101.2036	3.080025
757	0	0	847	0	0	0	0	-10.06	-1.755	101.2036	3.080025
760	0	0	863	25	10	1.785714286	0.714285714	-8.274285714	-1.040714286	68.46380408	1.083086224
761	65	5	870	0	0	0	0	-10.06	-1.755	101.2036	3.080025
772	5	0	874	0	0	0	0	-10.06	-1.755	101.2036	3.080025
773	0	0	877	22	16	1.571428571	1.142857143	-8.488571429	-0.612142857	72.0558449	0.374718878
777	0	0	888	3	0	0.214285714	0	-9.845714286	-1.755	96.9380898	3.080025
777	0	0	894	0	0	0	0	-10.06	-1.755	101.2036	3.080025
777	32	5	901	2	0	0.142857143	0	-9.917142857	-1.755	98.34972245	3.080025
780	0	0	903	49	10	3.5	0.714285714	-6.56	-1.040714286	43.0336	1.083086224
809	3	0	921	2	0	0.142857143	0	-9.917142857	-1.755	98.34972245	3.080025
825	0	0	947	0	0	0	0	-10.06	-1.755	101.2036	3.080025
831	0	0	950	69	6	4.928571429	0.428571429	-5.131428571	-1.326428571	26.33155918	1.759412755
842	0	0	952	0	0	0	0	-10.06	-1.755	101.2036	3.080025
847	0	0	959	0	0	0	0	-10.06	-1.755	101.2036	3.080025
863	25	10	964	0	0	0	0	-10.06	-1.755	101.2036	3.080025
870	0	0	970	0	0	0	0	-10.06	-1.755	101.2036	3.080025
874	0	0	973	0	0	0	0	-10.06	-1.755	101.2036	3.080025
877	22	16	975	1	15	0.071428571	1.071428571	-9.988571429	-0.683571429	99.77155918	0.467269898
888	3	0	998	0	0	0	0	-10.06	-1.755	101.2036	3.080025
894	0	0	1003	27	10	1.928571429	0.714285714	-8.131428571	-1.040714286	66.12013061	1.083086224
901	2	0	1011	0	0	0	0	-10.06	-1.755	101.2036	3.080025
903	3	0	1028	42	9	3	0.642857143	-7.06	-1.112142857	49.8436	1.236861735
903	46	10	1032	0	0	0	0	-10.06	-1.755	101.2036	3.080025
921	2	0	1034	27	13	1.928571429	0.928571429	-8.131428571	-0.826428571	66.12013061	0.682984184
947	0	0	1040	1	0	0.071428571	0	-9.988571429	-1.755	99.77155918	3.080025
950	69	6	1056	25	11	1.785714286	0.785714286	-8.274285714	-0.969285714	68.46380408	0.939514796
952	0	0	1058	72	1	5.142857143	0.071428571	-4.917142857	-1.683571429	24.17829388	2.834412755
959	0	0	1064	0	0	0	0	-10.06	-1.755	101.2036	3.080025
964	0	0	1096	2	0	0.142857143	0	-9.917142857	-1.755	98.34972245	3.080025
964	0	0	1102	0	0	0	0	-10.06	-1.755	101.2036	3.080025
970	0	0	1109	0	0	0	0	-10.06	-1.755	101.2036	3.080025
973	0	0	1117	1	0	0.071428571	0	-9.988571429	-1.755	99.77155918	3.080025
975	1	15	1120	0	0	0	0	-10.06	-1.755	101.2036	3.080025
998	0	0	1121	0	0	0	0	-10.06	-1.755	101.2036	3.080025
1003	27	10	1122	41	6	2.928571429	0.428571429	-7.131428571	-1.326428571	50.85727347	1.759412755
1011	0	0	1124	61	4	4.357142857	0.285714286	-5.702857143	-1.469285714	32.52257959	2.15880051
1028	42	9	1136	0	0	0	0	-10.06	-1.755	101.2036	3.080025
1032	0	0	1148	0	0	0	0	-10.06	-1.755	101.2036	3.080025
1034	25	13	1157	1	0	0.071428571	0	-9.988571429	-1.755	99.77155918	3.080025
1034	2	0	1158	0	0	0	0	-10.06	-1.755	101.2036	3.080025
1040	1	0	1163	0	0	0	0	-10.06	-1.755	101.2036	3.080025
1056	25	11	1170	0	0	0	0	-10.06	-1.755	101.2036	3.080025
1058	0	0	1174	0	0	0	0	-10.06	-1.755	101.2036	3.080025
1058	72	1	1180	0	0	0	0	-10.06	-1.755	101.2036	3.080025
1064	0	0	1191	0	0	0	0	-10.06	-1.755	101.2036	3.080025
1096	2	0	1192	60	3	4.285714286	0.214285714	-5.774285714	-1.540714286	33.34237551	2.37380051
1102	0	0	1201	20	18	1.428571429	1.285714286	-8.631428571	-0.469285714	74.50155918	0.220229082
1109	0	0	1203	50	8	3.571428571	0.571428571	-6.488571429	-1.183571429	42.10155918	1.400841327
1117	1	0	1213	0	0	0	0	-10.06	-1.755	101.2036	3.080025
1120	0	0	1222	0	0	0	0	-10.06	-1.755	101.2036	3.080025
1121	0	0	1230	0	0	0	0	-10.06	-1.755	101.2036	3.080025
1122	41	6	1239	23	12	1.642857143	0.857142857	-8.417142857	-0.897857143	70.84829388	0.806147449
1124	61	4	1254	75	1	5.357142857	0.071428571	-4.702857143	-1.683571429	22.11686531	2.834412755
1136	0	0	1271	2	0	0.142857143	0	-9.917142857	-1.755	98.34972245	3.080025
1148	0	0	1276	0	0	0	0	-10.06	-1.755	101.2036	3.080025
1157	1	0	1293	51	5	3.642857143	0.357142857	-6.417142857	-1.397857143	41.17972245	1.954004592
1158	0	0	1296	0	0	0	0	-10.06	-1.755	101.2036	3.080025
1163	0	0	1297	0	0	0	0	-10.06	-1.755	101.2036	3.080025
1170	0	0	1312	106	7	7.571428571	0.5	-2.488571429	-1.255	6.192987755	1.575025
1174	0	0	1313	66	5	4.714285714	0.357142857	-5.345714286	-1.397857143	28.57666122	1.954004592
1180	0	0	1329	0	0	0	0	-10.06	-1.755	101.2036	3.080025
1191	0	0	1334	0	0	0	0	-10.06	-1.755	101.2036	3.080025
1192	60	3	1337	0	0	0	0	-10.06	-1.755	101.2036	3.080025
1201	20	18	1349	0	1	0	0.071428571	-10.06	-1.683571429	101.2036	2.834412755
1203	50	8	1350	0	0	0	0	-10.06	-1.755	101.2036	3.080025
1213	0	0	1353	0	0	0	0	-10.06	-1.755	101.2036	3.080025
1222	0	0	1376	0	0	0	0	-10.06	-1.755	101.2036	3.080025
1230	0	0	1386	0	0	0	0	-10.06	-1.755	101.2036	3.080025
1239	23	12	1391	67	6	4.785714286	0.428571429	-5.274285714	-1.326428571	27.8180898	1.759412755
1254	75	1	1398	51	5	3.642857143	0.357142857	-6.417142857	-1.397857143	41.17972245	1.954004592
1271	2	0									
1276	0	0									
1293	51	5									
1296	0	0									
1297	0	0									
1312	37	4									
1312	69	3									
1313	66	5									
1329	0	0									
1329	0	0									
1334	0	0									
1337	0	0									
1349	0	1									
1350	0	0									
1353	0	0									
1376	0	0									
1386	0	0									
1391	67	6									
1398	51	5									

11.4.9 Hagen – C2

11.4.9.1 Hagen – C2 – Phase 1

O.R.C.U.S. 02.00 - Simulation Summary

UA Parameters

MTOW [kg]	Wingspan [m]	Length [m]	L/D
90	5	4	8

v [km/h]	Alt [m]	CCF [m]
100	100	11565.991

P_CumCat [1/Fh]	Engine [%]	ESys [%]	FCS [%]	NavSys [%]	Struct [%]
0.01	20	20	20	20	20

General map parameters

	Name	Area [km2]	PPL	PPL/km2
City	Hagen, Stadt der FernUniversitaet	160.45	187730	1170
County	Hagen, Stadt der FernUniversitaet	160.45	187730	1170
FS	NW	34112.45	17912134	525

Mission specific map parameters

	Area [km2]	PPL	Tourists	Total PPL
City	66.8555	78221	0	78221
Map total	66.8555	78221	0	78221

PPL MOD NA

Sim FH [Fh]	19600	Ev/Fh [1/Fh]	0.01015306
Events total	199		

Hits due to UA impacts		Hits/Fh [1/Fh]
City ATB	392	0.02
City OTW	131	0.0066837
Total	523	0.0266837

Prot	cyc	k_UA	Day	Time of impact	UA X Pos	UA Y Pos	Travelled Distance [km]	PPL_TD_CITY_ATB	PPL_CITY_ATB_COUNT	HIT_CITY_ATB_COUNT	PPL_TD_CITY_OTW	PPL_CITY_OTW_COUNT	HIT_CITY_OTW_COUNT	PPL_ALL_ATB_COUNT	PPL_ALL_OTW_COUNT	E	Case	Outcome
1	117	3047	Monday	19:30:51	9632	2616	1351.44	71181	71181	0	7040	7040	0	71181	7040	10	Engine Anomaly	UA approaches Emergency landing site
1002	98	2123	Monday	17:17:13	5719	3329	1128.72	59056	59056	0	19165	19165	0	59056	19165	1	Engine Out	No Ground Effect
1004	42	1008	Wednesday	10:46:27	7676	3915	477.44	64532	64532	0	13689	13689	0	64532	13689	29	Connection Failure	UA approaches Emergency landing site
1013	117	756	Friday	19:26:27	8888	3737	1344.08	70398	70398	0	7823	7823	0	70398	7823	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
1017	94	614	Tuesday	16:46:33	9521	3597	1077.61	58274	58274	0	19947	19947	0	58274	19947	50	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
1031	64	2778	Tuesday	13:22:32	8412	2692	737.58	61012	61012	0	17209	17209	0	61012	17209	78	Degradation of altitude	Central UA ground impact point below flight path
1040	72	1464	Thursday	14:15:32	5844	3929	825.89	60621	60621	1	17600	17600	0	60621	17600	26	Generator Failure	Central UA ground impact point below flight path
1048	116	2220	Friday	19:22:19	5992	3214	1337.22	70398	70398	0	7823	7823	0	70398	7823	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1050	35	1282	Sunday	09:58:25	6460	3975	397.36	57492	57492	0	20729	20729	0	57492	20729	31	Connection Failure	UA ground impact tangential to trajectory
1056	88	1014	Saturday	16:05:41	7647	3918	1009.50	59839	59839	0	18382	18382	0	59839	18382	75	Degradation of altitude	UA approaches Emergency landing site
1057	22	3347	Sunday	08:32:11	10597	2705	253.64	70007	70007	0	8214	8214	0	70007	8214	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1062	45	1552	Friday	11:08:20	5624	3884	513.89	62967	62967	3	15254	15254	3	62967	15254	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1063	25	3199	Saturday	08:52:43	10192	2639	287.86	68834	68834	0	9387	9387	0	68834	9387	1	Engine Out	No Ground Effect
1064	110	3338	Sunday	18:42:51	10577	2700	1271.42	57883	57883	0	20338	20338	0	57883	20338	73	Degradation of altitude	Central UA ground impact point below flight path
1067	4	3570	Wednesday	06:27:42	10891	2877	46.17	68443	68443	0	9778	9778	0	68443	9778	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
107	64	2934	Tuesday	13:22:51	9145	2631	738.08	61012	61012	0	17209	17209	0	61012	17209	1	Engine Out	No Ground Effect
1074	119	749	Wednesday	19:40:18	8921	3731	1367.19	69616	69616	0	8605	8605	0	69616	8605	40	Short Circuit / Overload	Central UA ground impact point below flight path
1089	24	513	Thursday	08:40:35	9921	3486	267.67	66096	66096	0	12125	12125	0	66096	12125	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
109	113	3129	Thursday	19:03:15	9950	2623	1305.44	71181	71181	0	7040	7040	0	71181	7040	19	Engine Fire	Central UA ground impact point below flight path
1096	73	3268	Thursday	14:25:57	10399	2665	843.25	60621	60621	0	17600	17600	0	60621	17600	36	Short Circuit / Overload	Central UA ground impact point below flight path
111	114	2097	Saturday	19:08:12	5657	3360	1313.69	69616	69616	0	8605	8605	1	69616	8605	31	Connection Failure	UA ground impact tangential to trajectory
1117	98	2996	Thursday	17:18:54	9419	2620	1131.53	57492	57492	0	20729	20729	0	57492	20729	37	Short Circuit / Overload	Central UA ground impact point below flight path
1118	74	2305	Friday	14:31:02	6282	3116	851.72	59056	59056	1	19165	19165	0	59056	19165	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
1119	40	868	Saturday	10:32:19	8354	3829	453.86	55145	55145	0	23076	23076	0	55145	23076	67	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
1128	93	1724	Monday	16:41:45	5368	3757	1069.61	59056	59056	17	19165	19165	4	59056	19165	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1133	119	931	Saturday	19:40:40	8048	3872	1367.78	69616	69616	0	8605	8605	0	69616	8605	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
1157	48	3323	Tuesday	11:32:33	10542	2691	554.28	64532	64532	0	13689	13689	0	64532	13689	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
1167	15	2427	Friday	07:41:49	6766	2981	169.72	69616	69616	1	8605	8605	0	69616	8605	17	Engine Fire	Central UA ground impact point below flight path
1167	58	2244	Friday	12:39:52	6070	3186	666.47	62967	62967	0	15254	15254	0	62967	15254	30	Connection Failure	Central UA ground impact point below flight path
118	65	3527	Saturday	13:30:55	10866	2838	751.55	59056	59056	0	19165	19165	4	59056	19165	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1185	120	3081	Tuesday	19:51:45	9768	2617	1386.25	71572	71572	17	6649	6649	0	71572	6649	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1186	8	1871	Wednesday	06:52:11	5344	3615	86.97	68443	68443	0	9778	9778	0	68443	9778	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
1192	6	468	Tuesday	06:35:36	10082	3434	59.33	69225	69225	0	8996	8996	0	69225	8996	24	Generator Failure	UA ground impact tangential to trajectory
1215	57	2810	Thursday	12:34:02	8566	2676	656.72	64532	64532	23	13689	13689	2	64532	13689	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1217	71	1459	Saturday	14:08:35	5858	3931	814.31	59056	59056	0	19165	19165	0	59056	19165	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1230	72	2986	Friday	14:18:28	9376	2621	830.78	59056	59056	0	19165	19165	0	59056	19165	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
1251	119	144	Friday	19:39:08	10832	3056	1365.25	70398	70398	0	7823	7823	0	70398	7823	36	Short Circuit / Overload	Central UA ground impact point below flight path
1253	58	1976	Sunday	12:39:21	5438	3500	665.61	57492	57492	0	20729	20729	1	57492	20729	24	Generator Failure	UA ground impact tangential to trajectory
1266	121	1383	Saturday	19:55:25	6093	3958	1392.36	69616	69616	11	8605	8605	2	69616	8605	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1272	26	1812	Friday	08:56:58	5332	3675	294.97	65314	65314	0	12907	12907	1	65314	12907	31	Connection Failure	UA ground impact tangential to trajectory
1281	29	921	Sunday	09:16:05	8097	3866	326.81	70007	70007	0	8214	8214	0	70007	8214	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1283	41	3190	Tuesday	10:43:43	10162	2636	472.89	64532	64532	0	13689	13689	0	64532	13689	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
1287	108	2644	Saturday	18:27:38	7762	2781	1246.06	59839	59839	4	18382	18382	5	59839	18382	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1290	58	1959	Tuesday	12:39:19	5417	3520	665.56	64532	64532	0	13689	13689	0	64532	13689	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
1291	17	1643	Wednesday	07:54:12	5459	3823	190.33	68443	68443	0	9778	9778	0	68443	9778	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
13	20	2186	Saturday	08:16:03	5889	3255	226.78	68834	68834	0	9387	9387	0	68834	9387	73	Degradation of altitude	Central UA ground impact point below flight path
130	92	2143	Thursday	16:35:38	5770	3306	1059.39	57492	57492	18	20729	20729	8	57492	20729	18	Engine Fire	UA structural desintegration - Debris Impact
1301	13	1967	Saturday	07:27:04	5426	3511	145.11	75092	75092	0	3129	3129	0	75092	3129	78	Degradation of altitude	Central UA ground impact point below flight path
1319	109	64	Wednesday	18:29:35	10891	2970	1249.33	56710	56710	0	21511	21511	0	56710	21511	29	Connection Failure	UA approaches Emergency landing site
1324	48	2519	Monday	11:31:01	7173	2889	551.69	64141	64141	0	14080	14080	1	64141	14080	78	Degradation of altitude	Central UA ground impact point below flight path
1328	72	651	Friday	14:13:57	9363	3636	823.28	59056	59056	0	19165	19165	0	59056	19165	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
1331	47	2885	Monday	11:24:46	8921	2645	541.30	64141	64141	0	14080	14080	0	64141	14080	69	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
1331	84	3050	Monday	15:41:51	9644	2616	969.78	61403	61403	1	16818	16818	0	61403	16818	69	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
1354	71	144	Wednesday	14:06:02	10832	3056	810.08	59839	59839	0	18382	18382	0	59839	18382	66	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
1384	99	1177	Friday	17:22:20	6896	3970	1137.25	59056	59056	0	19165	19165	5	59056	19165	63	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
139	109	2096	Saturday	18:33:30	5655	3361	1255.86	59839	59839	15	18382	18382	3	59839	18382	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
139	34	861	Saturday	09:50:39	8388	3824	384.44	68834	68834	0	9387	9387	0	68834	9387	69	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
1397	18	2565	Thursday	08:02:55	7386	2847	204.86	66096	66096	0	12125	12125	0	66096	12125	23	Generator Failure	Central UA ground impact point below flight path
1398	47	1104	Friday	11:21:20	7224	3953	535.58	62967	62967	0	15254	15254	5	62967	15254	20	Engine Fire	UA structural desintegration - Debris Impact
144	67	564	Thursday	13:39:06	9725	3543	765.17	60621	60621	0	17600	17600	0	60621	17600	40	Short Circuit / Overload	Central UA ground impact point below flight path
148	32	1300	Monday	09:37:38	6390	3973	362.72	64923	64923	1	13298	13298	2	64923	13298	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
152	95	2133	Friday	16:56:26	5744	3317	1094.06	59056	59056	0	19165	19165	0	59056	19165	58	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
157	98	3126	Wednesday	17:19:09	9939	2622	1131.94	56710	56710	0	21511	21511	0	56710	21511	17	Engine Fire	Central UA ground impact point below flight path
18	90	2158	Thursday	16:21:47	5810	3288	1036.31	57492	57492	26	20729	20729	8	57492	20729	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
185	93	1517	Wednesday	16:41:22	5705	3904	1068.94	56710	56710	0	21511	21511	0	56710	21511	72	Degradation of altitude	UA approaches Emergency landing site
188	55	3534	Saturday	12:21:33	10871	2844	635.92	55145	55145	0	23076	23076	0	55145	23076	17	Engine Fire	Central UA ground impact point below flight path
191	98	1328	Tuesday	17:15:42	6286	3970	1126.17	58274	58274	0	19947	19947	0	58274	19947	11	Engine Anomaly	Central UA ground impact point below flight path
213	81	2714	Wednesday	15:20:23	8101	2731	934.00	59839	59839	0	18382	18382	0	59839	18382	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
215	27	547	Friday	09:01:29	9792	3524	302.47	65314	65314	0	12907	12907	0	65314	12907	1	Engine Out	No Ground Effect
218	51	1930	Monday	11:50:42	5386	3552	584.50	64141	64141	0	14080	14080	0	64141	14080	30	Connection Failure	Central UA ground impact point below flight path
227	55	343	Wednesday	12:15:23	10462	3286	625.67	64532	64532	0	13689	13689	0	64532	13689	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
234	106	1060	Wednesday	18:10:42	7428	3938	1217.83	56710	56710	0	21511	21511	0	56710	21511	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
239	45	1465	Monday	11:08:09	5841	3929	513.61	64141	64141	4	14080	14080	0	64141	14080	9	Engine Out	UA ground impact tangential to trajectory
24	34	403	Wednesday	09:49:47	10292	3357	382.97	65705	65705	0	12516	12516	0	65705	12516	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
24	54	3260	Wednesday	12:14:04	10377	2661	623.47	64532	64532	0	13689	13689	0	64532	13689	42	Partial Lock of Flight Control Surfaces	Central UA ground impact point below flight path
272	79	1562	Saturday	15:04:17	5603	3878	907.17	59056	59056	5	19165	19165	6	59056	19165	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
278	42	3351	Friday	10:50:58	10606	2707	484.97	62967	62967	0	15254	15254	0	62967	15254	22	Generator Failure	UA approaches Emergency landing site
282	4	2273	Tuesday	06:25:12	6168	3152	42.00	69225	69225	0	8996	8996	0	69225	8996	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
287	87	2003	Sunday	16:00:39	5477	3470	1001.11	57883	57883	0	20338	20338	0	57883	20338	78	Degradation of altitude	Central UA ground impact point below flight path
29	118	2802	Monday	19:37:20	8527	2680	1362.22	71181	71181	0	7040	7040	0	71181	7040	25	Generator Failure	UA approaches Emergency landing site
307	114	1794	Saturday	19:07:37	5334	3693	1312.72	69616	69616	24	8605	8605	0	69616	8605	63	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
308	24	1646	Sunday	08:42:47	5455	3820	271.31	70007	70007	0	8214	8214	0	70007	8214	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
314	78	1341	Saturday	14:56:56	6239	3967	894.89	59056	59056	9	19165	19165	7	59056	19165	21	Engine Fire	UA structural desintegration - Debris Impact
317	117	2182	Tuesday	19:29:11	5878	3259	1348.67	71572	71572	0	6649	6649	0	71572	6649	40	Short Circuit / Overload	Central UA ground impact point below flight path
318	119	2842	Wednesday	19:44:21	8718	2661	1373.92	69616	69616	0	8605	8605	0	69616	8605	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
319	28	2463	Thursday	09:12:07	6921	2944	320.19	66096	66096	0	12125	12125	0	66096	12125	73	Degradation of altitude	Central UA ground impact point below flight path
324	114	2400	Tuesday	19:08:48	6653	3010	1314.67	71572	71572	36	6649	6649	0	71572	6649	21	Engine Fire	UA structural desintegration - Debris Impact
335	89	2386	Saturday	16:15:17	6595	3025	1025.47	59839	59839	0	18382	18382	0	59839	18382	36	Short Circuit / Overload	Central UA ground impact point below flight path
34	14	364	Saturday	07:30:54	10405	3311	151.53	75092	75092	0	3129	3129	0	75092	3129	35	Connection Failure	UA ground impact tangential to trajectory
347	27	521	Thursday	09:01:26	9891	3495	302.39	66096	66096	0	12125	12125	0	66096	12125	17	Engine Fire	Central UA ground impact point below flight path
347	92	405	Thursday	16:32:17	10286	3360	1053.81	57492	57492	0	20729	20729	0	57492	20729	19	Engine Fire	Central UA ground impact point below flight path
353	91	581	Wednesday	16:25:41	9657	3561	1042.81	56710	56710	0	21511	21511	0	56710	21511	75	Degradation of altitude	UA approaches Emergency landing site
361	29	1422	Thursday	09:17:02	5968	3946	328.42	66096	66096	0	12125	12125	0	66096	12125	70	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
362	4	1728	Friday	06:24:08	5365	3753	40.25	69616	69616	31	8605	8605	0	69616	8605	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
376	29	411	Friday	09:15:06	10268	3367	325.17	65314	65314	0	12907	12907	0	65314	12907	9	Engine Out	UA ground impact tangential to trajectory
38	117	2165	Wednesday	19:29:09	5829	3279	1348.61	69616	69616	0	8605	8605	0	69616	8605	68	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
381	9	648	Wednesday	06:56:45	9376	3633	94.61	68443	68443	0	9778	9778	0	68443	9778	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
384	25	2550	Saturday	08:51:27	7316	2860	285.78	68834	68834	0	9387	9387	0	68834	9387	28	Generator Failure	UA ground impact tangential to trajectory
391	6	1350	Saturday	06:37:18	6207	3966	62.17	75092	75092	0	3129	3129	0	75092	3129	23	Generator Failure	Central UA ground impact point below flight path
422	119	3170	Tuesday	19:44:58	10095	2631	1374.97	71572	71572	0	6649	6649	0	71572	6649	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
43	33	259	Monday	09:42:33	10656	3187	370.94	64923	64923	10	13298	13298	3	64923	13298	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
444	72	1092	Wednesday	14:14:48	7279	3950	824.69	59839	59839	0	18382	18382	0	59839	18382	46	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
448	116	776	Sunday	19:19:32	8795	3755	1332.58	69616	69616	1	8605	8605	0	69616	8605	4	Engine Out	Central ground impact point below flight path with B/G Ratio.
449	101	393	Monday	17:34:43	10322	3346	1157.86	59056	59056	0	19165	19165	0	59056	19165	51	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
460	116	3119	Friday	19:24:03	9913	2621	1340.11	70398	70398	0	7823	7823	0	70398	7823	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
467	7	698	Friday	06:42:58	9155	3683	71.64	69616	69616	0	8605	8605	0	69616	8605	23	Generator Failure	Central UA ground impact point below flight path
468	97	3147	Saturday	17:12:16	10015	2626	1120.45	59839	59839	2	18382	18382	6	59839	18382	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
470	17	372	Monday	07:51:45	10383	3321	186.25	69616	69616	0	8605	8605	0	69616	8605	17	Engine Fire	Central UA ground impact point below flight path
474	43	88	Friday	10:51:37	10879	2995	486.05	62967	62967	0	15254	15254	0	62967	15254	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
477	34	2685	Monday	09:54:10	7960	2750	390.30	64923	64923	2	13298	13298	0	64923	13298	28	Generator Failure	UA ground impact tangential to trajectory
48	36	1002	Saturday	10:04:49	7705	3912	408.03	55145	55145	0	23076	23076	0	55145	23076	25	Generator Failure	UA approaches Emergency landing site
483	119	2332	Sunday	19:43:22	6383	3085	1372.28	69616	69616	9	8605	8605	1	69616	8605	21	Engine Fire	UA structural desintegration - Debris Impact
484	120	1931	Monday	19:49:32	5387	3551	1382.56	71181	71181	0	7040	7040	0	71181	7040	68	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
485	104	755	Tuesday	17:56:14	8893	3736	1193.72	58274	58274	0	19947	19947	0	58274	19947	14	Engine Anomaly	Central UA ground impact point below flight path
487	13	2840	Thursday	07:28:44	8709	2662	147.92	68834	68834	0	9387	9387	0	68834	9387	10	Engine Anomaly	UA approaches Emergency landing site
49	56	2138	Sunday	12:25:47	5757	3312	643.00	57492	57492	0	20729	20729	0	57492	20729	10	Engine Anomaly	UA approaches Emergency landing site
495	20	2091	Friday	08:15:52	5644	3367	226.47	65314	65314	0	12907	12907	0	65314	12907	29	Connection Failure	UA approaches Emergency landing site
498	104	2060	Monday	17:58:44	5578	3404	1197.92	59056	59056	9	19165	19165	0	59056	19165	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
498	118	1885	Monday	19:35:33	5351	3600	1359.28	71181	71181	0	7040	7040	0	71181	7040	14	Engine Anomaly	Central UA ground impact point below flight path
507	33	2784	Wednesday	09:47:26	8441	2689	379.06	65705	65705	5	12516	12516	5	65705	12516	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
508	73	2144	Thursday	14:23:47	5773	3304	839.64	60621	60621	0	17600	17600	0	60621	17600	67	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
522	26	1198	Thursday	08:55:47	6805	3973	293.00	66096	66096	0	12125	12125	4	66096	12125	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
526	110	1600	Monday	18:39:30	5529	3853	1265.83	59056	59056	0	19165	19165	0	59056	19165	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
530	120	1870	Friday	19:49:24	5344	3616	1382.36	70398	70398	13	7823	7823	2	70398	7823	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
535	60	1192	Wednesday	12:51:44	6831	3972	686.22	64532	64532	0	13689	13689	0	64532	13689	73	Degradation of altitude	Central UA ground impact point below flight path
543	56	427	Thursday	12:22:30	10218	3386	637.50	64532	64532	0	13689	13689	0	64532	13689	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
546	51	2622	Sunday	11:52:02	7656	2798	586.72	57492	57492	0	20729	20729	0	57492	20729	2	Engine Out	UA approaches Emergency landing site
546	56	565	Sunday	12:22:46	9721	3544	637.94	57492	57492	1	20729	20729	1	57492	20729	31	Connection Failure	UA ground impact tangential to trajectory
570	84	2938	Wednesday	15:41:38	9163	2630	969.42	59839	59839	0	18382	18382	0	59839	18382	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
575	21	2226	Monday	08:23:04	6011	3207	238.47	64923	64923	0	13298	13298	0	64923	13298	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
581	117	81	Sunday	19:25:08	10883	2987	1341.92	69616	69616	0	8605	8605	0	69616	8605	72	Degradation of altitude	UA approaches Emergency landing site
581	20	1607	Sunday	08:14:57	5517	3849	224.92	70007	70007	0	8214	8214	0	70007	8214	7	Engine Out	Central UA ground impact point below flight path
583	64	236	Tuesday	13:17:38	10700	3160	729.42	61012	61012	0	17209	17209	0	61012	17209	72	Degradation of altitude	UA approaches Emergency landing site
585	30	226	Thursday	09:21:41	10717	3149	336.14	66096	66096	0	12125	12125	0	66096	12125	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
599	16	3280	Thursday	07:50:25	10432	2670	184.03	68834	68834	0	9387	9387	0	68834	9387	14	Engine Anomaly	Central UA ground impact point below flight path
602	106	2875	Sunday	18:14:11	8874	2648	1223.67	57883	57883	0	20338	20338	0	57883	20338	23	Generator Failure	Central UA ground impact point below flight path
602	92	1978	Sunday	16:35:18	5441	3498	1058.86	57883	57883	0	20338	20338	0	57883	20338	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
624	50	2011	Monday	11:43:55	5490	3461	573.19	64141	64141	0	14080	14080	0	64141	14080	3	Engine Out	Central UA ground impact point below flight path
633	121	1469	Wednesday	19:55:34	5830	3927	1392.64	69616	69616	38	8605	8605	1	69616	8605	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
65	121	2749	Tuesday	19:58:03	8271	2709	1396.75	71572	71572	0	6649	6649	0	71572	6649	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
654	97	3397	Wednesday	17:12:44	10698	2737	1121.25	56710	56710	0	21511	21511	0	56710	21511	37	Short Circuit / Overload	Central UA ground impact point below flight path
66	86	1004	Wednesday	15:51:48	7695	3913	986.33	59839	59839	0	18382	18382	0	59839	18382	66	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
663	121	172	Friday	19:53:04	10799	3087	1388.47	70398	70398	0	7823	7823	0	70398	7823	5	Engine Out	No Ground Effect
692	91	1912	Saturday	16:28:14	5370	3571	1047.08	59839	59839	0	18382	18382	0	59839	18382	66	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
694	14	1782	Monday	07:33:38	5337	3704	156.08	69616	69616	0	8605	8605	0	69616	8605	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
696	17	2127	Wednesday	07:55:08	5729	3325	191.89	68443	68443	0	9778	9778	0	68443	9778	37	Short Circuit / Overload	Central UA ground impact point below flight path

696	86	1868	Wednesday	15:53:27	5343	3618	989.11	59839	59839	0	18382	18382	0	59839	18382	38	Short Circuit / Overload	Central UA ground impact point below flight path
711	46	2041	Thursday	11:16:12	5542	3426	527.03	64532	64532	0	13689	13689	0	64532	13689	19	Engine Fire	Central UA ground impact point below flight path
716	118	1989	Tuesday	19:35:46	5456	3486	1359.61	71572	71572	0	6649	6649	0	71572	6649	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
727	57	1746	Saturday	12:31:58	5353	3737	653.31	55145	55145	0	23076	23076	0	55145	23076	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
729	41	3285	Monday	10:43:54	10446	2672	473.19	64141	64141	0	14080	14080	1	64141	14080	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
732	52	353	Thursday	11:54:35	10435	3298	591.00	64532	64532	0	13689	13689	0	64532	13689	40	Short Circuit / Overload	Central UA ground impact point below flight path
733	57	1755	Friday	12:32:00	5348	3729	653.33	62967	62967	0	15254	15254	0	62967	15254	13	Engine Anomaly	UA approaches Emergency landing site
741	1	3147	Saturday	06:06:03	10015	2626	10.11	75092	75092	5	3129	3129	1	75092	3129	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
750	52	811	Monday	11:55:28	8628	3785	592.47	64141	64141	0	14080	14080	0	64141	14080	73	Degradation of altitude	Central UA ground impact point below flight path
751	71	473	Tuesday	14:06:41	10064	3440	811.14	61012	61012	0	17209	17209	0	61012	17209	1	Engine Out	No Ground Effect
756	48	487	Sunday	11:27:05	10015	3456	545.17	57492	57492	0	20729	20729	0	57492	20729	66	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
761	99	2	Friday	17:20:05	10899	2907	1133.47	59056	59056	0	19165	19165	0	59056	19165	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
783	36	388	Saturday	10:03:38	10337	3340	406.06	55145	55145	0	23076	23076	0	55145	23076	43	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
789	58	896	Friday	12:37:17	8218	3849	662.14	62967	62967	1	15254	15254	0	62967	15254	67	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
791	53	1370	Sunday	12:03:29	6137	3961	605.83	57492	57492	0	20729	20729	0	57492	20729	78	Degradation of altitude	Central UA ground impact point below flight path
797	15	1182	Saturday	07:39:25	6874	3971	165.72	75092	75092	0	3129	3129	0	75092	3129	2	Engine Out	UA approaches Emergency landing site
806	33	2438	Monday	09:46:46	6813	2970	377.94	64923	64923	6	13298	13298	0	64923	13298	4	Engine Out	Central ground impact point below flight path with B/G Ratio.
822	15	949	Wednesday	07:38:59	7961	3883	164.97	68443	68443	19	9778	9778	3	68443	9778	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
826	12	2973	Sunday	07:22:03	9319	2623	136.78	75874	75874	0	2347	2347	0	75874	2347	33	Connection Failure	Central UA ground impact point below flight path
844	106	2261	Thursday	18:13:00	6126	3166	1221.69	57492	57492	0	20729	20729	0	57492	20729	50	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
845	16	548	Friday	07:45:09	9788	3525	175.25	69616	69616	1	8605	8605	1	69616	8605	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
850	116	2938	Wednesday	19:23:43	9163	2630	1339.53	69616	69616	0	8605	8605	0	69616	8605	40	Short Circuit / Overload	Central UA ground impact point below flight path
854	23	3569	Sunday	08:39:33	10891	2876	265.92	70007	70007	0	8214	8214	0	70007	8214	18	Engine Fire	UA structural desintegration - Debris Impact
862	114	1198	Monday	19:06:29	6805	3973	1310.81	71181	71181	0	7040	7040	0	71181	7040	22	Generator Failure	UA approaches Emergency landing site
863	75	711	Tuesday	14:34:54	9096	3695	858.17	61012	61012	0	17209	17209	6	61012	17209	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
866	121	3267	Friday	19:59:02	10397	2664	1398.42	70398	70398	0	7823	7823	0	70398	7823	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
870	21	91	Tuesday	08:18:58	10877	2998	231.61	66096	66096	0	12125	12125	0	66096	12125	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
872	37	782	Thursday	10:11:19	8766	3760	418.89	64532	64532	13	13689	13689	5	64532	13689	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
876	66	3368	Monday	13:37:33	10641	2718	762.61	61403	61403	0	16818	16818	0	61403	16818	37	Short Circuit / Overload	Central UA ground impact point below flight path
877	36	1469	Tuesday	10:05:43	5830	3927	409.53	64532	64532	0	13689	13689	0	64532	13689	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
878	113	2247	Wednesday	19:01:33	6079	3183	1302.61	69616	69616	0	8605	8605	0	69616	8605	68	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
887	79	3049	Friday	15:07:09	9640	2616	911.94	59056	59056	0	19165	19165	0	59056	19165	35	Connection Failure	UA ground impact tangential to trajectory
892	76	1572	Wednesday	14:43:29	5582	3872	872.50	59839	59839	0	18382	18382	0	59839	18382	52	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
893	22	2543	Thursday	08:30:38	7283	2867	251.06	66096	66096	0	12125	12125	0	66096	12125	69	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
903	56	3435	Sunday	12:28:17	10761	2763	647.17	57492	57492	0	20729	20729	0	57492	20729	17	Engine Fire	Central UA ground impact point below flight path
913	3	2769	Wednesday	06:19:13	8368	2697	32.03	68443	68443	0	9778	9778	0	68443	9778	66	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
927	72	928	Wednesday	14:14:30	8063	3870	824.17	59839	59839	0	18382	18382	0	59839	18382	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
937	113	3432	Saturday	19:03:51	10756	2761	1306.42	69616	69616	1	8605	8605	3	69616	8605	18	Engine Fire	UA structural desintegration - Debris Impact
940	25	510	Tuesday	08:47:32	9932	3482	279.22	66096	66096	0	12125	12125	0	66096	12125	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
941	40	2709	Wednesday	10:35:51	8077	2734	459.78	64532	64532	0	13689	13689	0	64532	13689	36	Short Circuit / Overload	Central UA ground impact point below flight path
944	101	1188	Saturday	17:36:14	6848	3972	1160.42	59839	59839	0	18382	18382	9	59839	18382	63	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
949	17	2257	Thursday	07:55:23	6113	3171	192.31	68834	68834	2	9387	9387	0	68834	9387	67	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
953	112	1369	Monday	18:52:56	6140	3961	1288.22	59056	59056	4	19165	19165	11	59056	19165	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
955	107	2327	Wednesday	18:20:04	6364	3091	1233.47	56710	56710	0	21511	21511	0	56710	21511	72	Degradation of altitude	UA approaches Emergency landing site
963	14	995	Thursday	07:32:07	7738	3909	153.55	68834	68834	0	9387	9387	0	68834	9387	62	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
964	67	2803	Friday	13:43:24	8532	2679	772.36	59056	59056	0	19165	19165	0	59056	19165	28	Generator Failure	UA ground impact tangential to trajectory
973	24	3021	Sunday	08:45:26	9525	2617	275.72	70007	70007	2	8214	8214	0	70007	8214	31	Connection Failure	UA ground impact tangential to trajectory
979	44	906	Saturday	11:00:08	8170	3856	500.25	55145	55145	0	23076	23076	0	55145	23076	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
984	112	2423	Thursday	18:54:57	6749	2985	1291.61	57492	57492	0	20729	20729	0	57492	20729	1	Engine Out	No Ground Effect
984	22	1851	Thursday	08:29:17	5337	3636	248.83	66096	66096	0	12125	12125	0	66096	12125	29	Connection Failure	UA approaches Emergency landing site
991	19	3391	Thursday	08:11:26	10686	2733	219.08	66096	66096	0	12125	12125	0	66096	12125	76	Degradation of altitude	Central UA ground impact point below flight path
995	85	1560	Monday	15:45:55	5607	3879	976.56	61403	61403	0	16818	16818	0	61403	16818	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
996	87	1813	Tuesday	16:00:18	5332	3674	1000.50	58274	58274	0	19947	19947	0	58274	19947	62	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path

O.R.C.U.S. 02.00 - tTest of the Simulation

nProbes	1400
nEvents	199
nEvents_cor	188
tMission	14
x_cross_ATB	0.28
x_cross_OTW	0.0935714
x_cross_TOT	0.3735714
s2ATB	0.0962994
sATB	0.3103214
tATB	32.554872
s2OTW	0.0101761
sOTW	0.1008765
tOTW	30.997861
s2TOT	0.1585188
sTOT	0.3981442
tTOT	34.167517

UADay/Prot	HIT_TOT_ATB	HIT_TOT_OTW	UADay/Prot cor	HIT_TOT_mean_ATB	HIT_TOT_mean_OTW	HIT_TOT_mean_ATB/Fh	HIT_TOT_mean_OTW/Fh	x_i-x_cross ATB	x_i-x_cross OTW	(x_i-x_cross ATB)^2	(x_i-x_cross OTW)^2
1	0	0	1	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
13	0	0	13	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
18	26	8	18	26	8	1.857142857	0.571428571	1.577142857	0.477857143	2.487379592	0.228347449
24	0	0	24	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
24	0	0	29	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
29	0	0	34	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
34	0	0	38	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
38	0	0	43	10	3	0.714285714	0.214285714	0.434285714	0.120714286	0.188604082	0.014571939
43	10	3	48	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
48	0	0	49	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
49	0	0	65	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
65	0	0	66	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
66	0	0	107	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
107	0	0	109	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
109	0	0	111	0	1	0	0.071428571	-0.28	-0.022142857	0.0784	0.000490306
111	0	1	118	0	4	0	0.285714286	-0.28	0.192142857	0.0784	0.036918878
118	0	4	130	18	8	1.285714286	0.571428571	1.005714286	0.477857143	1.011461224	0.228347449
130	18	8	139	15	3	1.071428571	0.214285714	0.791428571	0.120714286	0.626359184	0.014571939
139	15	3	144	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
139	0	0	148	1	2	0.071428571	0.142857143	-0.208571429	0.049285714	0.043502041	0.002429082
144	0	0	152	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
148	1	2	157	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
152	0	0	185	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
157	0	0	188	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
185	0	0	191	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
188	0	0	213	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
191	0	0	215	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
213	0	0	218	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
215	0	0	227	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
218	0	0	234	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
227	0	0	239	4	0	0.285714286	0	0.005714286	-0.093571429	3.26531E-05	0.008755612
234	0	0	272	5	6	0.357142857	0.428571429	0.077142857	0.335	0.00595102	0.112225
239	4	0	278	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
272	5	6	282	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
278	0	0	287	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
282	0	0	307	24	0	1.714285714	0	1.434285714	-0.093571429	2.05717551	0.008755612
287	0	0	308	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
307	24	0	314	9	7	0.642857143	0.5	0.362857143	0.406428571	0.131665306	0.165184184
308	0	0	317	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
314	9	7	318	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
317	0	0	319	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
318	0	0	324	36	0	2.571428571	0	2.291428571	-0.093571429	5.250644898	0.008755612
319	0	0	335	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
324	36	0	347	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
335	0	0	353	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
347	0	0	361	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
347	0	0	362	31	0	2.214285714	0	1.934285714	-0.093571429	3.741461224	0.008755612
353	0	0	376	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
361	0	0	381	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
362	31	0	384	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
376	0	0	391	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
381	0	0	422	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
384	0	0	444	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
391	0	0	448	1	0	0.071428571	0	-0.208571429	-0.093571429	0.043502041	0.008755612
422	0	0	449	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
444	0	0	460	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
448	1	0	467	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
449	0	0	468	2	6	0.142857143	0.428571429	-0.137142857	0.335	0.018808163	0.112225
460	0	0	470	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
467	0	0	474	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
468	2	6	477	2	0	0.142857143	0	-0.137142857	-0.093571429	0.018808163	0.008755612
470	0	0	483	9	1	0.642857143	0.071428571	0.362857143	-0.022142857	0.131665306	0.000490306
474	0	0	484	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
477	2	0	485	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
483	9	1	487	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
484	0	0	495	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
485	0	0	498	9	0	0.642857143	0	0.362857143	-0.093571429	0.131665306	0.008755612
487	0	0	507	5	5	0.357142857	0.357142857	0.077142857	0.263571429	0.00595102	0.069469898
495	0	0	508	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
498	9	0	522	0	4	0	0.285714286	-0.28	0.192142857	0.0784	0.036918878
498	0	0	526	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
507	5	5	530	13	2	0.928571429	0.142857143	0.648571429	0.049285714	0.420644898	0.002429082
508	0	0	535	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
522	0	4	543	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
526	0	0	546	1	1	0.071428571	0.071428571	-0.208571429	-0.022142857	0.043502041	0.000490306
530	13	2	570	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
535	0	0	575	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
543	0	0	581	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
546	0	0	583	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
546	1	1	585	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
570	0	0	599	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
575	0	0	602	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
581	0	0	624	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
581	0	0	633	38	1	2.714285714	0.071428571	2.434285714	-0.022142857	5.925746939	0.000490306
583	0	0	654	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
585	0	0	663	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
599	0	0	692	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
602	0	0	694	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
602	0	0	696	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
624	0	0	711	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
633	38	1	716	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
654	0	0	727	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
663	0	0	729	0	1	0	0.071428571	-0.28	-0.022142857	0.0784	0.000490306
692	0	0	732	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
694	0	0	733	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
696	0	0	741	5	1	0.357142857	0.071428571	0.077142857	-0.022142857	0.00595102	0.000490306
696	0	0	750	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
711	0	0	751	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
716	0	0	756	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
727	0	0	761	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
729	0	1	783	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
732	0	0	789	1	0	0.071428571	0	-0.208571429	-0.093571429	0.043502041	0.008755612
733	0	0	791	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
741	5	1	797	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
750	0	0	806	6	0	0.428571429	0	0.148571429	-0.093571429	0.022073469	0.008755612
751	0	0	822	19	3	1.357142857	0.214285714	1.077142857	0.120714286	1.160236735	0.014571939
756	0	0	826	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
761	0	0	844	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
783	0	0	845	1	1	0.071428571	0.071428571	-0.208571429	-0.022142857	0.043502041	0.000490306
789	1	0	850	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
791	0	0	854	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
797	0	0	862	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
806	6	0	863	0	6	0	0.428571429	-0.28	0.335	0.0784	0.112225
822	19	3	866	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
826	0	0	870	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
844	0	0	872	13	5	0.928571429	0.357142857	0.648571429	0.263571429	0.420644898	0.069469898
845	1	1	876	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
850	0	0	877	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
854	0	0	878	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
862	0	0	887	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
863	0	6	892	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
866	0	0	893	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
870	0	0	903	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
872	13	5	913	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
876	0	0	927	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
877	0	0	937	1	3	0.071428571	0.214285714	-0.208571429	0.120714286	0.043502041	0.014571939
878	0	0	940	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
887	0	0	941	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
892	0	0	944	0	9	0	0.642857143	-0.28	0.549285714	0.0784	0.301714796
893	0	0	949	2	0	0.142857143	0	-0.137142857	-0.093571429	0.018808163	0.008755612
903	0	0	953	4	11	0.285714286	0.785714286	0.005714286	0.692142857	3.26531E-05	0.479061735
913	0	0	955	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
927	0	0	963	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
937	1	3	964	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
940	0	0	973	2	0	0.142857143	0	-0.137142857	-0.093571429	0.018808163	0.008755612
941	0	0	979	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
944	0	9	984	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
949	2	0	991	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
953	4	11	995	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
955	0	0	996	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
963	0	0	1002	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
964	0	0	1004	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
973	2	0	1013	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
979	0	0	1017	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
984	0	0	1031	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
984	0	0	1040	1	0	0.071428571	0	-0.208571429	-0.093571429	0.043502041	0.008755612
991	0	0	1048	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
995	0	0	1050	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
996	0	0	1056	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
1002	0	0	1057	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
1004	0	0	1062	3	3	0.214285714	0.214285714	-0.065714286	0.120714286	0.004318367	0.014571939
1013	0	0	1063	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
1017	0	0	1064	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
1031	0	0	1067	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
1040	1	0	1074	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
1048	0	0	1089	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
1050	0	0	1096	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
1056	0	0	1117	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
1057	0	0	1118	1	0	0.071428571	0	-0.208571429	-0.093571429	0.043502041	0.008755612
1062	3	3	1119	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
1063	0	0	1128	17	4	1.214285714	0.285714286	0.934285714	0.192142857	0.872889796	0.036918878
1064	0	0	1133	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
1067	0	0	1157	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
1074	0	0	1167	1	0	0.071428571	0	-0.208571429	-0.093571429	0.043502041	0.008755612
1089	0	0	1185	17	0	1.214285714	0	0.934285714	-0.093571429	0.872889796	0.008755612
1096	0	0	1186	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
1117	0	0	1192	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
1118	1	0	1215	23	2	1.642857143	0.142857143	1.362857143	0.049285714	1.857379592	0.002429082
1119	0	0	1217	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
1128	17	4	1230	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
1133	0	0	1251	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
1157	0	0	1253	0	1	0	0.071428571	-0.28	-0.022142857	0.0784	0.000490306
1167	1	0	1266	11	2	0.785714286	0.142857143	0.505714286	0.049285714	0.255746939	0.002429082
1167	0	0	1272	0	1	0	0.071428571	-0.28	-0.022142857	0.0784	0.000490306
1185	17	0	1281	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
1186	0	0	1283	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
1192	0	0	1287	4	5	0.285714286	0.357142857	0.005714286	0.263571429	3.26531E-05	0.069469898
1215	23	2	1290	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
1217	0	0	1291	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
1230	0	0	1301	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
1251	0	0	1319	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
1253	0	1	1324	0	1	0	0.071428571	-0.28	-0.022142857	0.0784	0.000490306
1266	11	2	1328	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
1272	0	1	1331	1	0	0.071428571	0	-0.208571429	-0.093571429	0.043502041	0.008755612
1281	0	0	1354	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
1283	0	0	1384	0	5	0	0.357142857	-0.28	0.263571429	0.0784	0.069469898
1287	4	5	1397	0	0	0	0	-0.28	-0.093571429	0.0784	0.008755612
1290	0	0	1398	0	5	0	0.357142857	-0.28	0.263571429	0.0784	0.069469898
1291	0	0									
1301	0	0									
1319	0	0									
1324	0	1									
1328	0	0									
1331	0	0									
1331	1	0									
1354	0	0									
1384	0	5									
1397	0	0									
1398	0	5									

11.4.9.2 Hagen – C2 – Phase 2

O.R.C.U.S. 02.00 - Simulation Summary

UA Parameters

MTOW [kg]	Wingspan [m]	Length [m]	L/D
90	5	4	8

v [km/h]	Alt [m]	CCF [m]
100	100	11565.99117

P_CumCat [1/Fh]	Engine [%]	ESys [%]	FCS [%]	NavSys [%]	Struct [%]
0.01	20	20	20	20	20

General map parameters

	Name	Area [km2]	PPL	PPL/km2
City	Hagen, Stadt der FernUniversitaet	160.45	187730	1170
County	Hagen, Stadt der FernUniversitaet	160.45	187730	1170
FS	NW	34112.45	17912134	525

Mission specific map parameters

	Area [km2]	PPL	Tourists	Total PPL
City	66.8555	78221	0	78221
Map total	66.8555	78221	0	78221

PPL MOD NA

Sim FH [Fh]	19600	Ev/Fh [1/Fh]	0.010663265
Events total	209		

Hits due to UA impacts		Hits/Fh [1/Fh]
City ATB	389	0.019846939
City OTW	148	0.00755102
Total	537	0.027397959

Prot	cyc	k_UA	Day	Time of impact	UA X Pos	UA Y Pos	Travelled Distance [km]	PPL_TD_CITY_ATB	PPL_CITY_ATB_COUNT	HIT_CITY_ATB_COUNT	PPL_TD_CITY_OTW	PPL_CITY_OTW_COUNT	HIT_CITY_OTW_COUNT	PPL_ALL_ATB_COUNT	PPL_ALL_OTW_COUNT	E	Case	Outcome
1	115	1177	Monday	19:13:22	6896	3970	1322.30	71181	71181	0	7040	7040	0	71181	7040	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
1000	40	3392	Saturday	10:37:10	10688	2733	461.97	55145	55145	0	23076	23076	0	55145	23076	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
1004	81	553	Wednesday	15:16:14	9768	3531	927.06	59839	59839	4	18382	18382	2	59839	18382	20	Engine Fire	UA structural desintegration - Debris Impact
1010	12	1789	Tuesday	07:19:47	5335	3697	132.97	69225	69225	32	8996	8996	1	69225	8996	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1021	105	708	Saturday	18:03:04	9110	3693	1205.14	59839	59839	0	18382	18382	0	59839	18382	67	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
103	98	2798	Friday	17:18:32	8508	2682	1130.89	59056	59056	0	19165	19165	0	59056	19165	44	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
1032	60	3267	Wednesday	12:55:44	10397	2664	692.89	64532	64532	0	13689	13689	0	64532	13689	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
1051	1	3061	Monday	06:05:54	9689	2616	9.83	69616	69616	2	8605	8605	0	69616	8605	9	Engine Out	UA ground impact tangential to trajectory
1052	23	6	Tuesday	08:32:40	10900	2911	254.47	66096	66096	0	12125	12125	0	66096	12125	77	Degradation of altitude	Central UA ground impact point below flight path
1053	74	688	Wednesday	14:27:54	9200	3673	846.53	59839	59839	0	18382	18382	7	59839	18382	18	Engine Fire	UA structural desintegration - Debris Impact
1062	73	224	Friday	14:20:04	10721	3146	833.47	59056	59056	0	19165	19165	0	59056	19165	10	Engine Anomaly	UA approaches Emergency landing site
1069	9	3553	Friday	07:02:21	10883	2861	103.94	69616	69616	0	8605	8605	0	69616	8605	5	Engine Out	No Ground Effect
1071	51	2405	Sunday	11:51:36	6673	3005	586.03	57492	57492	21	20729	20729	3	57492	20729	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1072	42	3334	Monday	10:50:57	10567	2698	484.92	64141	64141	0	14080	14080	6	64141	14080	18	Engine Fire	UA structural desintegration - Debris Impact
1078	109	626	Sunday	18:30:40	9470	3610	1251.14	57883	57883	0	20338	20338	0	57883	20338	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1090	95	1069	Friday	16:54:22	7386	3942	1090.64	59056	59056	0	19165	19165	0	59056	19165	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
1106	47	2652	Sunday	11:24:20	7801	2775	540.56	57492	57492	0	20729	20729	0	57492	20729	37	Short Circuit / Overload	Central UA ground impact point below flight path
1107	116	863	Monday	19:19:43	8378	3826	1332.86	71181	71181	0	7040	7040	0	71181	7040	12	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
1107	72	3072	Monday	14:18:37	9733	2617	831.06	61403	61403	0	16818	16818	0	61403	16818	40	Short Circuit / Overload	Central UA ground impact point below flight path
1108	10	2737	Tuesday	07:07:43	8213	2716	112.89	69225	69225	2	8996	8996	0	69225	8996	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
1109	47	361	Wednesday	11:19:55	10414	3308	533.20	64532	64532	0	13689	13689	0	64532	13689	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
1112	5	2477	Saturday	06:32:31	6983	2930	54.22	75092	75092	0	3129	3129	0	75092	3129	26	Generator Failure	Central UA ground impact point below flight path
1113	22	286	Sunday	08:26:16	10599	3219	243.80	70007	70007	0	8214	8214	0	70007	8214	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
1114	90	1008	Monday	16:19:34	7676	3915	1032.61	59056	59056	0	19165	19165	0	59056	19165	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1118	89	2853	Friday	16:16:11	8770	2657	1026.97	59056	59056	0	19165	19165	0	59056	19165	68	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
1128	39	2756	Monday	10:29:01	8305	2705	448.36	64141	64141	13	14080	14080	1	64141	14080	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
1129	67	3097	Tuesday	13:43:58	9830	2619	773.31	61012	61012	0	17209	17209	0	61012	17209	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
1144	78	243	Wednesday	14:54:49	10687	3169	891.36	59839	59839	0	18382	18382	0	59839	18382	24	Generator Failure	UA ground impact tangential to trajectory
1149	6	1004	Monday	06:36:38	7695	3913	61.06	69616	69616	0	8605	8605	0	69616	8605	9	Engine Out	UA ground impact tangential to trajectory
115	50	3360	Wednesday	11:46:31	10625	2713	577.53	64532	64532	0	13689	13689	3	64532	13689	21	Engine Fire	UA structural desintegration - Debris Impact
1155	32	496	Sunday	09:36:05	9983	3466	360.14	70007	70007	0	8214	8214	0	70007	8214	10	Engine Anomaly	UA approaches Emergency landing site
1174	69	1431	Friday	13:54:39	5940	3942	791.08	59056	59056	0	19165	19165	0	59056	19165	2	Engine Out	UA approaches Emergency landing site
1177	81	631	Monday	15:16:23	9449	3615	927.31	61403	61403	7	16818	16818	2	61403	16818	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1191	5	2226	Monday	06:32:02	6011	3207	53.42	69616	69616	0	8605	8605	0	69616	8605	29	Connection Failure	UA approaches Emergency landing site
1201	12	3509	Thursday	07:23:05	10851	2822	138.50	68834	68834	0	9387	9387	2	68834	9387	20	Engine Fire	UA structural desintegration - Debris Impact
1208	36	1737	Thursday	10:06:14	5359	3746	410.39	64532	64532	0	13689	13689	0	64532	13689	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
1220	120	305	Tuesday	19:46:23	10556	3241	1377.33	71572	71572	0	6649	6649	0	71572	6649	50	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
1221	92	1192	Wednesday	16:33:48	6831	3972	1056.33	56710	56710	0	21511	21511	0	56710	21511	40	Short Circuit / Overload	Central UA ground impact point below flight path
1224	57	2222	Saturday	12:32:54	5999	3212	654.83	55145	55145	0	23076	23076	0	55145	23076	28	Generator Failure	UA ground impact tangential to trajectory
1234	116	1702	Tuesday	19:21:20	5388	3776	1335.56	71572	71572	0	6649	6649	0	71572	6649	22	Generator Failure	UA approaches Emergency landing site
1254	70	277	Monday	13:59:21	10619	3208	798.94	61403	61403	0	16818	16818	0	61403	16818	55	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
1258	95	1519	Friday	16:55:15	5700	3903	1092.08	59056	59056	0	19165	19165	0	59056	19165	72	Degradation of altitude	UA approaches Emergency landing site
1263	99	1471	Wednesday	17:22:54	5824	3926	1138.19	56710	56710	44	21511	21511	4	56710	21511	18	Engine Fire	UA structural desintegration - Debris Impact
127	8	81	Monday	06:48:43	10883	2987	81.22	69616	69616	0	8605	8605	0	69616	8605	72	Degradation of altitude	UA approaches Emergency landing site
1297	100	820	Tuesday	17:28:36	8585	3792	1147.67	58274	58274	0	19947	19947	0	58274	19947	40	Short Circuit / Overload	Central UA ground impact point below flight path
1297	31	3223	Tuesday	09:34:24	10267	2647	357.33	66096	66096	0	12125	12125	4	66096	12125	18	Engine Fire	UA structural desintegration - Debris Impact
130	75	2786	Thursday	14:38:54	8450	2688	864.83	60621	60621	0	17600	17600	0	60621	17600	73	Degradation of altitude	Central UA ground impact point below flight path
1335	25	1694	Friday	08:49:48	5396	3782	283.03	65314	65314	0	12907	12907	0	65314	12907	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
134	113	2256	Monday	19:01:35	6110	3172	1302.64	71181	71181	40	7040	7040	0	71181	7040	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1342	22	891	Friday	08:27:26	8243	3846	245.75	65314	65314	0	12907	12907	1	65314	12907	46	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
1351	81	2161	Sunday	15:19:19	5818	3284	932.22	52799	52799	0	25422	25422	0	52799	25422	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1357	36	2342	Saturday	10:07:24	6421	3074	412.33	55145	55145	0	23076	23076	0	55145	23076	2	Engine Out	UA approaches Emergency landing site
1362	20	1806	Thursday	08:15:20	5332	3681	225.56	66096	66096	0	12125	12125	0	66096	12125	38	Short Circuit / Overload	Central UA ground impact point below flight path
1368	37	168	Wednesday	10:10:08	10804	3083	416.92	64532	64532	0	13689	13689	0	64532	13689	1	Engine Out	No Ground Effect
1368	39	2652	Wednesday	10:28:49	7801	2775	448.03	64532	64532	10	13689	13689	4	64532	13689	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1371	105	492	Saturday	18:02:39	9997	3461	1204.44	59839	59839	2	18382	18382	8	59839	18382	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
138	43	3296	Friday	10:57:48	10475	2678	496.36	62967	62967	3	15254	15254	4	62967	15254	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1392	20	2039	Saturday	08:15:46	5538	3428	226.30	68834	68834	0	9387	9387	0	68834	9387	22	Generator Failure	UA approaches Emergency landing site
1399	66	731	Saturday	13:32:28	9004	3714	754.14	59056	59056	0	19165	19165	0	59056	19165	57	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
14	51	771	Sunday	11:48:27	8818	3751	580.78	57492	57492	0	20729	20729	0	57492	20729	11	Engine Anomaly	Central UA ground impact point below flight path
1400	15	3473	Sunday	07:43:50	10813	2792	173.08	75874	75874	0	2347	2347	0	75874	2347	10	Engine Anomaly	UA approaches Emergency landing site
158	103	1467	Thursday	17:50:39	5835	3928	1184.44	57492	57492	0	20729	20729	0	57492	20729	66	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
159	18	1553	Friday	08:00:58	5622	3883	201.61	65314	65314	0	12907	12907	0	65314	12907	47	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
162	81	2922	Monday	15:20:48	9091	2634	934.67	61403	61403	9	16818	16818	6	61403	16818	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
17	52	3345	Wednesday	12:00:22	10592	2704	600.61	64532	64532	0	13689	13689	0	64532	13689	30	Connection Failure	Central UA ground impact point below flight path
17	91	1134	Wednesday	16:26:44	7087	3961	1044.58	56710	56710	0	21511	21511	0	56710	21511	1	Engine Out	No Ground Effect
171	101	2710	Wednesday	17:39:11	8082	2733	1165.31	56710	56710	0	21511	21511	2	56710	21511	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
174	28	1719	Saturday	09:10:40	5372	3761	317.80	68834	68834	0	9387	9387	0	68834	9387	13	Engine Anomaly	UA approaches Emergency landing site
186	11	3435	Thursday	07:16:01	10761	2763	126.70	68834	68834	0	9387	9387	0	68834	9387	17	Engine Fire	Central UA ground impact point below flight path
188	46	1116	Saturday	11:14:25	7168	3957	524.06	55145	55145	0	23076	23076	0	55145	23076	73	Degradation of altitude	Central UA ground impact point below flight path
191	23	1122	Tuesday	08:34:50	7141	3958	258.06	66096	66096	0	12125	12125	0	66096	12125	36	Short Circuit / Overload	Central UA ground impact point below flight path
196	73	3095	Sunday	14:25:37	9822	2618	842.69	52799	52799	0	25422	25422	0	52799	25422	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
201	20	777	Friday	08:13:21	8790	3756	222.25	65314	65314	0	12907	12907	0	65314	12907	1	Engine Out	No Ground Effect
218	43	3555	Monday	10:58:18	10884	2863	497.19	64141	64141	0	14080	14080	2	64141	14080	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
223	46	3208	Saturday	11:18:27	10220	2642	530.78	55145	55145	0	23076	23076	0	55145	23076	10	Engine Anomaly	UA approaches Emergency landing site
223	81	3484	Saturday	15:21:53	10826	2801	936.47	59056	59056	0	19165	19165	0	59056	19165	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
225	10	2418	Monday	07:07:07	6728	2991	111.86	69616	69616	0	8605	8605	0	69616	8605	36	Short Circuit / Overload	Central UA ground impact point below flight path
226	26	170	Tuesday	08:53:49	10802	3085	289.70	66096	66096	0	12125	12125	0	66096	12125	27	Generator Failure	UA ground impact tangential to trajectory
231	2	455	Sunday	06:07:49	10126	3419	13.03	75874	75874	0	2347	2347	0	75874	2347	2	Engine Out	UA approaches Emergency landing site
232	1	406	Monday	06:00:46	10283	3361	1.30	69616	69616	0	8605	8605	0	69616	8605	46	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
244	62	995	Saturday	13:05:13	7738	3909	708.72	59056	59056	0	19165	19165	0	59056	19165	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
249	111	862	Thursday	18:45:01	8383	3825	1275.03	57492	57492	7	20729	20729	4	57492	20729	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
250	102	2638	Friday	17:45:59	7733	2785	1176.64	59056	59056	0	19165	19165	0	59056	19165	12	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
256	58	3325	Thursday	12:41:57	10546	2693	669.94	64532	64532	0	13689	13689	0	64532	13689	74	Degradation of altitude	Central UA ground impact point below flight path
256	81	380	Thursday	15:15:54	10360	3330	926.50	60621	60621	0	17600	17600	0	60621	17600	37	Short Circuit / Overload	Central UA ground impact point below flight path
279	68	1019	Saturday	13:46:55	7623	3921	778.20	59056	59056	0	19165	19165	0	59056	19165	43	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
288	113	1625	Monday	19:00:22	5487	3836	1300.61	71181	71181	0	7040	7040	0	71181	7040	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
292	24	3427	Friday	08:46:13	10749	2757	277.03	65314	65314	0	12907	12907	0	65314	12907	34	Connection Failure	UA ground impact tangential to trajectory
292	97	2585	Friday	17:11:11	7480	2829	1118.64	59056	59056	7	19165	19165	2	59056	19165	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
331	49	1841	Tuesday	11:36:38	5334	3646	561.08	64532	64532	0	13689	13689	0	64532	13689	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
344	12	198	Monday	07:16:43	10763	3117	127.86	69616	69616	0	8605	8605	0	69616	8605	74	Degradation of altitude	Central UA ground impact point below flight path
353	50	2469	Wednesday	11:44:47	6948	2938	574.67	64532	64532	0	13689	13689	0	64532	13689	31	Connection Failure	UA ground impact tangential to trajectory
362	86	2871	Friday	15:55:23	8855	2650	992.33	59056	59056	1	19165	19165	0	59056	19165	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
370	44	2212	Saturday	11:02:39	5967	3224	504.44	55145	55145	0	23076	23076	0	55145	23076	24	Generator Failure	UA ground impact tangential to trajectory
376	13	739	Friday	07:24:41	8967	3722	141.17	69616	69616	0	8605	8605	0	69616	8605	28	Generator Failure	UA ground impact tangential to trajectory
381	83	1731	Wednesday	15:32:23	5363	3751	953.97	59839	59839	0	18382	18382	0	59839	18382	44	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
383	91	1463	Friday	16:27:23	5847	3930	1045.64	59056	59056	25	19165	19165	1	59056	19165	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
389	114	281	Thursday	19:04:42	10610	3213	1307.86	71181	71181	3	7040	7040	1	71181	7040	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
395	116	3284	Wednesday	19:24:23	10443	2672	1340.64	69616	69616	0	8605	8605	0	69616	8605	74	Degradation of altitude	Central UA ground impact point below flight path
400	115	3598	Monday	19:18:02	10899	2903	1330.08	71181	71181	0	7040	7040	0	71181	7040	48	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
409	47	1338	Wednesday	11:21:48	6249	3968	536.33	64532	64532	0	13689	13689	0	64532	13689	69	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
409	52	180	Wednesday	11:54:15	10789	3096	590.44	64532	64532	0	13689	13689	0	64532	13689	78	Degradation of altitude	Central UA ground impact point below flight path
429	100	1719	Tuesday	17:30:20	5372	3761	1150.56	58274	58274	0	19947	19947	0	58274	19947	47	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
435	105	3216	Monday	18:07:55	10246	2644	1213.20	59056	59056	0	19165	19165	0	59056	19165	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
435	19	2864	Monday	08:10:26	8822	2652	217.39	64923	64923	0	13298	13298	0	64923	13298	11	Engine Anomaly	Central UA ground impact point below flight path
44	102	372	Tuesday	17:41:36	10383	3321	1169.36	58274	58274	0	19947	19947	0	58274	19947	18	Engine Fire	UA structural desintegration - Debris Impact
442	38	3105	Monday	10:22:45	9861	2619	437.92	64141	64141	0	14080	14080	0	64141	14080	67	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
446	90	195	Friday	16:17:59	10767	3113	1030.00	59056	59056	1	19165	19165	0	59056	19165	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
449	100	1996	Monday	17:30:52	5466	3478	1151.45	59056	59056	0	19165	19165	0	59056	19165	75	Degradation of altitude	UA approaches Emergency landing site
468	1	2784	Saturday	06:05:21	8441	2689	8.94	75092	75092	0	3129	3129	0	75092	3129	78	Degradation of altitude	UA approaches Emergency landing site
471	36	3474	Tuesday	10:09:34	10814	2793	415.97	64532	64532	0	13689	13689	0	64532	13689	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
479	82	1700	Wednesday	15:25:23	5390	3777	942.31	59839	59839	0	18382	18382	0	59839	18382	13	Engine Anomaly	UA approaches Emergency landing site
479	89	1149	Wednesday	16:12:53	7019	3965	1021.50	56710	56710	0	21511	21511	0	56710	21511	25	Generator Failure	UA approaches Emergency landing site
480	77	2139	Thursday	14:51:31	5760	3310	885.89	60621	60621	0	17600	17600	1	60621	17600	66	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
486	10	490	Wednesday	07:03:24	10004	3459	105.67	68443	68443	0	9778	9778	0	68443	9778	37	Short Circuit / Overload	Central UA ground impact point below flight path
486	28	1451	Wednesday	09:10:09	5881	3935	316.94	65705	65705	0	12516	12516	1	65705	12516	37	Short Circuit / Overload	Central UA ground impact point below flight path
488	102	718	Friday	17:42:16	9064	3702	1170.47	59056	59056	0	19165	19165	0	59056	19165	66	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
491	81	3510	Monday	15:21:56	10852	2823	936.56	61403	61403	0	16818	16818	0	61403	16818	62	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
497	16	1819	Sunday	07:47:36	5332	3668	179.33	75874	75874	0	2347	2347	0	75874	2347	57	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
497	84	1183	Sunday	15:38:16	6869	3971	963.78	52799	52799	0	25422	25422	1	52799	25422	31	Connection Failure	UA ground impact tangential to trajectory
505	35	2968	Tuesday	10:01:40	9297	2624	402.78	64532	64532	0	13689	13689	0	64532	13689	73	Degradation of altitude	Central UA ground impact point below flight path
508	112	201	Thursday	18:50:40	10758	3120	1284.47	57492	57492	0	20729	20729	0	57492	20729	37	Short Circuit / Overload	Central UA ground impact point below flight path
51	14	2223	Tuesday	07:34:29	6002	3211	157.50	69225	69225	0	8996	8996	0	69225	8996	10	Engine Anomaly	UA approaches Emergency landing site
52	7	344	Wednesday	06:42:18	10459	3288	70.50	68443	68443	0	9778	9778	0	68443	9778	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
526	27	305	Monday	09:01:01	10556	3241	301.70	64923	64923	0	13298	13298	0	64923	13298	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
528	18	827	Wednesday	07:59:34	8552	3798	199.28	65705	65705	10	12516	12516	7	65705	12516	18	Engine Fire	UA structural desintegration - Debris Impact
531	20	51	Saturday	08:11:57	10895	2956	219.92	68834	68834	0	9387	9387	0	68834	9387	57	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
533	117	99	Monday	19:25:11	10872	3007	1341.97	71181	71181	0	7040	7040	0	71181	7040	22	Generator Failure	UA approaches Emergency landing site
537	121	2366	Friday	19:57:21	6595	3025	1395.58	70398	70398	0	7823	7823	0	70398	7823	37	Short Circuit / Overload	Central UA ground impact point below flight path
549	12	1763	Wednesday	07:19:44	5344	3722	132.89	68443	68443	0	9778	9778	0	68443	9778	10	Engine Anomaly	UA approaches Emergency landing site
552	48	790	Saturday	11:27:41	8728	3767	546.14	55145	55145	7	23076	23076	8	55145	23076	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
558	101	1136	Friday	17:36:08	7078	3962	1160.25	59056	59056	0	19165	19165	2	59056	19165	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
562	21	3445	Tuesday	08:25:25	10776	2771	242.39	66096	66096	0	12125	12125	0	66096	12125	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
563	16	3583	Wednesday	07:51:00	10895	2889	185.00	68443	68443	0	9778	9778	0	68443	9778	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
580	59	2492	Saturday	12:47:18	7050	2915	678.83	55145	55145	19	23076	23076	5	55145	23076	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
582	54	3355	Monday	12:14:15	10614	2710	623.78	64141	64141	0	14080	14080	0	64141	14080	70	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
585	49	3501	Thursday	11:39:50	10843	2815	566.42	64532	64532	0	13689	13689	0	64532	13689	25	Generator Failure	UA approaches Emergency landing site
595	100	1468	Sunday	17:29:50	5833	3927	1149.75	57883	57883	0	20338	20338	0	57883	20338	13	Engine Anomaly	UA approaches Emergency landing site
597	58	1795	Tuesday	12:39:01	5334	3692	665.03	64532	64532	1	13689	13689	0	64532	13689	47	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
602	1	657	Sunday	06:01:15	9337	3642	2.11	75874	75874	0	2347	2347	0	75874	2347	14	Engine Anomaly	Central UA ground impact point below flight path
605	21	644	Wednesday	08:20:01	9393	3629	233.39	65705	65705	0	12516	12516	0	65705	12516	49	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
616	2	3282	Sunday	06:13:15	10438	2671	22.11	75874	75874	0	2347	2347	0	75874	2347	66	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
619	44	120	Wednesday	10:58:38	10856	3029	497.72	64532	64532	0	13689	13689	0	64532	13689	68	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
635	3	3409	Friday	06:20:27	10719	2745	34.08	69616	69616	0	8605	8605	0	69616	8605	23	Generator Failure	UA approaches Emergency landing site
64	14	1756	Monday	07:33:35	5347	3728	156.00	69616	69616	0	8605	8605	0	69616	8605	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
641	56	3600	Thursday	12:28:37	10899	2905	647.70	64532	64532	0	13689	13689	0	64532	13689	5	Engine Out	No Ground Effect
646	64	1153	Tuesday	13:19:25	7001	3966	732.36	61012	61012	0	17209	17209	1	61012	17209	19	Engine Fire	Central UA ground impact point below flight path
651	26	3308	Sunday	08:59:51	10505	2684	299.78	70007	70007	0	8214	8214	0	70007	8214	78	Degradation of altitude	Central UA ground impact point below flight path
660	113	2187	Tuesday	19:01:27	5892	3253	1302.42	71572	71572	0	6649	6649	0	71572	6649	58	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
663	59	3227	Friday	12:48:43	10280	2648	681.20	62967	62967	0	15254	15254	0	62967	15254	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
666	90	1630	Monday	16:20:45	5479	3832	1034.61	59056	59056	0	19165	19165	4	59056	19165	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact

670	72	1628	Friday	14:15:50	5482	3834	826.42	59056	59056	0	19165	19165	0	59056	19165	28	Generator Failure	UA ground impact tangential to trajectory
671	18	2253	Saturday	08:02:18	6099	3176	203.86	68834	68834	1	9387	9387	0	68834	9387	36	Short Circuit / Overload	Central UA ground impact point below flight path
676	28	1996	Thursday	09:11:13	5466	3478	318.69	66096	66096	0	12125	12125	0	66096	12125	10	Engine Anomaly	UA approaches Emergency landing site
683	29	3099	Thursday	09:20:16	9838	2619	333.80	66096	66096	0	12125	12125	0	66096	12125	74	Degradation of altitude	Central UA ground impact point below flight path
696	54	2370	Wednesday	12:12:22	6531	3043	620.61	64532	64532	0	13689	13689	0	64532	13689	14	Engine Anomaly	Central UA ground impact point below flight path
698	68	509	Friday	13:45:56	9936	3481	776.56	59056	59056	0	19165	19165	0	59056	19165	5	Engine Out	No Ground Effect
707	94	1652	Sunday	16:48:34	5446	3816	1080.94	57883	57883	0	20338	20338	0	57883	20338	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
72	45	2857	Tuesday	11:10:50	8789	2655	518.08	64532	64532	0	13689	13689	0	64532	13689	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
720	89	2498	Saturday	16:15:29	7077	2909	1025.83	59839	59839	27	18382	18382	3	59839	18382	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
723	51	892	Tuesday	11:48:41	8238	3846	581.17	64532	64532	2	13689	13689	0	64532	13689	62	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
730	89	1556	Tuesday	16:13:41	5616	3882	1022.81	58274	58274	2	19947	19947	7	58274	19947	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
74	69	1543	Thursday	13:54:52	5644	3889	791.44	60621	60621	0	17600	17600	1	60621	17600	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
748	4	457	Saturday	06:21:41	10119	3421	36.17	75092	75092	0	3129	3129	0	75092	3129	9	Engine Out	UA ground impact tangential to trajectory
753	101	1768	Thursday	17:37:22	5342	3717	1162.28	57492	57492	0	20729	20729	0	57492	20729	39	Short Circuit / Overload	Central UA ground impact point below flight path
757	91	3434	Monday	16:31:10	10759	2763	1051.97	59056	59056	0	19165	19165	0	59056	19165	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
758	89	994	Tuesday	16:12:36	7743	3908	1021.00	58274	58274	0	19947	19947	0	58274	19947	51	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
766	121	2403	Wednesday	19:57:23	6665	3007	1395.64	69616	69616	2	8605	8605	0	69616	8605	62	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
766	79	2946	Wednesday	15:06:58	9199	2628	911.61	59839	59839	21	18382	18382	3	59839	18382	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
775	72	314	Friday	14:13:18	10535	3252	822.19	59056	59056	0	19165	19165	3	59056	19165	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
776	102	2473	Saturday	17:45:39	6966	2934	1176.11	59839	59839	0	18382	18382	0	59839	18382	78	Degradation of altitude	Central UA ground impact point below flight path
781	41	3285	Thursday	10:43:54	10446	2672	473.19	64532	64532	0	13689	13689	0	64532	13689	72	Degradation of altitude	UA approaches Emergency landing site
782	19	3573	Friday	08:11:48	10892	2879	219.67	65314	65314	0	12907	12907	0	65314	12907	10	Engine Anomaly	UA approaches Emergency landing site
789	2	2841	Friday	06:12:24	8714	2662	20.69	69616	69616	9	8605	8605	5	69616	8605	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
789	8	3297	Friday	06:54:55	10477	2678	91.55	69616	69616	0	8605	8605	0	69616	8605	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
8	45	1059	Monday	11:07:23	7433	3938	512.31	64141	64141	0	14080	14080	0	64141	14080	58	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
807	45	2096	Tuesday	11:09:22	5655	3361	515.64	64532	64532	15	13689	13689	4	64532	13689	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
812	17	545	Sunday	07:52:05	9800	3522	186.81	75874	75874	0	2347	2347	0	75874	2347	38	Short Circuit / Overload	Central UA ground impact point below flight path
815	71	3283	Wednesday	14:12:06	10440	2671	820.17	59839	59839	0	18382	18382	7	59839	18382	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
838	91	3071	Friday	16:30:29	9729	2617	1050.81	59056	59056	0	19165	19165	0	59056	19165	29	Connection Failure	UA approaches Emergency landing site
847	75	849	Sunday	14:35:09	8446	3815	858.61	52799	52799	0	25422	25422	0	52799	25422	47	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
853	69	2909	Saturday	13:57:30	9031	2637	795.83	59056	59056	1	19165	19165	0	59056	19165	78	Degradation of altitude	Central UA ground impact point below flight path
859	91	3365	Friday	16:31:03	10635	2716	1051.75	59056	59056	0	19165	19165	0	59056	19165	35	Connection Failure	UA ground impact tangential to trajectory
860	91	1368	Saturday	16:27:12	6144	3962	1045.33	59839	59839	0	18382	18382	0	59839	18382	23	Generator Failure	Central UA ground impact point below flight path
863	10	723	Tuesday	07:03:51	9041	3707	106.42	69225	69225	0	8996	8996	0	69225	8996	23	Generator Failure	Central UA ground impact point below flight path
869	71	1692	Monday	14:09:01	5398	3784	815.06	61403	61403	0	16818	16818	0	61403	16818	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
874	53	635	Saturday	12:02:04	9432	3619	603.47	55145	55145	0	23076	23076	0	55145	23076	75	Degradation of altitude	UA approaches Emergency landing site
877	38	2897	Tuesday	10:22:20	8976	2641	437.25	64532	64532	23	13689	13689	2	64532	13689	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
883	97	2325	Monday	17:10:40	6356	3093	1117.80	59056	59056	0	19165	19165	0	59056	19165	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
884	19	3296	Tuesday	08:11:15	10475	2678	218.78	66096	66096	0	12125	12125	0	66096	12125	67	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
886	101	773	Thursday	17:35:26	8809	3752	1159.08	57492	57492	0	20729	20729	0	57492	20729	22	Generator Failure	UA approaches Emergency landing site
886	78	3381	Thursday	15:00:51	10667	2726	901.44	60621	60621	0	17600	17600	0	60621	17600	17	Engine Fire	Central UA ground impact point below flight path
893	11	1870	Thursday	07:13:00	5344	3616	121.67	68834	68834	6	9387	9387	4	68834	9387	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
911	77	1992	Monday	14:51:14	5460	3482	885.42	61403	61403	0	16818	16818	0	61403	16818	39	Short Circuit / Overload	Central UA ground impact point below flight path
913	111	3473	Wednesday	18:50:03	10813	2792	1283.42	56710	56710	0	21511	21511	0	56710	21511	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
929	103	2954	Friday	17:53:31	9235	2626	1189.22	59056	59056	0	19165	19165	0	59056	19165	58	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
93	115	1056	Tuesday	19:13:08	7447	3937	1321.92	71572	71572	0	6649	6649	0	71572	6649	73	Degradation of altitude	Central UA ground impact point below flight path
931	57	2308	Sunday	12:33:03	6293	3112	655.11	57492	57492	0	20729	20729	0	57492	20729	2	Engine Out	UA approaches Emergency landing site
95	96	677	Thursday	17:00:33	9249	3662	1100.94	57492	57492	0	20729	20729	0	57492	20729	28	Generator Failure	UA ground impact tangential to trajectory
956	14	2249	Thursday	07:34:33	6086	3180	157.58	68834	68834	0	9387	9387	0	68834	9387	25	Generator Failure	UA approaches Emergency landing site
961	70	1886	Tuesday	14:02:28	5352	3599	804.11	61012	61012	8	17209	17209	5	61012	17209	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
970	104	1611	Thursday	17:57:53	5510	3846	1196.47	57492	57492	0	20729	20729	0	57492	20729	74	Degradation of altitude	Central UA ground impact point below flight path
971	17	216	Friday	07:51:26	10734	3137	185.75	69616	69616	0	8605	8605	0	69616	8605	34	Connection Failure	UA ground impact tangential to trajectory
974	56	3237	Monday	12:27:55	10310	2652	646.53	64141	64141	0	14080	14080	2	64141	14080	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
98	55	2159	Sunday	12:18:53	5813	3287	631.50	57492	57492	0	20729	20729	2	57492	20729	9	Engine Out	UA ground impact tangential to trajectory
99	62	1151	Monday	13:05:32	7010	3965	709.22	61403	61403	0	16818	16818	0	61403	16818	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
990	90	1336	Wednesday	16:20:11	6257	3968	1033.67	56710	56710	0	21511	21511	0	56710	21511	36	Short Circuit / Overload	Central UA ground impact point below flight path
991	55	2911	Thursday	12:20:20	9041	2637	633.92	64532	64532	1	13689	13689	0	64532	13689	58	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
995	37	2261	Monday	10:14:11	6126	3166	423.64	64141	64141	0	14080	14080	0	64141	14080	6	Engine Out	UA approaches Emergency landing site

O.R.C.U.S. 02.00 - tTest of the Simulation

nProbes	200
nEvents	209
nEvents_cor	194
tMission	14
x_cross_ATB	1.945
x_cross_OTW	0.74
x_cross_TOT	2.685
s2ATB	3.4867357
sATB	1.8672803
tATB	14.655021
s2OTW	0.4895231
sOTW	0.6996593
tOTW	14.755409
s2TOT	6.5123823
sTOT	2.551937
tTOT	14.824117

UADay/Prot	HIT_TOT_ATB	HIT_TOT_OTW	UADay/Prot cor	HIT_TOT_mean_ATB	HIT_TOT_mean_OTW	HIT_TOT_mean_ATB/Fh	HIT_TOT_mean_OTW/Fh	x_i-x_cross ATB	x_i-x_cross OTW	(x_i-x_cross ATB)^2	(x_i-x_cross OTW)^2
1	0	0	1	0	0	0	0	-1.945	-0.74	3.783025	0.5476
8	0	0	8	0	0	0	0	-1.945	-0.74	3.783025	0.5476
14	0	0	14	0	0	0	0	-1.945	-0.74	3.783025	0.5476
17	0	0	17	0	0	0	0	-1.945	-0.74	3.783025	0.5476
17	0	0	44	0	0	0	0	-1.945	-0.74	3.783025	0.5476
44	0	0	51	0	0	0	0	-1.945	-0.74	3.783025	0.5476
51	0	0	52	0	0	0	0	-1.945	-0.74	3.783025	0.5476
52	0	0	64	0	0	0	0	-1.945	-0.74	3.783025	0.5476
64	0	0	72	0	0	0	0	-1.945	-0.74	3.783025	0.5476
72	0	0	74	0	1	0	0.071428571	-1.945	-0.668571429	3.783025	0.446987755
74	0	1	93	0	0	0	0	-1.945	-0.74	3.783025	0.5476
93	0	0	95	0	0	0	0	-1.945	-0.74	3.783025	0.5476
95	0	0	98	0	2	0	0.142857143	-1.945	-0.597142857	3.783025	0.356579592
98	0	2	99	0	0	0	0	-1.945	-0.74	3.783025	0.5476
99	0	0	103	0	0	0	0	-1.945	-0.74	3.783025	0.5476
103	0	0	115	0	3	0	0.214285714	-1.945	-0.525714286	3.783025	0.27637551
115	0	3	127	0	0	0	0	-1.945	-0.74	3.783025	0.5476
127	0	0	130	0	0	0	0	-1.945	-0.74	3.783025	0.5476
130	0	0	134	40	0	2.857142857	0	0.912142857	-0.74	0.832004592	0.5476
134	40	0	138	3	4	0.214285714	0.285714286	-1.730714286	-0.454285714	2.995371939	0.20637551
138	3	4	158	0	0	0	0	-1.945	-0.74	3.783025	0.5476
158	0	0	159	0	0	0	0	-1.945	-0.74	3.783025	0.5476
159	0	0	162	9	6	0.642857143	0.428571429	-1.302142857	-0.311428571	1.69557602	0.096987755
162	9	6	171	0	2	0	0.142857143	-1.945	-0.597142857	3.783025	0.356579592
171	0	2	174	0	0	0	0	-1.945	-0.74	3.783025	0.5476
174	0	0	186	0	0	0	0	-1.945	-0.74	3.783025	0.5476
186	0	0	188	0	0	0	0	-1.945	-0.74	3.783025	0.5476
188	0	0	191	0	0	0	0	-1.945	-0.74	3.783025	0.5476
191	0	0	196	0	0	0	0	-1.945	-0.74	3.783025	0.5476
196	0	0	201	0	0	0	0	-1.945	-0.74	3.783025	0.5476
201	0	0	218	0	2	0	0.142857143	-1.945	-0.597142857	3.783025	0.356579592
218	0	2	223	0	0	0	0	-1.945	-0.74	3.783025	0.5476
223	0	0	225	0	0	0	0	-1.945	-0.74	3.783025	0.5476
223	0	0	226	0	0	0	0	-1.945	-0.74	3.783025	0.5476
225	0	0	231	0	0	0	0	-1.945	-0.74	3.783025	0.5476
226	0	0	232	0	0	0	0	-1.945	-0.74	3.783025	0.5476
231	0	0	244	0	0	0	0	-1.945	-0.74	3.783025	0.5476
232	0	0	249	7	4	0.5	0.285714286	-1.445	-0.454285714	2.088025	0.20637551
244	0	0	250	0	0	0	0	-1.945	-0.74	3.783025	0.5476
249	7	4	256	0	0	0	0	-1.945	-0.74	3.783025	0.5476
250	0	0	279	0	0	0	0	-1.945	-0.74	3.783025	0.5476
256	0	0	288	0	0	0	0	-1.945	-0.74	3.783025	0.5476
256	0	0	292	7	2	0.5	0.142857143	-1.445	-0.597142857	2.088025	0.356579592
279	0	0	331	0	0	0	0	-1.945	-0.74	3.783025	0.5476
288	0	0	344	0	0	0	0	-1.945	-0.74	3.783025	0.5476
292	0	0	353	0	0	0	0	-1.945	-0.74	3.783025	0.5476
292	7	2	362	1	0	0.071428571	0	-1.873571429	-0.74	3.510269898	0.5476
331	0	0	370	0	0	0	0	-1.945	-0.74	3.783025	0.5476
344	0	0	376	0	0	0	0	-1.945	-0.74	3.783025	0.5476
353	0	0	381	0	0	0	0	-1.945	-0.74	3.783025	0.5476
362	1	0	383	25	1	1.785714286	0.071428571	-0.159285714	-0.668571429	0.025371939	0.446987755
370	0	0	389	3	1	0.214285714	0.071428571	-1.730714286	-0.668571429	2.995371939	0.446987755
376	0	0	395	0	0	0	0	-1.945	-0.74	3.783025	0.5476
381	0	0	400	0	0	0	0	-1.945	-0.74	3.783025	0.5476
383	25	1	409	0	0	0	0	-1.945	-0.74	3.783025	0.5476
389	3	1	429	0	0	0	0	-1.945	-0.74	3.783025	0.5476
395	0	0	435	0	0	0	0	-1.945	-0.74	3.783025	0.5476
400	0	0	442	0	0	0	0	-1.945	-0.74	3.783025	0.5476
409	0	0	446	1	0	0.071428571	0	-1.873571429	-0.74	3.510269898	0.5476
409	0	0	449	0	0	0	0	-1.945	-0.74	3.783025	0.5476
429	0	0	468	0	0	0	0	-1.945	-0.74	3.783025	0.5476
435	0	0	471	0	0	0	0	-1.945	-0.74	3.783025	0.5476
435	0	0	479	0	0	0	0	-1.945	-0.74	3.783025	0.5476
442	0	0	480	0	1	0	0.071428571	-1.945	-0.668571429	3.783025	0.446987755
446	1	0	486	0	1	0	0.071428571	-1.945	-0.668571429	3.783025	0.446987755
449	0	0	488	0	0	0	0	-1.945	-0.74	3.783025	0.5476
468	0	0	491	0	0	0	0	-1.945	-0.74	3.783025	0.5476
471	0	0	497	1	1	0.071428571	0.071428571	-1.873571429	-0.668571429	3.510269898	0.446987755
479	0	0	506	0	0	0	0	-1.945	-0.74	3.783025	0.5476
479	0	0	508	0	0	0	0	-1.945	-0.74	3.783025	0.5476
480	0	1	526	0	0	0	0	-1.945	-0.74	3.783025	0.5476
486	0	0	528	10	7	0.714285714	0.5	-1.230714286	-0.24	1.514657653	0.0576
486	0	1	531	0	0	0	0	-1.945	-0.74	3.783025	0.5476
488	0	0	533	0	0	0	0	-1.945	-0.74	3.783025	0.5476
491	0	0	537	0	0	0	0	-1.945	-0.74	3.783025	0.5476
497	1	0	549	0	0	0	0	-1.945	-0.74	3.783025	0.5476
497	0	1	552	7	8	0.5	0.571428571	-1.445	-0.168571429	2.088025	0.028416327
506	0	0	558	0	2	0	0.142857143	-1.945	-0.597142857	3.783025	0.356579592
508	0	0	562	0	0	0	0	-1.945	-0.74	3.783025	0.5476
526	0	0	563	0	0	0	0	-1.945	-0.74	3.783025	0.5476
528	10	7	580	19	5	1.357142857	0.357142857	-0.587857143	-0.382857143	0.34557602	0.146579592
531	0	0	582	0	0	0	0	-1.945	-0.74	3.783025	0.5476
533	0	0	585	0	0	0	0	-1.945	-0.74	3.783025	0.5476
537	0	0	595	0	0	0	0	-1.945	-0.74	3.783025	0.5476
549	0	0	597	1	0	0.071428571	0	-1.873571429	-0.74	3.510269898	0.5476
552	7	8	602	0	0	0	0	-1.945	-0.74	3.783025	0.5476
558	0	2	605	0	0	0	0	-1.945	-0.74	3.783025	0.5476
562	0	0	616	0	0	0	0	-1.945	-0.74	3.783025	0.5476
563	0	0	619	0	0	0	0	-1.945	-0.74	3.783025	0.5476
580	19	5	635	0	0	0	0	-1.945	-0.74	3.783025	0.5476
582	0	0	641	0	0	0	0	-1.945	-0.74	3.783025	0.5476
585	0	0	646	0	1	0	0.071428571	-1.945	-0.668571429	3.783025	0.446987755
595	0	0	651	0	0	0	0	-1.945	-0.74	3.783025	0.5476
597	1	0	660	0	0	0	0	-1.945	-0.74	3.783025	0.5476
602	0	0	663	0	0	0	0	-1.945	-0.74	3.783025	0.5476
605	0	0	666	0	4	0	0.285714286	-1.945	-0.454285714	3.783025	0.20637551
616	0	0	670	0	0	0	0	-1.945	-0.74	3.783025	0.5476
619	0	0	671	1	0	0.071428571	0	-1.873571429	-0.74	3.510269898	0.5476
635	0	0	676	0	0	0	0	-1.945	-0.74	3.783025	0.5476
641	0	0	683	0	0	0	0	-1.945	-0.74	3.783025	0.5476
646	0	1	696	0	0	0	0	-1.945	-0.74	3.783025	0.5476
651	0	0	698	0	0	0	0	-1.945	-0.74	3.783025	0.5476
660	0	0	707	0	0	0	0	-1.945	-0.74	3.783025	0.5476
663	0	0	720	27	3	1.928571429	0.214285714	-0.016428571	-0.525714286	0.000269898	0.27637551
666	0	4	723	2	0	0.142857143	0	-1.802142857	-0.74	3.247718878	0.5476
670	0	0	730	2	7	0.142857143	0.5	-1.802142857	-0.24	3.247718878	0.0576
671	1	0	748	0	0	0	0	-1.945	-0.74	3.783025	0.5476
676	0	0	753	0	0	0	0	-1.945	-0.74	3.783025	0.5476
683	0	0	757	0	0	0	0	-1.945	-0.74	3.783025	0.5476
696	0	0	758	0	0	0	0	-1.945	-0.74	3.783025	0.5476
698	0	0	766	23	3	1.642857143	0.214285714	-0.302142857	-0.525714286	0.091290306	0.27637551
707	0	0	775	0	3	0	0.214285714	-1.945	-0.525714286	3.783025	0.27637551
720	27	3	776	0	0	0	0	-1.945	-0.74	3.783025	0.5476
723	2	0	781	0	0	0	0	-1.945	-0.74	3.783025	0.5476
730	2	7	782	0	0	0	0	-1.945	-0.74	3.783025	0.5476
748	0	0	789	9	5	0.642857143	0.357142857	-1.302142857	-0.382857143	1.69557602	0.146579592
753	0	0	807	15	4	1.071428571	0.285714286	-0.873571429	-0.454285714	0.763127041	0.20637551
757	0	0	812	0	0	0	0	-1.945	-0.74	3.783025	0.5476
758	0	0	815	0	7	0	0.5	-1.945	-0.24	3.783025	0.0576
766	2	0	838	0	0	0	0	-1.945	-0.74	3.783025	0.5476
766	21	3	847	0	0	0	0	-1.945	-0.74	3.783025	0.5476
775	0	3	853	1	0	0.071428571	0	-1.873571429	-0.74	3.510269898	0.5476
776	0	0	859	0	0	0	0	-1.945	-0.74	3.783025	0.5476
781	0	0	860	0	0	0	0	-1.945	-0.74	3.783025	0.5476
782	0	0	863	0	0	0	0	-1.945	-0.74	3.783025	0.5476
789	9	5	869	0	0	0	0	-1.945	-0.74	3.783025	0.5476
789	0	0	874	0	0	0	0	-1.945	-0.74	3.783025	0.5476
807	15	4	877	23	2	1.642857143	0.142857143	-0.302142857	-0.597142857	0.091290306	0.356579592
812	0	0	883	0	0	0	0	-1.945	-0.74	3.783025	0.5476
815	0	7	884	0	0	0	0	-1.945	-0.74	3.783025	0.5476
838	0	0	886	0	0	0	0	-1.945	-0.74	3.783025	0.5476
847	0	0	893	6	4	0.428571429	0.285714286	-1.516428571	-0.454285714	2.299555612	0.20637551
853	1	0	911	0	0	0	0	-1.945	-0.74	3.783025	0.5476
859	0	0	913	0	0	0	0	-1.945	-0.74	3.783025	0.5476
860	0	0	929	0	0	0	0	-1.945	-0.74	3.783025	0.5476
863	0	0	931	0	0	0	0	-1.945	-0.74	3.783025	0.5476
869	0	0	956	0	0	0	0	-1.945	-0.74	3.783025	0.5476
874	0	0	961	8	5	0.571428571	0.357142857	-1.373571429	-0.382857143	1.886698469	0.146579592
877	23	2	970	0	0	0	0	-1.945	-0.74	3.783025	0.5476
883	0	0	971	0	0	0	0	-1.945	-0.74	3.783025	0.5476
884	0	0	974	0	2	0	0.142857143	-1.945	-0.597142857	3.783025	0.356579592
886	0	0	990	0	0	0	0	-1.945	-0.74	3.783025	0.5476
886	0	0	991	1	0	0.071428571	0	-1.873571429	-0.74	3.510269898	0.5476
893	6	4	995	0	0	0	0	-1.945	-0.74	3.783025	0.5476
911	0	0	1000	0	0	0	0	-1.945	-0.74	3.783025	0.5476
913	0	0	1004	4	2	0.285714286	0.142857143	-1.659285714	-0.597142857	2.753229082	0.356579592
929	0	0	1010	32	1	2.285714286	0.071428571	0.340714286	-0.668571429	0.116086224	0.446987755
931	0	0	1021	0	0	0	0	-1.945	-0.74	3.783025	0.5476
956	0	0	1032	0	0	0	0	-1.945	-0.74	3.783025	0.5476
961	8	5	1051	2	0	0.142857143	0	-1.802142857	-0.74	3.247718878	0.5476
970	0	0	1052	0	0	0	0	-1.945	-0.74	3.783025	0.5476
971	0	0	1053	0	7	0	0.5	-1.945	-0.24	3.783025	0.0576
974	0	2	1062	0	0	0	0	-1.945	-0.74	3.783025	0.5476
990	0	0	1069	0	0	0	0	-1.945	-0.74	3.783025	0.5476
991	1	0	1071	21	3	1.5	0.214285714	-0.445	-0.525714286	0.198025	0.27637551
995	0	0	1072	0	6	0	0.428571429	-1.945	-0.311428571	3.783025	0.096987755
1000	0	0	1078	0	0	0	0	-1.945	-0.74	3.783025	0.5476
1004	4	2	1090	0	0	0	0	-1.945	-0.74	3.783025	0.5476
1010	32	1	1106	0	0	0	0	-1.945	-0.74	3.783025	0.5476
1021	0	0	1107	0	0	0	0	-1.945	-0.74	3.783025	0.5476
1032	0	0	1108	2	0	0.142857143	0	-1.802142857	-0.74	3.247718878	0.5476
1051	2	0	1109	0	0	0	0	-1.945	-0.74	3.783025	0.5476
1052	0	0	1112	0	0	0	0	-1.945	-0.74	3.783025	0.5476
1053	0	7	1113	0	0	0	0	-1.945	-0.74	3.783025	0.5476
1062	0	0	1114	0	0	0	0	-1.945	-0.74	3.783025	0.5476
1069	0	0	1118	0	0	0	0	-1.945	-0.74	3.783025	0.5476
1071	21	3	1128	13	1	0.928571429	0.071428571	-1.016428571	-0.668571429	1.033127041	0.446987755
1072	0	6	1129	0	0	0	0	-1.945	-0.74	3.783025	0.5476
1078	0	0	1144	0	0	0	0	-1.945	-0.74	3.783025	0.5476
1090	0	0	1149	0	0	0	0	-1.945	-0.74	3.783025	0.5476
1106	0	0	1155	0	0	0	0	-1.945	-0.74	3.783025	0.5476
1107	0	0	1174	0	0	0	0	-1.945	-0.74	3.783025	0.5476
1107	0	0	1177	7	2	0.5	0.142857143	-1.445	-0.597142857	2.088025	0.356579592
1108	2	0	1191	0	0	0	0	-1.945	-0.74	3.783025	0.5476
1109	0	0	1201	0	2	0	0.142857143	-1.945	-0.597142857	3.783025	0.356579592
1112	0	0	1208	0	0	0	0	-1.945	-0.74	3.783025	0.5476
1113	0	0	1220	0	0	0	0	-1.945	-0.74	3.783025	0.5476
1114	0	0	1221	0	0	0	0	-1.945	-0.74	3.783025	0.5476
1118	0	0	1224	0	0	0	0	-1.945	-0.74	3.783025	0.5476
1128	13	1	1234	0	0	0	0	-1.945	-0.74	3.783025	0.5476
1129	0	0	1254	0	0	0	0	-1.945	-0.74	3.783025	0.5476
1144	0	0	1258	0	0	0	0	-1.945	-0.74	3.783025	0.5476
1149	0	0	1263	44	4	3.142857143	0.285714286	1.197857143	-0.454285714	1.434861735	0.20637551
1155	0	0	1297	0	4	0	0.285714286	-1.945	-0.454285714	3.783025	0.20637551
1174	0	0	1335	0	0	0	0	-1.945	-0.74	3.783025	0.5476
1177	7	2	1342	0	1	0	0.071428571	-1.945	-0.668571429	3.783025	0.446987755
1191	0	0	1351	0	0	0	0	-1.945	-0.74	3.783025	0.5476
1201	0	2	1357	0	0	0	0	-1.945	-0.74	3.783025	0.5476
1208	0	0	1362	0	0	0	0	-1.945	-0.74	3.783025	0.5476
1220	0	0	1368	10	4	0.714285714	0.285714286	-1.230714286	-0.454285714	1.514657653	0.20637551
1221	0	0	1371	2	8	0.142857143	0.571428571	-1.802142857	-0.168571429	3.247718878	0.028416327
1224	0	0	1392	0	0	0	0	-1.945	-0.74	3.783025	0.5476
1234	0	0	1399	0	0	0	0	-1.945	-0.74	3.783025	0.5476
1254	0	0	1400	0	0	0	0	-1.945	-0.74	3.783025	0.5476
1258	0	0									
1263	44	4									
1297	0	0									
1297	0	4									
1335	0	0									
1342	0	1									
1351	0	0									
1357	0	0									
1362	0	0									
1368	0	0									
1368	10	4									
1371	2	8									
1392	0	0									
1399	0	0									
1400	0	0									

11.4.10 Aalen – C3

11.4.10.1 Aalen – C3 – Phase 1

O.R.C.U.S. 02.00 - Simulation Summary

UA Parameters

MTOW [kg]	Wingspan [m	Length [m]	L/D
90	5	4	8

v [km/h]	Alt [m]	CCF [m]
100	100	12137.353

P_CumCat [1/Fh]	Engine [%]	ESys [%]	FCS [%]	NavSys [%]	Struct [%]
0.01	20	20	20	20	20

General map parameters

	Name	Area [km2]	PPL	PPL/km2
City	Aalen, Stadt	146.58	67849	463
County	Ostalbkreis	1511.39	312422	207
FS	BW	35748.3	11023425	308

Mission specific map parameters

	Area [km2]	PPL	Tourists	Total PPL
City	66.8555	30955	0	30955
Map total	66.8555	30955	0	30955

PPL MOD NA

Sim FH [Fh] 19600 Ev/Fh [1/Fh] 0.0094898
Events total 186

Hits due to UA impacts		Hits/Fh [1/Fh]
City ATB	297	0.0151531
City OTW	66	0.0033673
Total	363	0.0185204

Prot	cyc	k_UA	Day	Time of impact	UA X Pos	UA Y Pos	Travelled Distance [km]	PPL_TD_CITY_ATB	PPL_CITY_ATB_COUNT	HIT_CITY_ATB_COUNT	PPL_TD_CITY_OTW	PPL_CITY_OTW_COUNT	HIT_CITY_OTW_COUNT	PPL_ALL_ATB_COUNT	PPL_ALL_OTW_COUNT	E	Case	Outcome
1008	90	1762	Sunday	16:51:41	3832	4643	1086.16	22906	22906	0	8049	8049	1	22906	8049	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1014	14	3565	Saturday	07:41:52	8780	1338	169.80	29871	29871	1	1084	1084	2	29871	1084	21	Engine Fire	UA structural desintegration - Debris Impact
1014	44	901	Saturday	11:14:57	6550	3364	524.94	21823	21823	0	9132	9132	0	21823	9132	11	Engine Anomaly	Central UA ground impact point below flight path
1016	59	216	Monday	13:02:49	8716	1609	704.69	23835	23835	0	7120	7120	0	23835	7120	72	Degradation of altitude	UA approaches Emergency landing site
102	101	3176	Thursday	18:14:39	7979	1534	1224.44	23525	23525	0	7430	7430	6	23525	7430	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
1022	102	3449	Sunday	18:22:30	8649	1317	1237.50	22906	22906	0	8049	8049	0	22906	8049	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
1030	48	2056	Monday	11:46:25	3947	4301	577.39	25228	25228	0	5727	5727	0	25228	5727	62	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
1035	1	2101	Saturday	06:04:15	4022	4216	7.08	29871	29871	0	1084	1084	0	29871	1084	10	Engine Anomaly	UA approaches Emergency landing site
104	13	2831	Saturday	07:33:06	6628	2258	155.19	29871	29871	9	1084	1084	0	29871	1084	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
1044	74	3024	Monday	14:57:43	7432	1802	896.22	23835	23835	0	7120	7120	0	23835	7120	68	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
1058	115	1576	Monday	19:53:22	4093	4641	1388.97	28169	28169	27	2786	2786	1	28169	2786	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1063	54	1326	Saturday	12:28:39	4800	4368	647.75	21823	21823	0	9132	9132	0	21823	9132	28	Generator Failure	UA ground impact tangential to trajectory
1064	115	3356	Sunday	19:56:59	8474	1350	1394.97	27549	27549	0	3406	3406	0	27549	3406	17	Engine Fire	Central UA ground impact point below flight path
1070	87	1341	Saturday	16:29:00	4748	4393	1048.33	24299	24299	0	6656	6656	0	24299	6656	42	Partial Lock of Flight Control Surfaces	Central UA ground impact point below flight path
1091	34	1926	Saturday	10:04:12	3816	4502	407.03	21823	21823	0	9132	9132	0	21823	9132	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1093	89	2471	Monday	16:45:51	5105	3283	1076.42	21978	21978	0	8977	8977	0	21978	8977	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1094	115	406	Tuesday	19:51:00	8361	1992	1385.03	28633	28633	2	2322	2322	0	28633	2322	8	Engine Out	UA ground impact tangential to trajectory
1098	3	3041	Saturday	06:20:42	7497	1767	34.53	29871	29871	0	1084	1084	0	29871	1084	19	Engine Fire	Central UA ground impact point below flight path
110	37	1639	Friday	10:25:28	3977	4661	442.47	25383	25383	2	5572	5572	0	25383	5572	73	Degradation of altitude	Central UA ground impact point below flight path
1104	22	545	Friday	08:34:01	7957	2345	256.72	27240	27240	0	3715	3715	0	27240	3715	46	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
1104	68	1711	Friday	14:11:22	3879	4660	818.97	23990	23990	9	6965	6965	2	23990	6965	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1123	81	2030	Wednesday	15:46:41	3911	4347	977.83	23990	23990	0	6965	6965	3	23990	6965	20	Engine Fire	UA structural desintegration - Debris Impact
1126	75	2135	Saturday	15:03:13	4087	4146	905.36	23835	23835	0	7120	7120	0	23835	7120	17	Engine Fire	Central UA ground impact point below flight path
1127	47	1982	Sunday	11:39:00	3857	4425	565.00	22287	22287	0	8668	8668	0	22287	8668	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1129	109	1862	Tuesday	19:10:16	3798	4573	1317.11	28633	28633	0	2322	2322	0	28633	2322	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1143	55	1895	Tuesday	12:37:05	3803	4539	661.81	25228	25228	0	5727	5727	0	25228	5727	22	Generator Failure	UA approaches Emergency landing site
1154	68	1662	Saturday	14:11:17	3942	4664	818.81	23835	23835	0	7120	7120	0	23835	7120	5	Engine Out	No Ground Effect
1180	23	1427	Thursday	08:43:05	4471	4513	271.83	26311	26311	0	4644	4644	0	26311	4644	66	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
1181	67	2123	Friday	14:04:56	4063	4171	808.22	23990	23990	0	6965	6965	0	23990	6965	69	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
1184	58	3091	Monday	13:01:21	7685	1672	702.25	23835	23835	0	7120	7120	0	23835	7120	58	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
1187	69	451	Thursday	14:16:06	8243	2101	826.86	24609	24609	0	6346	6346	0	24609	6346	29	Connection Failure	UA approaches Emergency landing site
120	94	1015	Monday	17:19:19	6052	3679	1132.20	21978	21978	1	8977	8977	0	21978	8977	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
1202	87	781	Friday	16:27:52	7063	3017	1046.45	23216	23216	0	7739	7739	0	23216	7739	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1225	9	2772	Sunday	07:03:52	6371	2417	106.44	29562	29562	0	1393	1393	0	29562	1393	5	Engine Out	No Ground Effect
1228	56	478	Wednesday	12:41:29	8165	2169	669.17	24609	24609	0	6346	6346	0	24609	6346	72	Degradation of altitude	UA approaches Emergency landing site
1243	102	2213	Thursday	18:20:00	4266	3971	1233.33	23525	23525	0	7430	7430	0	23525	7430	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
1249	62	316	Wednesday	13:24:51	8561	1794	741.44	23990	23990	0	6965	6965	0	23990	6965	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
1255	112	1328	Tuesday	19:31:02	4793	4372	1351.72	28633	28633	4	2322	2322	0	28633	2322	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
1255	50	3458	Tuesday	12:03:50	8663	1317	606.39	25228	25228	0	5727	5727	0	25228	5727	57	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
1265	29	2320	Friday	09:28:36	4573	3702	347.67	27240	27240	0	3715	3715	0	27240	3715	37	Short Circuit / Overload	Central UA ground impact point below flight path
1291	43	967	Wednesday	11:07:49	6261	3549	513.03	24609	24609	0	6346	6346	0	24609	6346	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1300	11	2765	Friday	07:18:25	6340	2436	130.70	27395	27395	0	3560	3560	0	27395	3560	1	Engine Out	No Ground Effect
1301	63	1717	Saturday	13:34:58	3872	4659	758.30	23835	23835	8	7120	7120	2	23835	7120	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1307	27	2731	Friday	09:14:52	6191	2531	324.78	27240	27240	0	3715	3715	0	27240	3715	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
1310	106	682	Monday	18:46:01	7463	2729	1276.72	21978	21978	0	8977	8977	0	21978	8977	10	Engine Anomaly	UA approaches Emergency landing site
1315	10	29	Saturday	07:05:36	8809	1379	109.33	29871	29871	0	1084	1084	0	29871	1084	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
1315	48	211	Saturday	11:42:42	8722	1601	571.17	21823	21823	0	9132	9132	0	21823	9132	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
1324	55	2216	Monday	12:37:43	4274	3964	662.89	25228	25228	0	5727	5727	0	25228	5727	49	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
1344	57	957	Sunday	12:49:45	6305	3522	682.92	22287	22287	13	8668	8668	0	22287	8668	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
136	103	3490	Wednesday	18:29:51	8707	1317	1249.78	22906	22906	0	8049	8049	0	22906	8049	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
1366	31	3466	Monday	09:45:29	8674	1316	375.81	25692	25692	0	5263	5263	3	25692	5263	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
1371	104	912	Saturday	18:31:55	6502	3396	1253.22	24299	24299	0	6656	6656	0	24299	6656	77	Degradation of altitude	Central UA ground impact point below flight path
1388	94	850	Tuesday	17:18:59	6771	3218	1131.64	23216	23216	0	7739	7739	0	23216	7739	66	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
1390	54	2776	Thursday	12:31:35	6388	2406	652.64	24764	24764	0	6191	6191	0	24764	6191	1	Engine Out	No Ground Effect
1392	21	157	Saturday	08:25:57	8774	1519	243.28	25692	25692	0	5263	5263	0	25692	5263	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
149	11	3218	Tuesday	07:19:20	8112	1478	132.22	27085	27085	0	3870	3870	2	27085	3870	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
155	60	2037	Monday	13:13:46	3920	4335	722.97	23835	23835	0	7120	7120	0	23835	7120	2	Engine Out	UA approaches Emergency landing site
181	11	820	Saturday	07:14:28	6899	3131	124.14	29871	29871	0	1084	1084	0	29871	1084	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
183	91	2719	Monday	17:00:55	6139	2565	1101.53	21978	21978	0	8977	8977	0	21978	8977	76	Degradation of altitude	Central UA ground impact point below flight path
198	54	3542	Tuesday	12:33:07	8762	1329	655.22	25228	25228	0	5727	5727	0	25228	5727	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
212	48	1430	Tuesday	11:45:09	4462	4517	575.28	25228	25228	12	5727	5727	0	25228	5727	21	Engine Fire	UA structural desintegration - Debris Impact
215	71	3550	Friday	14:36:57	8769	1332	861.58	23990	23990	0	6965	6965	0	23990	6965	37	Short Circuit / Overload	Central UA ground impact point below flight path
218	64	1553	Monday	13:41:56	4142	4628	769.89	23835	23835	0	7120	7120	0	23835	7120	75	Degradation of altitude	UA approaches Emergency landing site
240	74	2002	Tuesday	14:55:39	3878	4394	892.78	24299	24299	0	6656	6656	0	24299	6656	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
250	52	1086	Friday	12:13:35	5745	3863	622.67	25383	25383	45	5572	5572	0	25383	5572	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
250	82	1685	Friday	15:53:17	3910	4664	988.81	23990	23990	0	6965	6965	0	23990	6965	36	Short Circuit / Overload	Central UA ground impact point below flight path
256	70	106	Thursday	14:22:42	8803	1454	837.83	24609	24609	0	6346	6346	0	24609	6346	10	Engine Anomaly	UA approaches Emergency landing site
269	74	2019	Wednesday	14:55:42	3897	4366	892.83	23990	23990	0	6965	6965	0	23990	6965	33	Connection Failure	Central UA ground impact point below flight path
279	106	31	Saturday	18:44:42	8810	1380	1274.53	24299	24299	2	6656	6656	1	24299	6656	18	Engine Fire	UA structural desintegration - Debris Impact
284	90	1416	Thursday	16:50:59	4504	4500	1085.00	23525	23525	0	7430	7430	0	23525	7430	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
285	10	1050	Friday	07:07:39	5900	3771	112.78	27395	27395	0	3560	3560	0	27395	3560	68	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
291	63	1808	Thursday	13:35:10	3807	4617	758.61	24609	24609	0	6346	6346	0	24609	6346	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
303	77	2432	Tuesday	15:18:22	4958	3394	930.64	24299	24299	1	6656	6656	0	24299	6656	40	Short Circuit / Overload	Central UA ground impact point below flight path
313	30	3235	Friday	09:37:44	8162	1457	362.89	27240	27240	0	3715	3715	0	27240	3715	34	Connection Failure	UA ground impact tangential to trajectory
327	36	840	Friday	10:16:35	6814	3189	427.64	25383	25383	10	5572	5572	0	25383	5572	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
330	105	1094	Monday	18:39:35	5711	3883	1265.97	21978	21978	24	8977	8977	0	21978	8977	20	Engine Fire	UA structural desintegration - Debris Impact
330	84	3482	Monday	16:11:29	8696	1316	1019.14	21978	21978	0	8977	8977	0	21978	8977	31	Connection Failure	UA ground impact tangential to trajectory
341	100	3324	Friday	18:07:40	8401	1371	1212.80	23216	23216	0	7739	7739	1	23216	7739	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
344	98	1700	Monday	17:49:49	3891	4662	1183.05	21978	21978	0	8977	8977	0	21978	8977	58	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
369	13	3351	Friday	07:34:10	8463	1353	156.95	27395	27395	0	3560	3560	0	27395	3560	40	Short Circuit / Overload	Central UA ground impact point below flight path
372	73	3493	Monday	14:51:23	8710	1317	885.67	23835	23835	0	7120	7120	0	23835	7120	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
377	69	1860	Saturday	14:18:57	3798	4574	831.61	23835	23835	0	7120	7120	0	23835	7120	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
382	49	714	Thursday	11:51:00	7337	2821	585.00	24764	24764	0	6191	6191	0	24764	6191	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
391	3	3568	Saturday	06:21:46	8782	1340	36.30	29871	29871	0	1084	1084	0	29871	1084	34	Connection Failure	UA ground impact tangential to trajectory
398	102	2427	Saturday	18:20:25	4939	3409	1234.06	24299	24299	0	6656	6656	0	24299	6656	25	Generator Failure	UA approaches Emergency landing site
399	106	1275	Sunday	18:47:13	4984	4278	1278.72	22906	22906	1	8049	8049	0	22906	8049	9	Engine Out	UA ground impact tangential to trajectory
409	68	591	Wednesday	14:09:07	7800	2471	815.20	23990	23990	0	6965	6965	0	23990	6965	8	Engine Out	UA ground impact tangential to trajectory
415	39	2802	Tuesday	10:42:23	6502	2335	470.67	25228	25228	0	5727	5727	0	25228	5727	39	Short Circuit / Overload	Central UA ground impact point below flight path
433	58	1435	Saturday	12:58:00	4448	4523	696.67	23835	23835	0	7120	7120	0	23835	7120	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
447	36	1219	Saturday	10:17:21	5198	4168	428.92	21823	21823	1	9132	9132	0	21823	9132	9	Engine Out	UA ground impact tangential to trajectory
448	89	534	Sunday	16:41:55	7993	2315	1069.89	22906	22906	0	8049	8049	0	22906	8049	78	Degradation of altitude	Central UA ground impact point below flight path
451	82	1874	Wednesday	15:53:39	3799	4561	989.44	23990	23990	0	6965	6965	1	23990	6965	21	Engine Fire	UA structural desintegration - Debris Impact
452	75	2530	Thursday	15:04:00	5337	3112	906.69	24609	24609	0	6346	6346	0	24609	6346	46	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
455	80	1643	Sunday	15:38:38	3971	4662	964.39	22906	22906	0	8049	8049	1	22906	8049	36	Short Circuit / Overload	Central UA ground impact point below flight path
459	44	2038	Thursday	11:17:15	3922	4334	528.78	24764	24764	0	6191	6191	0	24764	6191	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
465	19	1813	Wednesday	08:14:45	3805	4613	224.58	25847	25847	0	5108	5108	0	25847	5108	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
471	41	307	Tuesday	10:51:55	8577	1776	486.53	25228	25228	0	5727	5727	0	25228	5727	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
473	96	702	Thursday	17:33:14	7384	2787	1155.42	23525	23525	0	7430	7430	0	23525	7430	39	Short Circuit / Overload	Central UA ground impact point below flight path
482	67	236	Saturday	14:01:06	8691	1643	801.86	23835	23835	0	7120	7120	0	23835	7120	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
483	9	622	Sunday	06:59:31	7689	2557	99.20	29562	29562	9	1393	1393	1	29562	1393	20	Engine Fire	UA structural desintegration - Debris Impact
486	81	2426	Wednesday	15:47:30	4936	3411	979.17	23990	23990	0	6965	6965	0	23990	6965	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
495	69	2857	Friday	14:20:59	6740	2191	834.97	23990	23990	0	6965	6965	0	23990	6965	66	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
499	53	1441	Tuesday	12:21:36	4430	4530	636.00	25228	25228	0	5727	5727	0	25228	5727	2	Engine Out	UA approaches Emergency landing site
506	7	2582	Tuesday	06:48:55	5551	2960	81.53	27085	27085	5	3870	3870	2	27085	3870	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
515	37	1079	Thursday	10:24:20	5775	3845	440.58	24764	24764	0	6191	6191	0	24764	6191	53	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
517	93	1541	Saturday	17:13:05	4169	4621	1121.83	24299	24299	0	6656	6656	0	24299	6656	39	Short Circuit / Overload	Central UA ground impact point below flight path
53	14	962	Thursday	07:36:37	6283	3536	161.03	26930	26930	0	4025	4025	0	26930	4025	1	Engine Out	No Ground Effect
532	13	30	Sunday	07:27:26	8810	1379	145.75	29562	29562	0	1393	1393	0	29562	1393	31	Connection Failure	UA ground impact tangential to trajectory
535	63	2912	Wednesday	13:37:24	6975	2053	762.33	23990	23990	6	6965	6965	7	23990	6965	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
54	42	529	Friday	10:59:38	8009	2302	499.41	25383	25383	1	5572	5572	0	25383	5572	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
540	65	3432	Monday	13:53:01	8621	1320	788.36	23835	23835	0	7120	7120	1	23835	7120	21	Engine Fire	UA structural desintegration - Debris Impact
543	51	3063	Thursday	12:10:19	7581	1724	617.19	24764	24764	5	6191	6191	4	24764	6191	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
551	26	2961	Friday	09:08:03	7179	1938	313.42	27240	27240	2	3715	3715	1	27240	3715	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
553	30	3358	Sunday	09:37:58	8479	1349	363.30	27085	27085	0	3870	3870	2	27085	3870	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
56	35	2660	Sunday	10:12:58	5882	2733	421.64	22287	22287	0	8668	8668	0	22287	8668	75	Degradation of altitude	UA approaches Emergency landing site
569	83	614	Tuesday	15:58:23	7718	2535	997.33	23216	23216	0	7739	7739	0	23216	7739	33	Connection Failure	Central UA ground impact point below flight path
58	76	3404	Tuesday	15:13:04	8572	1328	921.78	24299	24299	0	6656	6656	3	24299	6656	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
581	68	2247	Sunday	14:12:28	4356	3889	820.78	22906	22906	0	8049	8049	0	22906	8049	9	Engine Out	UA ground impact tangential to trajectory
59	109	428	Wednesday	19:07:21	8305	2045	1312.28	28014	28014	5	2941	2941	1	28014	2941	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
594	19	3535	Saturday	08:18:14	8756	1326	230.39	25692	25692	0	5263	5263	0	25692	5263	19	Engine Fire	Central UA ground impact point below flight path
596	82	622	Monday	15:51:08	7689	2557	985.22	23835	23835	0	7120	7120	0	23835	7120	31	Connection Failure	UA ground impact tangential to trajectory
609	10	1899	Sunday	07:09:22	3804	4534	115.64	29562	29562	0	1393	1393	0	29562	1393	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
622	17	2685	Saturday	08:01:57	5991	2661	203.25	25692	25692	0	5263	5263	0	25692	5263	32	Connection Failure	UA approaches Emergency landing site
626	76	2440	Wednesday	15:11:07	4987	3372	918.53	23990	23990	1	6965	6965	0	23990	6965	9	Engine Out	UA ground impact tangential to trajectory
63	8	1898	Sunday	06:54:48	3804	4535	91.36	29562	29562	0	1393	1393	0	29562	1393	74	Degradation of altitude	Central UA ground impact point below flight path
636	72	2702	Saturday	14:42:31	6065	2613	870.86	23835	23835	0	7120	7120	0	23835	7120	47	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
637	35	1342	Sunday	10:10:19	4744	4394	417.19	22287	22287	1	8668	8668	3	22287	8668	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
641	27	3250	Thursday	09:15:55	8206	1440	326.53	26311	26311	0	4644	4644	0	26311	4644	28	Generator Failure	UA ground impact tangential to trajectory
648	32	2939	Thursday	09:51:42	7088	1989	386.17	26311	26311	1	4644	4644	0	26311	4644	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
648	61	332	Thursday	13:17:36	8529	1828	729.36	24609	24609	0	6346	6346	0	24609	6346	40	Short Circuit / Overload	Central UA ground impact point below flight path
653	39	2802	Tuesday	10:42:23	6502	2335	470.67	25228	25228	0	5727	5727	0	25228	5727	49	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
659	58	215	Monday	12:55:31	8718	1607	692.55	23835	23835	0	7120	7120	0	23835	7120	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
662	63	2245	Thursday	13:36:03	4351	3894	760.08	24609	24609	0	6346	6346	0	24609	6346	35	Connection Failure	UA ground impact tangential to trajectory
668	96	2095	Wednesday	17:36:04	4011	4228	1160.11	22906	22906	0	8049	8049	0	22906	8049	36	Short Circuit / Overload	Central UA ground impact point below flight path
676	60	3438	Thursday	13:16:37	8631	1319	727.70	24609	24609	0	6346	6346	0	24609	6346	46	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
682	101	2995	Wednesday	18:14:17	7317	1863	1223.83	22906	22906	0	8049	8049	0	22906	8049	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
694	20	519	Monday	08:19:24	8040	2275	232.36	25692	25692	0	5263	5263	0	25692	5263	28	Generator Failure	UA ground impact tangential to trajectory

697	89	2396	Thursday	16:45:41	4828	3496	1076.17	23525	23525	0	7430	7430	0	23525	7430	13	Engine Anomaly	UA approaches Emergency landing site
70	68	3153	Sunday	14:14:17	7903	1569	823.83	22906	22906	0	8049	8049	0	22906	8049	67	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
704	55	1186	Thursday	12:35:38	5329	4097	659.42	24764	24764	6	6191	6191	0	24764	6191	12	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
709	41	1147	Tuesday	10:53:37	5489	4010	489.36	25228	25228	0	5727	5727	0	25228	5727	22	Generator Failure	UA approaches Emergency landing site
714	85	1332	Sunday	16:14:25	4779	4378	1024.03	22906	22906	0	8049	8049	0	22906	8049	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
715	53	57	Monday	12:18:48	8812	1403	631.33	25228	25228	6	5727	5727	2	25228	5727	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
719	73	972	Friday	14:46:17	6239	3563	877.17	23990	23990	2	6965	6965	1	23990	6965	20	Engine Fire	UA structural desintegration - Debris Impact
723	102	3012	Tuesday	18:21:36	7384	1827	1236.03	23216	23216	0	7739	7739	0	23216	7739	5	Engine Out	No Ground Effect
723	60	307	Tuesday	13:10:17	8577	1776	717.14	24299	24299	0	6656	6656	0	24299	6656	55	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
724	79	2623	Wednesday	15:33:20	5724	2841	955.56	23990	23990	19	6965	6965	3	23990	6965	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
728	102	2238	Sunday	18:20:03	4332	3911	1233.42	22906	22906	0	8049	8049	0	22906	8049	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
732	94	3552	Thursday	17:24:26	8770	1332	1140.75	23525	23525	0	7430	7430	0	23525	7430	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
740	91	2447	Friday	17:00:22	5014	3352	1100.61	23216	23216	0	7739	7739	0	23216	7739	29	Connection Failure	UA approaches Emergency landing site
753	96	1073	Thursday	17:33:59	5801	3830	1156.67	23525	23525	0	7430	7430	0	23525	7430	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
759	72	1285	Wednesday	14:39:39	4947	4297	866.08	23990	23990	0	6965	6965	0	23990	6965	55	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
76	70	2182	Saturday	14:26:54	4190	4043	844.83	23835	23835	1	7120	7120	0	23835	7120	77	Degradation of altitude	Central UA ground impact point below flight path
773	8	2936	Wednesday	06:56:54	7076	1996	94.86	27240	27240	13	3715	3715	3	27240	3715	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
779	69	2956	Tuesday	14:21:11	7158	1950	835.31	24299	24299	1	6656	6656	0	24299	6656	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
782	74	2324	Friday	14:56:19	4585	3692	893.86	23990	23990	0	6965	6965	0	23990	6965	40	Short Circuit / Overload	Central UA ground impact point below flight path
783	17	65	Saturday	07:56:39	8812	1410	194.42	25692	25692	0	5263	5263	0	25692	5263	5	Engine Out	No Ground Effect
783	69	2939	Saturday	14:21:08	7088	1989	835.25	23835	23835	0	7120	7120	0	23835	7120	29	Connection Failure	UA approaches Emergency landing site
784	53	1350	Sunday	12:21:24	4717	4407	635.69	22287	22287	0	8668	8668	0	22287	8668	37	Short Circuit / Overload	Central UA ground impact point below flight path
789	20	3395	Friday	08:25:14	8555	1331	242.06	27240	27240	0	3715	3715	0	27240	3715	17	Engine Fire	Central UA ground impact point below flight path
789	22	3585	Friday	08:40:10	8793	1349	266.97	27240	27240	0	3715	3715	0	27240	3715	24	Generator Failure	UA ground impact tangential to trajectory
793	41	447	Tuesday	10:52:12	8254	2091	487.00	25228	25228	0	5727	5727	0	25228	5727	22	Generator Failure	UA approaches Emergency landing site
808	61	2293	Wednesday	13:21:34	4489	3773	735.97	23990	23990	0	6965	6965	0	23990	6965	11	Engine Anomaly	Central UA ground impact point below flight path
809	45	1017	Thursday	11:22:29	6043	3685	537.47	24764	24764	0	6191	6191	0	24764	6191	6	Engine Out	UA approaches Emergency landing site
817	77	3182	Friday	15:19:54	7999	1526	933.17	23990	23990	0	6965	6965	0	23990	6965	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
830	101	2888	Thursday	18:14:04	6873	2112	1223.47	23525	23525	0	7430	7430	0	23525	7430	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
832	101	2797	Saturday	18:13:53	6480	2349	1223.17	24299	24299	0	6656	6656	0	24299	6656	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
834	105	3359	Monday	18:44:09	8481	1348	1273.61	21978	21978	0	8977	8977	0	21978	8977	25	Generator Failure	UA approaches Emergency landing site
843	64	210	Wednesday	13:39:13	8723	1599	765.36	23990	23990	0	6965	6965	0	23990	6965	22	Generator Failure	UA approaches Emergency landing site
849	78	1081	Tuesday	15:22:55	5767	3850	938.22	24299	24299	20	6656	6656	1	24299	6656	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
852	108	2331	Friday	19:03:56	4608	3673	1306.56	28014	28014	7	2941	2941	1	28014	2941	18	Engine Fire	UA structural desintegration - Debris Impact
860	38	2143	Saturday	10:33:47	4104	4129	456.31	21823	21823	0	9132	9132	0	21823	9132	28	Generator Failure	UA ground impact tangential to trajectory
870	25	2755	Tuesday	09:00:21	6296	2464	300.58	26311	26311	0	4644	4644	0	26311	4644	12	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
898	28	2591	Tuesday	09:21:51	5589	2934	336.44	26311	26311	0	4644	4644	0	26311	4644	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
90	94	3091	Saturday	17:23:31	7685	1672	1139.20	24299	24299	1	6656	6656	2	24299	6656	18	Engine Fire	UA structural desintegration - Debris Impact
909	54	1252	Saturday	12:28:30	5070	4234	647.50	21823	21823	0	9132	9132	0	21823	9132	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
913	58	3173	Wednesday	13:01:30	7970	1539	702.53	23990	23990	0	6965	6965	0	23990	6965	49	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
917	72	3559	Sunday	14:44:15	8776	1335	873.75	22906	22906	0	8049	8049	0	22906	8049	51	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
928	102	466	Thursday	18:16:27	8200	2138	1227.44	23525	23525	8	7430	7430	2	23525	7430	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
93	19	1986	Tuesday	08:15:06	3861	4418	225.17	26311	26311	0	4644	4644	0	26311	4644	62	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
931	51	2709	Sunday	12:09:36	6095	2593	616.00	22287	22287	0	8668	8668	0	22287	8668	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
934	32	3285	Wednesday	09:52:23	8302	1404	387.33	25847	25847	0	5108	5108	0	25847	5108	35	Connection Failure	UA ground impact tangential to trajectory
940	69	896	Tuesday	14:17:00	6572	3350	828.36	24299	24299	0	6656	6656	0	24299	6656	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
944	24	3092	Saturday	08:53:45	7689	1671	289.58	25692	25692	0	5263	5263	0	25692	5263	17	Engine Fire	Central UA ground impact point below flight path
966	7	439	Sunday	06:44:34	8275	2071	74.30	29562	29562	5	1393	1393	0	29562	1393	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
979	110	3370	Saturday	19:20:36	8504	1342	1334.33	28014	28014	0	2941	2941	0	28014	2941	70	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate

O.R.C.U.S. 02.00 - tTest of the Simulation

nProbes	1400
nEvents	186
nEvents_cor	176
tMission	14
x_cross_ATB	0.2121429
x_cross_OTW	0.0471429
x_cross_TOT	0.2592857
s2ATB	0.0581103
sATB	0.2410608
tATB	31.375873
s2OTW	0.0026503
sOTW	0.051481
tOTW	26.99558
s2TOT	0.0801858
sTOT	0.2831711
tTOT	32.939162

UADay/Prot	HIT_TOT_ATB	HIT_TOT_OTW	UADay/Prot cor	HIT_TOT_mean_ATB	HIT_TOT_mean_OTW	HIT_TOT_mean_ATB/Fh	HIT_TOT_mean_OTW/Fh	x_i-x_cross ATB	x_i-x_cross OTW	(x_i-x_cross ATB)^2	(x_i-x_cross OTW)^2
53	0	0	53	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
54	1	0	54	1	0	0.071428571	0	-0.140714286	-0.047142857	0.01980051	0.002222449
56	0	0	56	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
58	0	3	58	0	3	0	0.214285714	-0.212142857	0.167142857	0.045004592	0.027936735
59	5	1	59	5	1	0.357142857	0.071428571	0.145	0.024285714	0.021025	0.000589796
63	0	0	63	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
70	0	0	70	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
76	1	0	76	1	0	0.071428571	0	-0.140714286	-0.047142857	0.01980051	0.002222449
90	1	2	90	1	2	0.071428571	0.142857143	-0.140714286	0.095714286	0.01980051	0.009161224
93	0	0	93	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
102	0	6	102	0	6	0	0.428571429	-0.212142857	0.381428571	0.045004592	0.145487755
104	9	0	104	9	0	0.642857143	0	0.430714286	-0.047142857	0.185514796	0.002222449
110	2	0	110	2	0	0.142857143	0	-0.069285714	-0.047142857	0.00480051	0.002222449
120	1	0	120	1	0	0.071428571	0	-0.140714286	-0.047142857	0.01980051	0.002222449
136	0	0	136	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
149	0	2	149	0	2	0	0.142857143	-0.212142857	0.095714286	0.045004592	0.009161224
155	0	0	155	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
181	0	0	181	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
183	0	0	183	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
198	0	0	198	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
212	12	0	212	12	0	0.857142857	0	0.645	-0.047142857	0.416025	0.002222449
215	0	0	215	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
218	0	0	218	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
240	0	0	240	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
250	45	0	250	45	0	3.214285714	0	3.002142857	-0.047142857	9.012861735	0.002222449
250	0	0	256	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
256	0	0	269	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
269	0	0	279	2	1	0.142857143	0.071428571	-0.069285714	0.024285714	0.00480051	0.000589796
279	2	1	284	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
284	0	0	285	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
285	0	0	291	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
291	0	0	303	1	0	0.071428571	0	-0.140714286	-0.047142857	0.01980051	0.002222449
303	1	0	313	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
313	0	0	327	10	0	0.714285714	0	0.502142857	-0.047142857	0.252147449	0.002222449
327	10	0	330	24	0	1.714285714	0	1.502142857	-0.047142857	2.256433163	0.002222449
330	24	0	341	0	1	0	0.071428571	-0.212142857	0.024285714	0.045004592	0.000589796
330	0	0	344	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
341	0	1	369	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
344	0	0	372	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
369	0	0	377	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
372	0	0	382	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
377	0	0	391	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
382	0	0	398	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
391	0	0	399	1	0	0.071428571	0	-0.140714286	-0.047142857	0.01980051	0.002222449
398	0	0	409	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
399	1	0	415	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
409	0	0	433	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
415	0	0	447	1	0	0.071428571	0	-0.140714286	-0.047142857	0.01980051	0.002222449
433	0	0	448	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
447	1	0	451	0	1	0	0.071428571	-0.212142857	0.024285714	0.045004592	0.000589796
448	0	0	452	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
451	0	1	455	0	1	0	0.071428571	-0.212142857	0.024285714	0.045004592	0.000589796
452	0	0	459	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
455	0	1	465	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
459	0	0	471	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
465	0	0	473	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
471	0	0	482	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
473	0	0	483	9	1	0.642857143	0.071428571	0.430714286	0.024285714	0.185514796	0.000589796
482	0	0	486	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
483	9	1	495	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
486	0	0	499	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
495	0	0	506	5	2	0.357142857	0.142857143	0.145	0.095714286	0.021025	0.009161224
499	0	0	515	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
506	5	2	517	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
515	0	0	532	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
517	0	0	535	6	7	0.428571429	0.5	0.216428571	0.452857143	0.046841327	0.205079592
532	0	0	540	0	1	0	0.071428571	-0.212142857	0.024285714	0.045004592	0.000589796
535	6	7	543	5	4	0.357142857	0.285714286	0.145	0.238571429	0.021025	0.056916327
540	0	1	551	2	1	0.142857143	0.071428571	-0.069285714	0.024285714	0.00480051	0.000589796
543	5	4	553	0	2	0	0.142857143	-0.212142857	0.095714286	0.045004592	0.009161224
551	2	1	569	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
553	0	2	581	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
569	0	0	594	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
581	0	0	596	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
594	0	0	609	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
596	0	0	622	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
609	0	0	626	1	0	0.071428571	0	-0.140714286	-0.047142857	0.01980051	0.002222449
622	0	0	636	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
626	1	0	637	1	3	0.071428571	0.214285714	-0.140714286	0.167142857	0.01980051	0.027936735
636	0	0	641	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
637	1	3	648	1	0	0.071428571	0	-0.140714286	-0.047142857	0.01980051	0.002222449
641	0	0	653	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
648	1	0	659	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
648	0	0	662	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
653	0	0	668	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
659	0	0	676	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
662	0	0	682	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
668	0	0	694	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
676	0	0	697	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
682	0	0	704	6	0	0.428571429	0	0.216428571	-0.047142857	0.046841327	0.002222449
694	0	0	709	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
697	0	0	714	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
704	6	0	715	6	2	0.428571429	0.142857143	0.216428571	0.095714286	0.046841327	0.009161224
709	0	0	719	2	1	0.142857143	0.071428571	-0.069285714	0.024285714	0.00480051	0.000589796
714	0	0	723	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
715	6	2	724	19	3	1.357142857	0.214285714	1.145	0.167142857	1.311025	0.027936735
719	2	1	728	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
723	0	0	732	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
723	0	0	740	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
724	19	3	753	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
728	0	0	759	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
732	0	0	773	13	3	0.928571429	0.214285714	0.716428571	0.167142857	0.513269898	0.027936735
740	0	0	779	1	0	0.071428571	0	-0.140714286	-0.047142857	0.01980051	0.002222449
753	0	0	782	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
759	0	0	783	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
773	13	3	784	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
779	1	0	789	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
782	0	0	793	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
783	0	0	808	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
783	0	0	809	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
784	0	0	817	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
789	0	0	830	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
789	0	0	832	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
793	0	0	834	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
808	0	0	843	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
809	0	0	849	20	1	1.428571429	0.071428571	1.216428571	0.024285714	1.479698469	0.000589796
817	0	0	852	7	1	0.5	0.071428571	0.287857143	0.024285714	0.082861735	0.000589796
830	0	0	860	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
832	0	0	870	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
834	0	0	898	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
843	0	0	909	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
849	20	1	913	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
852	7	1	917	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
860	0	0	928	8	2	0.571428571	0.142857143	0.359285714	0.095714286	0.129086224	0.009161224
870	0	0	931	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
898	0	0	934	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
909	0	0	940	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
913	0	0	944	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
917	0	0	966	5	0	0.357142857	0	0.145	-0.047142857	0.021025	0.002222449
928	8	2	979	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
931	0	0	1008	0	1	0	0.071428571	-0.212142857	0.024285714	0.045004592	0.000589796
934	0	0	1014	1	2	0.071428571	0.142857143	-0.140714286	0.095714286	0.01980051	0.009161224
940	0	0	1016	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
944	0	0	1022	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
966	5	0	1030	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
979	0	0	1035	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
1008	0	1	1044	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
1014	1	2	1058	27	1	1.928571429	0.071428571	1.716428571	0.024285714	2.946127041	0.000589796
1014	0	0	1063	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
1016	0	0	1064	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
1022	0	0	1070	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
1030	0	0	1091	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
1035	0	0	1093	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
1044	0	0	1094	2	0	0.142857143	0	-0.069285714	-0.047142857	0.00480051	0.002222449
1058	27	1	1098	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
1063	0	0	1104	9	2	0.642857143	0.142857143	0.430714286	0.095714286	0.185514796	0.009161224
1064	0	0	1123	0	3	0	0.214285714	-0.212142857	0.167142857	0.045004592	0.027936735
1070	0	0	1126	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
1091	0	0	1127	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
1093	0	0	1129	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
1094	2	0	1143	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
1098	0	0	1154	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
1104	0	0	1180	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
1104	9	2	1181	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
1123	0	3	1184	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
1126	0	0	1187	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
1127	0	0	1202	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
1129	0	0	1225	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
1143	0	0	1228	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
1154	0	0	1243	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
1180	0	0	1249	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
1181	0	0	1255	4	0	0.285714286	0	0.073571429	-0.047142857	0.005412755	0.002222449
1184	0	0	1265	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
1187	0	0	1291	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
1202	0	0	1300	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
1225	0	0	1301	8	2	0.571428571	0.142857143	0.359285714	0.095714286	0.129086224	0.009161224
1228	0	0	1307	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
1243	0	0	1310	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
1249	0	0	1315	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
1255	4	0	1324	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
1255	0	0	1344	13	0	0.928571429	0	0.716428571	-0.047142857	0.513269898	0.002222449
1265	0	0	1366	0	3	0	0.214285714	-0.212142857	0.167142857	0.045004592	0.027936735
1291	0	0	1371	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
1300	0	0	1388	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
1301	8	2	1390	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
1307	0	0	1392	0	0	0	0	-0.212142857	-0.047142857	0.045004592	0.002222449
1310	0	0									
1315	0	0									
1315	0	0									
1324	0	0									
1344	13	0									
1366	0	3									
1371	0	0									
1388	0	0									
1390	0	0									
1392	0	0									

11.4.10.2 Aalen – C3 – Phase 2

O.R.C.U.S. 02.00 - Simulation Summary

UA Parameters

MTOW [kg]	Wingspan [m	Length [m]	L/D
90	5	4	8

v [km/h]	Alt [m]	CCF [m]
100	100	12137.353

P_CumCat [1/Fh]	Engine [%]	ESys [%]	FCS [%]	NavSys [%]	Struct [%]
0.01	20	20	20	20	20

General map parameters

	Name	Area [km2]	PPL	PPL/km2
City	Aalen, Stadt	146.58	67849	463
County	Ostalbkreis	1511.39	312422	207
FS	BW	35748.3	11023425	308

Mission specific map parameters

	Area [km2]	PPL	Tourists	Total PPL
City	66.8555	30955	0	30955
Map total	66.8555	30955	0	30955

PPL MOD NA

Sim FH [Fh]	19600	Ev/Fh [1/Fh]	0.01020408
Events total	200		

Hits due to UA impacts		Hits/Fh [1/Fh]
City ATB	406	0.0207143
City OTW	90	0.0045918
Total	496	0.0253061

Prot	cyc	k_UA	Day	Time of impact	UA X Pos	UA Y Pos	Travelled Distance [km]	PPL_TD_CITY_ATB	PPL_CITY_ATB_COUNT	HIT_CITY_ATB_COUNT	PPL_TD_CITY_OTW	PPL_CITY_OTW_COUNT	HIT_CITY_OTW_COUNT	PPL_ALL_ATB_COUNT	PPL_ALL_OTW_COUNT	E	Case	Outcome
1021	55	1227	Saturday	12:35:43	5167	4184	659.55	21823	21823	5	9132	9132	6	21823	9132	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
1023	60	1263	Monday	13:12:13	5029	4256	720.36	23835	23835	0	7120	7120	0	23835	7120	49	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
1024	81	1973	Tuesday	15:46:35	3849	4438	977.64	24299	24299	0	6656	6656	0	24299	6656	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1049	44	745	Saturday	11:14:39	7212	2912	524.42	21823	21823	3	9132	9132	2	21823	9132	21	Engine Fire	UA structural desintegration - Debris Impact
107	39	1583	Tuesday	10:39:56	4079	4644	466.56	25228	25228	0	5727	5727	0	25228	5727	68	Degradation of lateral and horizontal navigation data accurracy.	UA approaches Emergency landing site
1079	6	2606	Monday	06:41:41	5652	2890	69.47	27085	27085	0	3870	3870	0	27085	3870	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1083	7	2038	Friday	06:47:49	3922	4334	79.70	27395	27395	0	3560	3560	0	27395	3560	2	Engine Out	UA approaches Emergency landing site
1090	25	250	Friday	08:55:17	8671	1668	292.14	27240	27240	0	3715	3715	0	27240	3715	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1095	1	3172	Wednesday	06:06:24	7966	1540	10.69	27240	27240	0	3715	3715	0	27240	3715	2	Engine Out	UA approaches Emergency landing site
1106	41	1584	Sunday	10:54:30	4077	4644	490.83	22287	22287	0	8668	8668	0	22287	8668	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
1106	59	1847	Sunday	13:06:06	3798	4586	710.19	22906	22906	0	8049	8049	1	22906	8049	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1107	115	2145	Monday	19:54:32	4108	4125	1390.89	28169	28169	0	2786	2786	0	28169	2786	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1114	49	2807	Monday	11:55:14	6523	2322	592.06	25228	25228	0	5727	5727	0	25228	5727	75	Degradation of altitude	UA approaches Emergency landing site
1116	78	1510	Wednesday	15:23:48	4244	4598	939.67	23990	23990	0	6965	6965	0	23990	6965	68	Degradation of lateral and horizontal navigation data accurracy.	UA approaches Emergency landing site
1119	92	3370	Saturday	17:09:30	8504	1342	1115.86	24299	24299	0	6656	6656	0	24299	6656	50	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
1120	35	633	Sunday	10:08:52	7649	2588	414.80	22287	22287	6	8668	8668	2	22287	8668	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1126	108	3278	Saturday	19:05:50	8283	1411	1309.75	28014	28014	0	2941	2941	0	28014	2941	23	Generator Failure	Central UA ground impact point below flight path
1126	70	1449	Saturday	14:25:25	4407	4539	842.36	23835	23835	0	7120	7120	0	23835	7120	37	Short Circuit / Overload	Central UA ground impact point below flight path
113	24	3207	Monday	08:53:58	8078	1492	289.97	25692	25692	0	5263	5263	0	25692	5263	19	Engine Fire	Central UA ground impact point below flight path
1146	8	1371	Friday	06:53:45	4647	4439	89.58	27395	27395	0	3560	3560	0	27395	3560	71	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate
1163	39	2901	Monday	10:42:36	6928	2080	471.00	25228	25228	7	5727	5727	0	25228	5727	21	Engine Fire	UA structural desintegration - Debris Impact
1166	66	994	Thursday	13:55:22	6143	3623	792.28	24609	24609	0	6346	6346	0	24609	6346	67	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate
1172	59	3363	Wednesday	13:09:10	8489	1346	715.30	23990	23990	0	6965	6965	0	23990	6965	65	Degradation of lateral and horizontal navigation data accurracy.	UA approaches Emergency landing site
1177	44	1552	Monday	11:16:16	4145	4628	527.14	25228	25228	0	5727	5727	0	25228	5727	39	Short Circuit / Overload	Central UA ground impact point below flight path
1182	44	3398	Saturday	11:20:01	8560	1330	533.36	21823	21823	0	9132	9132	0	21823	9132	71	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate
1186	88	1564	Wednesday	16:36:44	4118	4634	1061.22	22906	22906	0	8049	8049	0	22906	8049	67	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate
1187	76	1262	Thursday	15:08:44	5032	4254	914.56	24609	24609	0	6346	6346	0	24609	6346	24	Generator Failure	UA ground impact tangential to trajectory
1196	32	978	Saturday	09:47:43	6213	3580	379.56	25692	25692	11	5263	5263	2	25692	5263	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1198	26	118	Monday	09:02:17	8798	1468	303.83	25692	25692	0	5263	5263	3	25692	5263	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
1229	22	553	Thursday	08:34:02	7930	2366	256.75	26311	26311	0	4644	4644	0	26311	4644	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
1235	14	3475	Wednesday	07:41:42	8687	1316	169.50	27240	27240	0	3715	3715	0	27240	3715	14	Engine Anomaly	Central UA ground impact point below flight path
1244	9	2582	Friday	07:03:28	5551	2960	105.80	27395	27395	2	3560	3560	4	27395	3560	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1249	62	2747	Wednesday	13:29:47	6261	2486	749.64	23990	23990	1	6965	6965	1	23990	6965	12	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
128	79	2071	Tuesday	15:32:13	3971	4274	953.70	24299	24299	0	6656	6656	0	24299	6656	22	Generator Failure	UA approaches Emergency landing site
128	91	1458	Tuesday	16:58:21	4382	4549	1097.28	23216	23216	0	7739	7739	0	23216	7739	5	Engine Out	No Ground Effect
1287	84	1430	Saturday	16:07:19	4462	4517	1012.22	24299	24299	9	6656	6656	1	24299	6656	18	Engine Fire	UA structural desintegration - Debris Impact
1293	80	1577	Friday	15:38:30	4091	4641	964.17	23990	23990	27	6965	6965	2	23990	6965	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
1297	44	341	Tuesday	11:13:50	8511	1847	523.06	25228	25228	0	5727	5727	0	25228	5727	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1300	81	1915	Friday	15:46:28	3811	4515	977.44	23990	23990	0	6965	6965	0	23990	6965	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1302	13	2041	Sunday	07:31:31	3926	4328	152.53	29562	29562	0	1393	1393	0	29562	1393	28	Generator Failure	UA ground impact tangential to trajectory
1309	20	3280	Sunday	08:25:00	8289	1409	241.67	27085	27085	0	3870	3870	3	27085	3870	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1310	12	1834	Monday	07:23:48	3800	4597	139.69	27085	27085	0	3870	3870	0	27085	3870	72	Degradation of altitude	UA approaches Emergency landing site
1312	65	293	Wednesday	13:46:40	8603	1748	777.78	23990	23990	0	6965	6965	0	23990	6965	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
1325	39	2143	Tuesday	10:41:04	4104	4129	468.44	25228	25228	0	5727	5727	0	25228	5727	29	Connection Failure	UA approaches Emergency landing site
1329	78	3438	Saturday	15:27:42	8631	1319	946.17	23835	23835	0	7120	7120	0	23835	7120	17	Engine Fire	Central UA ground impact point below flight path
1333	97	1889	Wednesday	17:42:55	3802	4545	1171.55	22906	22906	0	8049	8049	0	22906	8049	28	Generator Failure	UA ground impact tangential to trajectory
1334	59	710	Thursday	13:03:48	7353	2810	706.36	24609	24609	0	6346	6346	0	24609	6346	29	Connection Failure	UA approaches Emergency landing site
1337	42	2976	Sunday	11:04:35	7240	1905	507.67	22287	22287	0	8668	8668	0	22287	8668	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
134	12	508	Monday	07:21:08	8075	2246	135.22	27085	27085	0	3870	3870	0	27085	3870	35	Connection Failure	UA ground impact tangential to trajectory
135	44	456	Tuesday	11:14:03	8229	2113	523.44	25228	25228	0	5727	5727	0	25228	5727	35	Connection Failure	UA ground impact tangential to trajectory
1350	103	549	Saturday	18:23:54	7943	2355	1239.86	24299	24299	0	6656	6656	0	24299	6656	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1363	72	1804	Friday	14:40:42	3808	4620	867.83	23990	23990	0	6965	6965	2	23990	6965	18	Engine Fire	UA structural desintegration - Debris Impact
1371	6	2227	Saturday	06:40:55	4303	3938	68.20	29871	29871	0	1084	1084	0	29871	1084	11	Engine Anomaly	Central UA ground impact point below flight path
1378	20	1500	Saturday	08:21:24	4269	4589	235.67	25692	25692	1	5263	5263	0	25692	5263	17	Engine Fire	Central UA ground impact point below flight path
1378	82	259	Saturday	15:50:23	8658	1684	984.00	23835	23835	0	7120	7120	0	23835	7120	28	Generator Failure	UA ground impact tangential to trajectory
1390	111	1245	Thursday	19:23:35	5097	4221	1339.31	28169	28169	0	2786	2786	0	28169	2786	23	Generator Failure	Central UA ground impact point below flight path
1390	9	951	Thursday	07:00:10	6331	3505	100.31	26930	26930	0	4025	4025	0	26930	4025	26	Generator Failure	Central UA ground impact point below flight path
1396	110	3568	Wednesday	19:21:00	8782	1340	1335.00	28014	28014	0	2941	2941	0	28014	2941	25	Generator Failure	UA approaches Emergency landing site
140	56	997	Sunday	12:42:32	6130	3631	670.92	22287	22287	0	8668	8668	0	22287	8668	71	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate
144	7	2606	Thursday	06:48:57	5652	2890	81.61	26930	26930	0	4025	4025	0	26930	4025	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
151	77	1781	Thursday	15:17:03	3820	4634	928.44	24609	24609	0	6346	6346	0	24609	6346	71	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate
159	14	1390	Friday	07:37:28	4585	4466	162.47	27395	27395	17	3560	3560	2	27395	3560	21	Engine Fire	UA structural desintegration - Debris Impact
173	25	2837	Friday	09:00:31	6654	2243	300.86	27240	27240	0	3715	3715	0	27240	3715	75	Degradation of altitude	UA approaches Emergency landing site
173	81	1800	Friday	15:46:14	3810	4622	977.06	23990	23990	0	6965	6965	0	23990	6965	35	Connection Failure	UA ground impact tangential to trajectory
176	105	1918	Monday	18:41:15	3812	4512	1268.75	21978	21978	0	8977	8977	0	21978	8977	20	Engine Fire	UA structural desintegration - Debris Impact
177	26	94	Tuesday	09:02:15	8807	1440	303.75	26311	26311	0	4644	4644	0	26311	4644	53	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
179	101	1529	Thursday	18:11:20	4197	4612	1218.89	23525	23525	0	7430	7430	0	23525	7430	27	Generator Failure	UA ground impact tangential to trajectory
182	5	2680	Sunday	06:34:33	5969	2676	57.58	29562	29562	0	1393	1393	0	29562	1393	68	Degradation of lateral and horizontal navigation data accurracy.	UA approaches Emergency landing site
185	19	1615	Wednesday	08:14:21	4018	4656	223.92	25847	25847	0	5108	5108	0	25847	5108	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
185	39	2217	Wednesday	10:41:12	4276	3962	468.69	24609	24609	0	6346	6346	0	24609	6346	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
188	93	190	Saturday	17:10:21	8745	1568	1117.28	24299	24299	0	6656	6656	0	24299	6656	75	Degradation of altitude	UA approaches Emergency landing site
20	95	2696	Saturday	17:30:00	6038	2630	1150.00	24299	24299	4	6656	6656	1	24299	6656	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
200	30	2452	Thursday	09:36:09	5032	3337	360.25	26311	26311	4	4644	4644	0	26311	4644	21	Engine Fire	UA structural desintegration - Debris Impact
204	41	2918	Monday	10:57:11	7000	2039	495.33	25228	25228	0	5727	5727	0	25228	5727	28	Generator Failure	UA ground impact tangential to trajectory
205	102	647	Tuesday	18:16:49	7596	2628	1228.05	23216	23216	0	7739	7739	0	23216	7739	47	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
228	51	501	Thursday	12:05:08	8096	2228	608.56	24764	24764	0	6191	6191	0	24764	6191	73	Degradation of altitude	Central UA ground impact point below flight path
232	89	3566	Monday	16:48:03	8781	1339	1080.11	21978	21978	2	8977	8977	6	21978	8977	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
235	19	3394	Thursday	08:17:56	8553	1331	229.92	26311	26311	0	4644	4644	0	26311	4644	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
24	21	2588	Wednesday	08:30:53	5576	2943	251.47	25847	25847	3	5108	5108	4	25847	5108	18	Engine Fire	UA structural desintegration - Debris Impact
258	81	1577	Saturday	15:45:46	4091	4641	976.31	23835	23835	0	7120	7120	0	23835	7120	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
261	51	1366	Tuesday	12:06:53	4663	4431	611.47	25228	25228	0	5727	5727	0	25228	5727	51	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
269	113	2111	Wednesday	19:39:54	4040	4196	1366.50	28014	28014	0	2941	2941	0	28014	2941	14	Engine Anomaly	Central UA ground impact point below flight path
272	66	3416	Saturday	14:00:16	8594	1324	800.44	23835	23835	0	7120	7120	0	23835	7120	38	Short Circuit / Overload	Central UA ground impact point below flight path
273	19	1508	Sunday	08:14:08	4249	4596	223.56	27085	27085	0	3870	3870	0	27085	3870	65	Degradation of lateral and horizontal navigation data accurracy.	UA approaches Emergency landing site
275	79	967	Tuesday	15:29:59	6261	3549	949.97	24299	24299	11	6656	6656	7	24299	6656	21	Engine Fire	UA structural desintegration - Debris Impact
283	100	1693	Wednesday	18:04:23	3900	4663	1207.31	22906	22906	1	8049	8049	0	22906	8049	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
297	74	1434	Wednesday	14:54:31	4451	4522	890.86	23990	23990	0	6965	6965	0	23990	6965	74	Degradation of altitude	Central UA ground impact point below flight path
298	115	1453	Thursday	19:53:08	4396	4543	1388.56	28169	28169	0	2786	2786	0	28169	2786	42	Partial Lock of Flight Control Surfaces	Central UA ground impact point below flight path
299	12	2584	Friday	07:25:20	5559	2954	142.22	27395	27395	4	3560	3560	1	27395	3560	21	Engine Fire	UA structural desintegration - Debris Impact
31	40	3107	Wednesday	10:50:17	7743	1644	483.83	24609	24609	0	6346	6346	0	24609	6346	67	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate
311	108	1400	Wednesday	19:02:03	4554	4479	1303.42	28014	28014	0	2941	2941	0	28014	2941	77	Degradation of altitude	Central UA ground impact point below flight path
315	50	2511	Sunday	12:01:55	5261	3167	603.20	22287	22287	0	8668	8668	0	22287	8668	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
316	47	1100	Monday	11:37:12	5686	3897	562.03	25228	25228	0	5727	5727	0	25228	5727	72	Degradation of altitude	UA approaches Emergency landing site
321	2	2695	Saturday	06:12:44	6034	2633	21.22	29871	29871	6	1084	1084	1	29871	1084	21	Engine Fire	UA structural desintegration - Debris Impact
327	60	1650	Friday	13:13:00	3960	4663	721.67	23990	23990	0	6965	6965	0	23990	6965	22	Generator Failure	UA approaches Emergency landing site
328	41	2778	Saturday	10:56:54	6397	2400	494.86	21823	21823	0	9132	9132	0	21823	9132	10	Engine Anomaly	UA approaches Emergency landing site
329	25	934	Sunday	08:56:40	6406	3458	294.45	27085	27085	0	3870	3870	0	27085	3870	73	Degradation of altitude	Central UA ground impact point below flight path
330	76	3214	Monday	15:12:40	8099	1483	921.14	23835	23835	0	7120	7120	0	23835	7120	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
339	57	1855	Wednesday	12:51:34	3798	4579	685.95	24609	24609	0	6346	6346	0	24609	6346	73	Degradation of altitude	Central UA ground impact point below flight path
342	25	2376	Saturday	08:59:35	4758	3551	299.31	25692	25692	0	5263	5263	0	25692	5263	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
345	37	1302	Tuesday	10:24:48	4885	4327	441.33	25228	25228	0	5727	5727	0	25228	5727	72	Degradation of altitude	UA approaches Emergency landing site
354	46	3366	Thursday	11:34:31	8496	1344	557.53	24764	24764	0	6191	6191	0	24764	6191	24	Generator Failure	UA ground impact tangential to trajectory
360	103	1908	Wednesday	18:26:39	3808	4524	1244.44	22906	22906	0	8049	8049	0	22906	8049	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
372	97	2268	Monday	17:43:41	4416	3837	1172.83	21978	21978	3	8977	8977	1	21978	8977	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
382	1	148	Thursday	06:00:17	8781	1507	0.50	26930	26930	0	4025	4025	0	26930	4025	22	Generator Failure	UA approaches Emergency landing site
384	102	2617	Saturday	18:20:49	5698	2858	1234.70	24299	24299	0	6656	6656	0	24299	6656	74	Degradation of altitude	Central UA ground impact point below flight path
392	39	3231	Sunday	10:43:16	8151	1462	472.11	22287	22287	0	8668	8668	0	22287	8668	5	Engine Out	No Ground Effect
398	12	2188	Saturday	07:24:31	4205	4029	140.89	29871	29871	20	1084	1084	0	29871	1084	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
398	25	2343	Saturday	08:59:31	4647	3641	299.20	25692	25692	0	5263	5263	0	25692	5263	12	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
402	100	3250	Wednesday	18:07:31	8206	1440	1212.56	22906	22906	0	8049	8049	0	22906	8049	78	Degradation of altitude	Central UA ground impact point below flight path
404	83	573	Friday	15:58:19	7862	2421	997.19	23216	23216	0	7739	7739	0	23216	7739	51	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
418	54	2249	Friday	12:30:31	4362	3884	650.86	25383	25383	11	5572	5572	1	25383	5572	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
422	17	839	Tuesday	07:58:12	6818	3186	197.03	26311	26311	2	4644	4644	0	26311	4644	12	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
439	60	2326	Friday	13:14:22	4592	3686	723.95	23990	23990	4	6965	6965	7	23990	6965	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
442	42	2944	Monday	11:04:32	7109	1977	507.56	25228	25228	0	5727	5727	0	25228	5727	6	Engine Out	UA approaches Emergency landing site
455	105	2519	Sunday	18:42:27	5293	3144	1270.78	22906	22906	8	8049	8049	3	22906	8049	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
458	5	999	Wednesday	06:31:09	6121	3637	51.92	27240	27240	0	3715	3715	0	27240	3715	1	Engine Out	No Ground Effect
474	96	1757	Friday	17:35:23	3836	4645	1158.97	23216	23216	0	7739	7739	0	23216	7739	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
482	59	883	Saturday	13:04:09	6628	3313	706.94	23835	23835	0	7120	7120	0	23835	7120	73	Degradation of altitude	Central UA ground impact point below flight path
499	113	636	Tuesday	19:36:55	7637	2597	1361.53	28633	28633	0	2322	2322	0	28633	2322	19	Engine Fire	Central UA ground impact point below flight path
500	114	2375	Wednesday	19:47:43	4754	3554	1379.53	28014	28014	0	2941	2941	0	28014	2941	36	Short Circuit / Overload	Central UA ground impact point below flight path
505	74	3378	Monday	14:58:26	8521	1338	897.42	23835	23835	0	7120	7120	1	23835	7120	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
509	101	2451	Friday	18:13:11	5029	3340	1222.00	23216	23216	4	7739	7739	5	23216	7739	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
511	42	2729	Sunday	11:04:05	6182	2536	506.83	22287	22287	0	8668	8668	0	22287	8668	73	Degradation of altitude	Central UA ground impact point below flight path
513	109	2241	Tuesday	19:11:02	4340	3904	1318.39	28633	28633	0	2322	2322	0	28633	2322	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
52	9	2475	Wednesday	07:03:15	5120	3271	105.44	27240	27240	10	3715	3715	0	27240	3715	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
521	107	1284	Wednesday	18:54:31	4950	4295	1290.89	22906	22906	0	8049	8049	0	22906	8049	17	Engine Fire	Central UA ground impact point below flight path
539	18	1384	Sunday	08:06:36	4605	4457	211.00	27085	27085	0	3870	3870	0	27085	3870	50	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
558	101	1685	Friday	18:11:38	3910	4664	1219.42	23216	23216	1	7739	7739	0	23216	7739	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
573	103	2872	Saturday	18:28:36	6805	2152	1247.69	24299	24299	0	6656	6656	0	24299	6656	67	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate
577	32	47	Wednesday	09:45:50	8812	1394	376.42	25847	25847	3	5108	5108	2	25847	5108	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
590	34	2849	Tuesday	10:06:04	6706	2211	410.14	25228	25228	0	5727	5727	0	25228	5727	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
591	86	2955	Wednesday	16:24:58	7154	1952	1041.64	22906	22906	0	8049	8049	0	22906	8049	65	Degradation of lateral and horizontal navigation data accurracy.	UA approaches Emergency landing site
607	53	2916	Friday	12:24:35	6992	2044	640.97	25383	25383	19	5572	5572	0	25383	5572	21	Engine Fire	UA structural desintegration - Debris Impact
610	38	2909	Monday	10:35:20	6962	2061	458.89	25228	25228	0	5727	5727	0	25228	5727	58	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
627	64	177	Thursday	13:39:09	8758	1548	765.25	24609	24609	0	6346	6346	0	24609	6346	38	Short Circuit / Overload	Central UA ground impact point below flight path
631	49	384	Monday	11:50:19	8415	1942	583.89	25228	25228	0	5727	5727	0	25228	5727	67	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate

637	10	3036	Sunday	07:11:40	7478	1777	119.47	29562	29562	0	1393	1393	0	29562	1393	10	Engine Anomaly	UA approaches Emergency landing site
65	113	3141	Tuesday	19:41:59	7862	1587	1369.97	28633	28633	0	2322	2322	0	28633	2322	74	Degradation of altitude	Central UA ground impact point below flight path
650	7	2672	Saturday	06:49:05	5934	2699	81.83	29871	29871	0	1084	1084	0	29871	1084	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
651	86	220	Sunday	16:19:27	8712	1616	1032.42	22906	22906	0	8049	8049	3	22906	8049	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
652	93	3329	Monday	17:16:42	8413	1368	1127.86	21978	21978	0	8977	8977	0	21978	8977	69	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
664	109	890	Saturday	19:08:18	6598	3333	1313.83	28014	28014	0	2941	2941	0	28014	2941	58	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
676	86	1176	Thursday	16:21:23	5370	4075	1035.64	23525	23525	34	7430	7430	0	23525	7430	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
685	74	585	Saturday	14:52:47	7821	2454	888.00	23835	23835	1	7120	7120	0	23835	7120	62	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
686	53	3402	Sunday	12:25:34	8568	1328	642.61	22287	22287	0	8668	8668	0	22287	8668	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
688	45	1684	Tuesday	11:23:49	3911	4664	539.72	25228	25228	13	5727	5727	2	25228	5727	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
695	60	1996	Tuesday	13:13:42	3871	4403	722.83	24299	24299	0	6656	6656	0	24299	6656	77	Degradation of altitude	Central UA ground impact point below flight path
70	92	2958	Sunday	17:08:40	7167	1945	1114.47	22906	22906	0	8049	8049	0	22906	8049	1	Engine Out	No Ground Effect
718	101	1545	Thursday	18:11:21	4160	4623	1218.94	23525	23525	1	7430	7430	0	23525	7430	42	Partial Lock of Flight Control Surfaces	Central UA ground impact point below flight path
720	88	3154	Saturday	16:39:57	7907	1567	1066.58	24299	24299	0	6656	6656	0	24299	6656	35	Connection Failure	UA ground impact tangential to trajectory
721	107	131	Sunday	18:52:12	8791	1484	1287.00	22906	22906	0	8049	8049	0	22906	8049	15	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
729	7	629	Monday	06:44:58	7663	2577	74.94	27085	27085	0	3870	3870	0	27085	3870	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
730	13	1505	Tuesday	07:30:26	4256	4594	150.72	27085	27085	0	3870	3870	0	27085	3870	24	Generator Failure	UA ground impact tangential to trajectory
730	8	2566	Tuesday	06:56:10	5484	3007	93.61	27085	27085	10	3870	3870	1	27085	3870	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
733	3	2983	Friday	06:20:35	7268	1889	34.33	27395	27395	0	3560	3560	0	27395	3560	75	Degradation of altitude	UA approaches Emergency landing site
733	89	3245	Friday	16:47:24	8192	1445	1079.03	23216	23216	0	7739	7739	3	23216	7739	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
737	35	675	Tuesday	10:08:58	7490	2709	414.95	25228	25228	0	5727	5727	0	25228	5727	19	Engine Fire	Central UA ground impact point below flight path
74	64	243	Thursday	13:39:17	8681	1655	765.47	24609	24609	0	6346	6346	0	24609	6346	28	Generator Failure	UA ground impact tangential to trajectory
742	24	1609	Sunday	08:50:45	4029	4654	284.58	27085	27085	1	3870	3870	0	27085	3870	52	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
742	85	3598	Sunday	16:19:00	8799	1356	1031.67	22906	22906	0	8049	8049	0	22906	8049	68	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
757	33	1217	Monday	09:55:29	5206	4164	392.50	25228	25228	1	5727	5727	0	25228	5727	40	Short Circuit / Overload	Central UA ground impact point below flight path
765	61	2713	Tuesday	13:22:25	6113	2582	737.39	24299	24299	0	6656	6656	0	24299	6656	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
772	107	1111	Tuesday	18:54:10	5639	3924	1290.31	23216	23216	23	7739	7739	0	23216	7739	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
778	62	2096	Monday	13:28:28	4013	4226	747.45	23835	23835	1	7120	7120	0	23835	7120	28	Generator Failure	UA ground impact tangential to trajectory
789	24	2408	Friday	08:52:21	4870	3462	287.28	27240	27240	1	3715	3715	0	27240	3715	19	Engine Fire	Central UA ground impact point below flight path
796	67	1661	Friday	14:03:59	3943	4664	806.67	23990	23990	0	6965	6965	0	23990	6965	53	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
796	76	2242	Friday	15:10:42	4343	3901	917.86	23990	23990	0	6965	6965	0	23990	6965	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
809	39	1031	Thursday	10:38:49	5982	3722	464.70	24764	24764	0	6191	6191	0	24764	6191	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
818	25	1782	Saturday	08:58:22	3819	4633	297.30	25692	25692	0	5263	5263	0	25692	5263	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
821	88	3459	Tuesday	16:40:34	8664	1316	1067.61	23216	23216	0	7739	7739	0	23216	7739	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
84	3	3297	Sunday	06:21:14	8333	1393	35.39	29562	29562	0	1393	1393	1	29562	1393	21	Engine Fire	UA structural desintegration - Debris Impact
851	52	1918	Thursday	12:15:16	3812	4512	625.47	24764	24764	0	6191	6191	0	24764	6191	66	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
860	49	2930	Saturday	11:55:28	7051	2010	592.47	21823	21823	0	9132	9132	0	21823	9132	22	Generator Failure	UA approaches Emergency landing site
869	106	2520	Monday	18:49:45	5297	3141	1282.92	21978	21978	1	8977	8977	0	21978	8977	4	Engine Out	Central ground impact point below flight path with B/G Ratio.
876	76	718	Monday	15:07:38	7321	2833	912.72	23835	23835	1	7120	7120	1	23835	7120	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
878	102	2757	Wednesday	18:21:06	6305	2458	1235.17	22906	22906	0	8049	8049	0	22906	8049	17	Engine Fire	Central UA ground impact point below flight path
883	94	1822	Monday	17:20:57	3802	4607	1134.92	21978	21978	0	8977	8977	4	21978	8977	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
889	49	2700	Sunday	11:55:01	6056	2619	591.70	22287	22287	0	8668	8668	0	22287	8668	69	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
889	78	2012	Sunday	15:24:48	3889	4377	941.36	22906	22906	0	8049	8049	0	22906	8049	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
9	16	378	Tuesday	07:50:00	8429	1928	183.33	27085	27085	8	3870	3870	0	27085	3870	63	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
90	95	1163	Saturday	17:26:53	5423	4046	1144.83	24299	24299	37	6656	6656	0	24299	6656	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
903	27	2203	Sunday	09:13:47	4241	3995	323.00	27085	27085	0	3870	3870	0	27085	3870	76	Degradation of altitude	Central UA ground impact point below flight path
904	39	3156	Monday	10:43:06	7913	1564	471.86	25228	25228	0	5727	5727	0	25228	5727	40	Short Circuit / Overload	Central UA ground impact point below flight path
905	56	3049	Tuesday	12:46:42	7528	1751	677.83	25228	25228	6	5727	5727	1	25228	5727	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
908	39	1228	Friday	10:39:12	5163	4186	465.36	25383	25383	7	5572	5572	3	25383	5572	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
927	26	1190	Wednesday	09:04:28	5313	4106	307.45	25847	25847	27	5108	5108	0	25847	5108	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
928	16	979	Thursday	07:51:12	6209	3582	185.36	26930	26930	0	4025	4025	0	26930	4025	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
931	81	3538	Sunday	15:49:44	8758	1327	982.92	22906	22906	0	8049	8049	0	22906	8049	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
933	35	2495	Tuesday	10:12:38	5198	3214	421.08	25228	25228	0	5727	5727	0	25228	5727	49	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
940	67	2189	Tuesday	14:05:04	4207	4027	808.45	24299	24299	0	6656	6656	0	24299	6656	44	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
943	54	2240	Friday	12:30:29	4337	3906	650.83	25383	25383	0	5572	5572	0	25383	5572	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
949	25	1815	Thursday	08:58:26	3804	4612	297.42	26311	26311	0	4644	4644	0	26311	4644	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
949	58	1006	Thursday	12:57:07	6091	3655	695.22	24609	24609	1	6346	6346	0	24609	6346	27	Generator Failure	UA ground impact tangential to trajectory
967	109	3040	Monday	19:12:39	7494	1769	1321.08	28169	28169	0	2786	2786	0	28169	2786	68	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
978	115	3191	Friday	19:56:39	8028	1513	1394.42	28014	28014	0	2941	2941	0	28014	2941	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
978	63	3200	Friday	13:37:58	8056	1501	763.30	23990	23990	0	6965	6965	0	23990	6965	72	Degradation of altitude	UA approaches Emergency landing site
98	84	2188	Sunday	16:08:51	4205	4029	1014.78	22906	22906	0	8049	8049	0	22906	8049	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
983	65	1553	Wednesday	13:49:12	4142	4628	782.03	23990	23990	23	6965	6965	0	23990	6965	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
998	29	3275	Thursday	09:30:31	8275	1414	350.89	26311	26311	0	4644	4644	0	26311	4644	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path

O.R.C.U.S. 02.00 - tTest of the Simulation

nProbes	200
nEvents	200
nEvents_cor	185
tMission	14
x_cross_ATB	2.03
x_cross_OTW	0.45
x_cross_TOT	2.48
s2ATB	3.7397764
sATB	1.9338502
tATB	14.772144
s2OTW	0.183212
sOTW	0.4280327
tOTW	14.537534
s2TOT	5.5197785
sTOT	2.3494209
tTOT	14.867951

UADay/Prot	HIT_TOT_ATB	HIT_TOT_OTW	UADay/Prot cor	HIT_TOT_mean_ATB	HIT_TOT_mean_OTW	HIT_TOT_mean_ATB/Fh	HIT_TOT_mean_OTW/Fh	x_i-x_cross ATB	x_i-x_cross OTW	(x_i-x_cross ATB)^2	(x_i-x_cross OTW)^2
9	8	0	9	8	0	0.571428571	0	-1.458571429	-0.45	2.127430612	0.2025
20	4	1	20	4	1	0.285714286	0.071428571	-1.744285714	-0.378571429	3.042532653	0.143316327
24	3	4	24	3	4	0.214285714	0.285714286	-1.815714286	-0.164285714	3.296818367	0.026989796
31	0	0	31	0	0	0	0	-2.03	-0.45	4.1209	0.2025
52	10	0	52	10	0	0.714285714	0	-1.315714286	-0.45	1.731104082	0.2025
65	0	0	65	0	0	0	0	-2.03	-0.45	4.1209	0.2025
70	0	0	70	0	0	0	0	-2.03	-0.45	4.1209	0.2025
74	0	0	74	0	0	0	0	-2.03	-0.45	4.1209	0.2025
84	0	1	84	0	1	0	0.071428571	-2.03	-0.378571429	4.1209	0.143316327
90	37	0	90	37	0	2.642857143	0	0.612857143	-0.45	0.375593878	0.2025
98	0	0	98	0	0	0	0	-2.03	-0.45	4.1209	0.2025
107	0	0	107	0	0	0	0	-2.03	-0.45	4.1209	0.2025
113	0	0	113	0	0	0	0	-2.03	-0.45	4.1209	0.2025
128	0	0	128	0	0	0	0	-2.03	-0.45	4.1209	0.2025
128	0	0	134	0	0	0	0	-2.03	-0.45	4.1209	0.2025
134	0	0	135	0	0	0	0	-2.03	-0.45	4.1209	0.2025
135	0	0	140	0	0	0	0	-2.03	-0.45	4.1209	0.2025
140	0	0	144	0	0	0	0	-2.03	-0.45	4.1209	0.2025
144	0	0	151	0	0	0	0	-2.03	-0.45	4.1209	0.2025
151	0	0	159	17	2	1.214285714	0.142857143	-0.815714286	-0.307142857	0.665389796	0.094336735
159	17	2	173	0	0	0	0	-2.03	-0.45	4.1209	0.2025
173	0	0	176	0	0	0	0	-2.03	-0.45	4.1209	0.2025
173	0	0	177	0	0	0	0	-2.03	-0.45	4.1209	0.2025
176	0	0	179	0	0	0	0	-2.03	-0.45	4.1209	0.2025
177	0	0	182	0	0	0	0	-2.03	-0.45	4.1209	0.2025
179	0	0	185	0	0	0	0	-2.03	-0.45	4.1209	0.2025
182	0	0	188	0	0	0	0	-2.03	-0.45	4.1209	0.2025
185	0	0	200	4	0	0.285714286	0	-1.744285714	-0.45	3.042532653	0.2025
185	0	0	204	0	0	0	0	-2.03	-0.45	4.1209	0.2025
188	0	0	205	0	0	0	0	-2.03	-0.45	4.1209	0.2025
200	4	0	228	0	0	0	0	-2.03	-0.45	4.1209	0.2025
204	0	0	232	2	6	0.142857143	0.428571429	-1.887142857	-0.021428571	3.561308163	0.000459184
205	0	0	235	0	0	0	0	-2.03	-0.45	4.1209	0.2025
228	0	0	258	0	0	0	0	-2.03	-0.45	4.1209	0.2025
232	2	6	261	0	0	0	0	-2.03	-0.45	4.1209	0.2025
235	0	0	269	0	0	0	0	-2.03	-0.45	4.1209	0.2025
258	0	0	272	0	0	0	0	-2.03	-0.45	4.1209	0.2025
261	0	0	273	0	0	0	0	-2.03	-0.45	4.1209	0.2025
269	0	0	275	11	7	0.785714286	0.5	-1.244285714	0.05	1.548246939	0.0025
272	0	0	283	1	0	0.071428571	0	-1.958571429	-0.45	3.836002041	0.2025
273	0	0	297	0	0	0	0	-2.03	-0.45	4.1209	0.2025
275	11	7	298	0	0	0	0	-2.03	-0.45	4.1209	0.2025
283	1	0	299	4	1	0.285714286	0.071428571	-1.744285714	-0.378571429	3.042532653	0.143316327
297	0	0	311	0	0	0	0	-2.03	-0.45	4.1209	0.2025
298	0	0	315	0	0	0	0	-2.03	-0.45	4.1209	0.2025
299	4	1	316	0	0	0	0	-2.03	-0.45	4.1209	0.2025
311	0	0	321	6	1	0.428571429	0.071428571	-1.601428571	-0.378571429	2.564573469	0.143316327
315	0	0	327	0	0	0	0	-2.03	-0.45	4.1209	0.2025
316	0	0	328	0	0	0	0	-2.03	-0.45	4.1209	0.2025
321	6	1	329	0	0	0	0	-2.03	-0.45	4.1209	0.2025
327	0	0	330	0	0	0	0	-2.03	-0.45	4.1209	0.2025
328	0	0	339	0	0	0	0	-2.03	-0.45	4.1209	0.2025
329	0	0	342	0	0	0	0	-2.03	-0.45	4.1209	0.2025
330	0	0	345	0	0	0	0	-2.03	-0.45	4.1209	0.2025
339	0	0	354	0	0	0	0	-2.03	-0.45	4.1209	0.2025
342	0	0	360	0	0	0	0	-2.03	-0.45	4.1209	0.2025
345	0	0	372	3	1	0.214285714	0.071428571	-1.815714286	-0.378571429	3.296818367	0.143316327
354	0	0	382	0	0	0	0	-2.03	-0.45	4.1209	0.2025
360	0	0	384	0	0	0	0	-2.03	-0.45	4.1209	0.2025
372	3	1	392	0	0	0	0	-2.03	-0.45	4.1209	0.2025
382	0	0	398	20	0	1.428571429	0	-0.601428571	-0.45	0.361716327	0.2025
384	0	0	402	0	0	0	0	-2.03	-0.45	4.1209	0.2025
392	0	0	404	0	0	0	0	-2.03	-0.45	4.1209	0.2025
398	20	0	418	11	1	0.785714286	0.071428571	-1.244285714	-0.378571429	1.548246939	0.143316327
398	0	0	422	2	0	0.142857143	0	-1.887142857	-0.45	3.561308163	0.2025
402	0	0	439	4	7	0.285714286	0.5	-1.744285714	0.05	3.042532653	0.0025
404	0	0	442	0	0	0	0	-2.03	-0.45	4.1209	0.2025
418	11	1	455	8	3	0.571428571	0.214285714	-1.458571429	-0.235714286	2.127430612	0.055561224
422	2	0	458	0	0	0	0	-2.03	-0.45	4.1209	0.2025
439	4	7	474	0	0	0	0	-2.03	-0.45	4.1209	0.2025
442	0	0	482	0	0	0	0	-2.03	-0.45	4.1209	0.2025
455	8	3	499	0	0	0	0	-2.03	-0.45	4.1209	0.2025
458	0	0	500	0	0	0	0	-2.03	-0.45	4.1209	0.2025
474	0	0	505	0	1	0	0.071428571	-2.03	-0.378571429	4.1209	0.143316327
482	0	0	509	4	5	0.285714286	0.357142857	-1.744285714	-0.092857143	3.042532653	0.008622449
499	0	0	511	0	0	0	0	-2.03	-0.45	4.1209	0.2025
500	0	0	513	0	0	0	0	-2.03	-0.45	4.1209	0.2025
505	0	1	521	0	0	0	0	-2.03	-0.45	4.1209	0.2025
509	4	5	539	0	0	0	0	-2.03	-0.45	4.1209	0.2025
511	0	0	558	1	0	0.071428571	0	-1.958571429	-0.45	3.836002041	0.2025
513	0	0	573	0	0	0	0	-2.03	-0.45	4.1209	0.2025
521	0	0	577	3	2	0.214285714	0.142857143	-1.815714286	-0.307142857	3.296818367	0.094336735
539	0	0	590	0	0	0	0	-2.03	-0.45	4.1209	0.2025
558	1	0	591	0	0	0	0	-2.03	-0.45	4.1209	0.2025
573	0	0	607	19	0	1.357142857	0	-0.672857143	-0.45	0.452736735	0.2025
577	3	2	610	0	0	0	0	-2.03	-0.45	4.1209	0.2025
590	0	0	627	0	0	0	0	-2.03	-0.45	4.1209	0.2025
591	0	0	631	0	0	0	0	-2.03	-0.45	4.1209	0.2025
607	19	0	637	0	0	0	0	-2.03	-0.45	4.1209	0.2025
610	0	0	650	0	0	0	0	-2.03	-0.45	4.1209	0.2025
627	0	0	651	0	3	0	0.214285714	-2.03	-0.235714286	4.1209	0.055561224
631	0	0	652	0	0	0	0	-2.03	-0.45	4.1209	0.2025
637	0	0	664	0	0	0	0	-2.03	-0.45	4.1209	0.2025
650	0	0	676	34	0	2.428571429	0	0.398571429	-0.45	0.158859184	0.2025
651	0	3	685	1	0	0.071428571	0	-1.958571429	-0.45	3.836002041	0.2025
652	0	0	686	0	0	0	0	-2.03	-0.45	4.1209	0.2025
664	0	0	688	13	2	0.928571429	0.142857143	-1.101428571	-0.307142857	1.213144898	0.094336735
676	34	0	695	0	0	0	0	-2.03	-0.45	4.1209	0.2025
685	1	0	718	1	0	0.071428571	0	-1.958571429	-0.45	3.836002041	0.2025
686	0	0	720	0	0	0	0	-2.03	-0.45	4.1209	0.2025
688	13	2	721	0	0	0	0	-2.03	-0.45	4.1209	0.2025
695	0	0	729	0	0	0	0	-2.03	-0.45	4.1209	0.2025
718	1	0	730	10	1	0.714285714	0.071428571	-1.315714286	-0.378571429	1.731104082	0.143316327
720	0	0	733	0	3	0	0.214285714	-2.03	-0.235714286	4.1209	0.055561224
721	0	0	737	0	0	0	0	-2.03	-0.45	4.1209	0.2025
729	0	0	742	1	0	0.071428571	0	-1.958571429	-0.45	3.836002041	0.2025
730	0	0	757	1	0	0.071428571	0	-1.958571429	-0.45	3.836002041	0.2025
730	10	1	765	0	0	0	0	-2.03	-0.45	4.1209	0.2025
733	0	0	772	23	0	1.642857143	0	-0.387142857	-0.45	0.149879592	0.2025
733	0	3	778	1	0	0.071428571	0	-1.958571429	-0.45	3.836002041	0.2025
737	0	0	789	1	0	0.071428571	0	-1.958571429	-0.45	3.836002041	0.2025
742	1	0	796	0	0	0	0	-2.03	-0.45	4.1209	0.2025
742	0	0	809	0	0	0	0	-2.03	-0.45	4.1209	0.2025
757	1	0	818	0	0	0	0	-2.03	-0.45	4.1209	0.2025
765	0	0	821	0	0	0	0	-2.03	-0.45	4.1209	0.2025
772	23	0	851	0	0	0	0	-2.03	-0.45	4.1209	0.2025
778	1	0	860	0	0	0	0	-2.03	-0.45	4.1209	0.2025
789	1	0	869	1	0	0.071428571	0	-1.958571429	-0.45	3.836002041	0.2025
796	0	0	876	1	1	0.071428571	0.071428571	-1.958571429	-0.378571429	3.836002041	0.143316327
796	0	0	878	0	0	0	0	-2.03	-0.45	4.1209	0.2025
809	0	0	883	0	4	0	0.285714286	-2.03	-0.164285714	4.1209	0.026989796
818	0	0	889	0	0	0	0	-2.03	-0.45	4.1209	0.2025
821	0	0	903	0	0	0	0	-2.03	-0.45	4.1209	0.2025
851	0	0	904	0	0	0	0	-2.03	-0.45	4.1209	0.2025
860	0	0	905	6	1	0.428571429	0.071428571	-1.601428571	-0.378571429	2.564573469	0.143316327
869	1	0	908	7	3	0.5	0.214285714	-1.53	-0.235714286	2.3409	0.055561224
876	1	1	927	27	0	1.928571429	0	-0.101428571	-0.45	0.010287755	0.2025
878	0	0	928	0	0	0	0	-2.03	-0.45	4.1209	0.2025
883	0	4	931	0	0	0	0	-2.03	-0.45	4.1209	0.2025
889	0	0	933	0	0	0	0	-2.03	-0.45	4.1209	0.2025
889	0	0	940	0	0	0	0	-2.03	-0.45	4.1209	0.2025
903	0	0	943	0	0	0	0	-2.03	-0.45	4.1209	0.2025
904	0	0	949	1	0	0.071428571	0	-1.958571429	-0.45	3.836002041	0.2025
905	6	1	967	0	0	0	0	-2.03	-0.45	4.1209	0.2025
908	7	3	978	0	0	0	0	-2.03	-0.45	4.1209	0.2025
927	27	0	983	23	0	1.642857143	0	-0.387142857	-0.45	0.149879592	0.2025
928	0	0	998	0	0	0	0	-2.03	-0.45	4.1209	0.2025
931	0	0	1021	5	6	0.357142857	0.428571429	-1.672857143	-0.021428571	2.79845102	0.000459184
933	0	0	1023	0	0	0	0	-2.03	-0.45	4.1209	0.2025
940	0	0	1024	0	0	0	0	-2.03	-0.45	4.1209	0.2025
943	0	0	1049	3	2	0.214285714	0.142857143	-1.815714286	-0.307142857	3.296818367	0.094336735
949	0	0	1079	0	0	0	0	-2.03	-0.45	4.1209	0.2025
949	1	0	1083	0	0	0	0	-2.03	-0.45	4.1209	0.2025
967	0	0	1090	0	0	0	0	-2.03	-0.45	4.1209	0.2025
978	0	0	1095	0	0	0	0	-2.03	-0.45	4.1209	0.2025
978	0	0	1106	0	1	0	0.071428571	-2.03	-0.378571429	4.1209	0.143316327
983	23	0	1107	0	0	0	0	-2.03	-0.45	4.1209	0.2025
998	0	0	1114	0	0	0	0	-2.03	-0.45	4.1209	0.2025
1021	5	6	1116	0	0	0	0	-2.03	-0.45	4.1209	0.2025
1023	0	0	1119	0	0	0	0	-2.03	-0.45	4.1209	0.2025
1024	0	0	1120	6	2	0.428571429	0.142857143	-1.601428571	-0.307142857	2.564573469	0.094336735
1049	3	2	1126	0	0	0	0	-2.03	-0.45	4.1209	0.2025
1079	0	0	1146	0	0	0	0	-2.03	-0.45	4.1209	0.2025
1083	0	0	1163	7	0	0.5	0	-1.53	-0.45	2.3409	0.2025
1090	0	0	1166	0	0	0	0	-2.03	-0.45	4.1209	0.2025
1095	0	0	1172	0	0	0	0	-2.03	-0.45	4.1209	0.2025
1106	0	0	1177	0	0	0	0	-2.03	-0.45	4.1209	0.2025
1106	0	1	1182	0	0	0	0	-2.03	-0.45	4.1209	0.2025
1107	0	0	1186	0	0	0	0	-2.03	-0.45	4.1209	0.2025
1114	0	0	1187	0	0	0	0	-2.03	-0.45	4.1209	0.2025
1116	0	0	1196	11	2	0.785714286	0.142857143	-1.244285714	-0.307142857	1.548246939	0.094336735
1119	0	0	1198	0	3	0	0.214285714	-2.03	-0.235714286	4.1209	0.055561224
1120	6	2	1229	0	0	0	0	-2.03	-0.45	4.1209	0.2025
1126	0	0	1235	0	0	0	0	-2.03	-0.45	4.1209	0.2025
1126	0	0	1244	2	4	0.142857143	0.285714286	-1.887142857	-0.164285714	3.561308163	0.026989796
1146	0	0	1249	1	1	0.071428571	0.071428571	-1.958571429	-0.378571429	3.836002041	0.143316327
1163	7	0	1287	9	1	0.642857143	0.071428571	-1.387142857	-0.378571429	1.924165306	0.143316327
1166	0	0	1293	27	2	1.928571429	0.142857143	-0.101428571	-0.307142857	0.010287755	0.094336735
1172	0	0	1297	0	0	0	0	-2.03	-0.45	4.1209	0.2025
1177	0	0	1300	0	0	0	0	-2.03	-0.45	4.1209	0.2025
1182	0	0	1302	0	0	0	0	-2.03	-0.45	4.1209	0.2025
1186	0	0	1309	0	3	0	0.214285714	-2.03	-0.235714286	4.1209	0.055561224
1187	0	0	1310	0	0	0	0	-2.03	-0.45	4.1209	0.2025
1196	11	2	1312	0	0	0	0	-2.03	-0.45	4.1209	0.2025
1198	0	3	1325	0	0	0	0	-2.03	-0.45	4.1209	0.2025
1229	0	0	1329	0	0	0	0	-2.03	-0.45	4.1209	0.2025
1235	0	0	1333	0	0	0	0	-2.03	-0.45	4.1209	0.2025
1244	2	4	1334	0	0	0	0	-2.03	-0.45	4.1209	0.2025
1249	1	1	1337	0	0	0	0	-2.03	-0.45	4.1209	0.2025
1287	9	1	1350	0	0	0	0	-2.03	-0.45	4.1209	0.2025
1293	27	2	1363	0	2	0	0.142857143	-2.03	-0.307142857	4.1209	0.094336735
1297	0	0	1371	0	0	0	0	-2.03	-0.45	4.1209	0.2025
1300	0	0	1378	1	0	0.071428571	0	-1.958571429	-0.45	3.836002041	0.2025
1302	0	0	1390	0	0	0	0	-2.03	-0.45	4.1209	0.2025
1309	0	3	1396	0	0	0	0	-2.03	-0.45	4.1209	0.2025
1310	0	0									
1312	0	0									
1325	0	0									
1329	0	0									
1333	0	0									
1334	0	0									
1337	0	0									
1350	0	0									
1363	0	2									
1371	0	0									
1378	1	0									
1378	0	0									
1390	0	0									
1390	0	0									
1396	0	0									

11.4.11 Schwedt/Oder – C4

11.4.11.1 Schwedt/Oder – C4 – Phase 1

O.R.C.U.S. 02.00 - Simulation Summary

UA Parameters

MTOW [kg]	Wingspan [m]	Length [m]	L/D
90	5	4	8

v [km/h]	Alt [m]	CCF [m]
100	100	9753.4262

P_CumCat [1/Fh]	Engine [%]	ESys [%]	FCS [%]	NavSys [%]	Struct [%]
0.01	20	20	20	20	20

General map parameters

	Name	Area [km2]	PPL	PPL/km2
City	Schwedt/Oder, Stadt	205.56	30075	146
County	Uckermark	3076.96	120349	39
FS	BB	29654.46	2504040	84

Mission specific map parameters

	Area [km2]	PPL	Tourists	Total PPL
City	66.8555	9761	0	9761
Map total	66.8555	9761	0	9761

PPL MOD NA

Sim FH [Fh] 19600 Ev/Fh [1/Fh] 0.0098469
Events total 193

Hits due to UA impacts		Hits/Fh [1/Fh]
City ATB	90	0.0045918
City OTW	19	0.0009694
Total	109	0.0055612

Prot	cyc	k_UA	Day	Time of impact	UA X Pos	UA Y Pos	Travelled Distance [km]	PPL_TD_CITY_ATB	PPL_CITY_ATB_COUNT	HIT_CITY_ATB_COUNT	PPL_TD_CITY_OTW	PPL_CITY_OTW_COUNT	HIT_CITY_OTW_COUNT	PPL_ALL_ATB_COUNT	PPL_ALL_OTW_COUNT	E	Case	Outcome
1017	95	937	Tuesday	15:11:36	5527	2539	919.36	7759	7759	0	2002	2002	0	7759	2002	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
1018	43	3412	Wednesday	10:11:19	7882	3262	418.89	7808	7808	0	1953	1953	0	7808	1953	76	Degradation of altitude	Central UA ground impact point below flight path
1024	118	2077	Tuesday	17:28:04	4036	1144	1146.78	7320	7320	0	2441	2441	0	7320	2441	57	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
103	6	2403	Friday	06:33:09	4927	1457	55.28	8443	8443	0	1318	1318	0	8443	1318	73	Degradation of altitude	Central UA ground impact point below flight path
1030	57	3272	Monday	11:33:02	7694	3072	555.06	7906	7906	0	1855	1855	0	7906	1855	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
1035	23	1561	Saturday	08:11:16	3831	1389	218.80	8004	8004	0	1757	1757	0	8004	1757	32	Connection Failure	UA approaches Emergency landing site
1036	26	768	Sunday	08:27:32	6150	2863	245.92	8736	8736	0	1025	1025	0	8736	1025	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
1060	20	3267	Wednesday	07:56:29	7685	3065	194.17	8345	8345	0	1416	1416	0	8345	1416	15	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
1063	23	2935	Saturday	08:13:30	6823	2453	222.53	8004	8004	0	1757	1757	0	8004	1757	9	Engine Out	UA ground impact tangential to trajectory
1064	117	2406	Sunday	17:22:44	4937	1461	1137.92	7125	7125	9	2636	2636	0	7125	2636	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1064	51	19	Sunday	10:52:38	7934	3435	487.72	7174	7174	3	2587	2587	1	7174	2587	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
107	126	2087	Tuesday	18:14:53	4056	1149	1224.83	7320	7320	0	2441	2441	0	7320	2441	39	Short Circuit / Overload	Central UA ground impact point below flight path
107	16	2360	Tuesday	07:31:37	4786	1397	152.70	8248	8248	3	1513	1513	1	8248	1513	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
1071	139	2614	Sunday	19:31:49	5677	1810	1353.05	8638	8638	0	1123	1123	0	8638	1123	36	Short Circuit / Overload	Central UA ground impact point below flight path
1071	84	3053	Sunday	14:10:41	7185	2688	817.81	6979	6979	0	2782	2782	0	6979	2782	55	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
108	31	680	Wednesday	08:56:40	6466	3013	294.45	8296	8296	0	1465	1465	0	8296	1465	66	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point below flight path
1081	71	3592	Wednesday	12:55:28	7943	3421	692.47	7808	7808	0	1953	1953	0	7808	1953	44	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
1090	139	2891	Friday	19:32:16	6677	2363	1353.81	9077	9077	0	684	684	0	9077	684	5	Engine Out	No Ground Effect
1100	136	1880	Monday	19:13:05	3761	1129	1321.81	8833	8833	0	928	928	1	8833	928	37	Short Circuit / Overload	Central UA ground impact point below flight path
1107	41	319	Monday	09:54:36	7534	3423	391.00	8296	8296	0	1465	1465	0	8296	1465	73	Degradation of altitude	Central UA ground impact point below flight path
1120	109	2078	Sunday	16:35:23	4038	1145	1059.00	7125	7125	0	2636	2636	0	7125	2636	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
113	37	2302	Monday	09:34:24	4605	1325	357.36	8296	8296	0	1465	1465	0	8296	1465	17	Engine Fire	Central UA ground impact point below flight path
1152	26	1588	Thursday	08:28:52	3800	1355	248.14	8296	8296	0	1465	1465	0	8296	1465	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
1153	79	1121	Friday	13:38:16	4881	2164	763.80	7564	7564	0	2197	2197	0	7564	2197	72	Degradation of altitude	UA approaches Emergency landing site
1167	2	1373	Friday	06:08:05	4164	1679	13.47	8443	8443	0	1318	1318	0	8443	1318	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
1173	43	1341	Thursday	10:07:57	4240	1736	413.28	7808	7808	0	1953	1953	0	7808	1953	30	Connection Failure	Central UA ground impact point below flight path
1182	37	3256	Saturday	09:35:58	7665	3047	359.94	8004	8004	0	1757	1757	0	8004	1757	65	Degradation of lateral and horizontal navigation data accurracy.	UA approaches Emergency landing site
1192	6	2403	Tuesday	06:33:09	4927	1457	55.28	8248	8248	0	1513	1513	0	8248	1513	27	Generator Failure	UA ground impact tangential to trajectory
1193	5	651	Wednesday	06:24:27	6568	3059	40.78	8345	8345	0	1416	1416	0	8345	1416	58	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
1209	86	1912	Friday	14:20:31	3790	1122	834.22	7564	7564	0	2197	2197	0	7564	2197	51	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
121	109	1042	Tuesday	16:33:42	5150	2325	1056.19	7320	7320	1	2441	2441	0	7320	2441	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1210	31	1869	Saturday	08:58:35	3752	1133	297.67	8004	8004	0	1757	1757	1	8004	1757	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1211	83	3536	Sunday	14:05:36	7946	3383	809.36	6979	6979	0	2782	2782	0	6979	2782	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
1237	109	2396	Friday	16:35:55	4904	1447	1059.86	7662	7662	0	2099	2099	0	7662	2099	3	Engine Out	Central UA ground impact point below flight path
1245	71	14	Saturday	12:49:39	7936	3433	682.78	7125	7125	7	2636	2636	1	7125	2636	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1249	100	972	Wednesday	15:40:56	5400	2468	968.22	7613	7613	0	2148	2148	0	7613	2148	35	Connection Failure	UA ground impact tangential to trajectory
1252	114	2697	Saturday	17:05:39	5984	1969	1109.44	7759	7759	1	2002	2002	0	7759	2002	49	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
1255	103	1973	Tuesday	16:00:07	3862	1119	1000.19	7320	7320	0	2441	2441	0	7320	2441	25	Generator Failure	UA approaches Emergency landing site
1256	10	1926	Wednesday	06:55:47	3804	1120	93.00	8345	8345	0	1416	1416	0	8345	1416	5	Engine Out	No Ground Effect
1261	102	877	Monday	15:52:28	5748	2658	987.47	7564	7564	0	2197	2197	0	7564	2197	31	Connection Failure	UA ground impact tangential to trajectory
1262	76	305	Tuesday	13:19:23	7564	3430	732.33	7759	7759	0	2002	2002	0	7759	2002	55	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
1263	137	1212	Wednesday	19:17:50	4593	1981	1329.75	8980	8980	0	781	781	0	8980	781	1	Engine Out	No Ground Effect
1264	143	425	Thursday	19:51:40	7274	3343	1386.14	8833	8833	0	928	928	0	8833	928	72	Degradation of altitude	UA approaches Emergency landing site
1266	138	3108	Saturday	19:26:47	7335	2792	1344.64	8882	8882	0	879	879	0	8882	879	12	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
1280	75	2685	Saturday	13:17:25	5940	1946	729.03	7711	7711	0	2050	2050	0	7711	2050	37	Short Circuit / Overload	Central UA ground impact point below flight path
1296	106	1333	Monday	16:16:37	4260	1750	1027.72	7223	7223	0	2538	2538	0	7223	2538	10	Engine Anomaly	UA approaches Emergency landing site
1328	120	526	Friday	17:37:14	6980	3234	1162.08	7662	7662	1	2099	2099	0	7662	2099	28	Generator Failure	UA ground impact tangential to trajectory
133	22	2824	Sunday	08:07:29	6445	2226	212.47	8736	8736	4	1025	1025	0	8736	1025	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
133	42	902	Sunday	10:01:24	5656	2609	402.33	7174	7174	0	2587	2587	4	7174	2587	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1340	40	1109	Wednesday	09:50:01	4920	2188	383.39	8296	8296	3	1465	1465	0	8296	1465	21	Engine Fire	UA structural desintegration - Debris Impact
1346	120	1849	Tuesday	17:39:24	3739	1140	1165.67	7320	7320	0	2441	2441	0	7320	2441	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1353	89	3262	Tuesday	14:40:17	7676	3057	867.14	7759	7759	0	2002	2002	0	7759	2002	17	Engine Fire	Central UA ground impact point below flight path
1354	110	3522	Wednesday	16:43:35	7944	3372	1072.67	7223	7223	0	2538	2538	0	7223	2538	67	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate
1370	134	785	Friday	18:59:35	6087	2832	1299.33	9077	9077	0	684	684	0	9077	684	51	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
1370	31	126	Friday	08:55:45	7854	3468	292.94	8394	8394	0	1367	1367	0	8394	1367	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
1372	74	2922	Sunday	13:11:56	6781	2426	719.92	6979	6979	0	2782	2782	0	6979	2782	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
1375	99	819	Wednesday	15:34:49	5962	2769	958.05	7613	7613	0	2148	2148	0	7613	2148	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
1389	23	362	Wednesday	08:09:20	7435	3395	215.56	8296	8296	0	1465	1465	0	8296	1465	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
1394	48	1202	Monday	10:37:00	4623	2000	461.67	7906	7906	9	1855	1855	2	7906	1855	63	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
1400	47	3407	Sunday	10:34:43	7877	3256	457.89	7174	7174	0	2587	2587	0	7174	2587	68	Degradation of lateral and horizontal navigation data accurracy.	UA approaches Emergency landing site
144	94	1779	Thursday	15:07:07	3712	1175	911.89	7613	7613	0	2148	2148	0	7613	2148	32	Connection Failure	UA approaches Emergency landing site
152	140	204	Friday	19:33:46	7751	3465	1356.28	9077	9077	0	684	684	0	9077	684	55	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
155	136	1019	Monday	19:11:41	5231	2373	1319.47	8833	8833	0	928	928	0	8833	928	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
16	132	3084	Tuesday	18:51:37	7271	2747	1286.05	7320	7320	0	2441	2441	0	7320	2441	34	Connection Failure	UA ground impact tangential to trajectory
172	48	2483	Thursday	10:39:04	5202	1580	465.14	7808	7808	0	1953	1953	0	7808	1953	9	Engine Out	UA ground impact tangential to trajectory
179	115	1958	Thursday	17:10:19	3842	1119	1117.20	7271	7271	0	2490	2490	0	7271	2490	47	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
179	6	804	Thursday	06:30:34	6017	2797	50.95	8394	8394	0	1367	1367	0	8394	1367	40	Short Circuit / Overload	Central UA ground impact point below flight path
186	105	504	Thursday	16:09:25	7047	3261	1015.72	7271	7271	0	2490	2490	0	7271	2490	35	Connection Failure	UA ground impact tangential to trajectory
194	98	2922	Friday	15:32:23	6781	2426	954.00	7564	7564	0	2197	2197	0	7564	2197	57	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
207	79	3387	Thursday	13:41:57	7857	3232	769.94	7613	7613	0	2148	2148	0	7613	2148	65	Degradation of lateral and horizontal navigation data accurracy.	UA approaches Emergency landing site
210	21	754	Sunday	07:58:16	6201	2888	197.11	8736	8736	0	1025	1025	0	8736	1025	37	Short Circuit / Overload	Central UA ground impact point below flight path
210	43	798	Sunday	10:07:05	6040	2808	411.81	7174	7174	0	2587	2587	0	7174	2587	14	Engine Anomaly	Central UA ground impact point below flight path
212	127	1245	Tuesday	18:19:22	4496	1916	1232.30	7320	7320	0	2441	2441	0	7320	2441	72	Degradation of altitude	UA approaches Emergency landing site
214	113	1294	Thursday	16:57:32	4360	1822	1095.89	7271	7271	0	2490	2490	0	7271	2490	36	Short Circuit / Overload	Central UA ground impact point below flight path
221	16	1027	Thursday	07:29:27	5203	2356	149.08	8394	8394	3	1367	1367	0	8394	1367	18	Engine Fire	UA structural desintegration - Debris Impact
225	124	2244	Monday	18:03:27	4436	1263	1205.75	7223	7223	0	2538	2538	0	7223	2538	72	Degradation of altitude	UA approaches Emergency landing site
257	68	1043	Friday	12:33:46	5146	2323	656.31	7711	7711	0	2050	2050	0	7711	2050	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
279	102	2938	Saturday	15:55:50	6833	2459	993.06	7711	7711	0	2050	2050	0	7711	2050	9	Engine Out	UA ground impact tangential to trajectory
280	120	1685	Sunday	17:39:08	3726	1249	1165.22	7125	7125	0	2636	2636	0	7125	2636	25	Generator Failure	UA approaches Emergency landing site
32	41	370	Thursday	09:54:41	7416	3389	391.14	8296	8296	0	1465	1465	0	8296	1465	30	Connection Failure	Central UA ground impact point below flight path
326	57	872	Thursday	11:29:07	5766	2668	548.55	7808	7808	0	1953	1953	0	7808	1953	73	Degradation of altitude	Central UA ground impact point below flight path
33	117	2181	Friday	17:22:23	4270	1207	1137.31	7662	7662	0	2099	2099	0	7662	2099	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
33	17	3394	Friday	07:39:09	7864	3241	165.25	8443	8443	0	1318	1318	0	8443	1318	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
340	79	1942	Thursday	13:39:37	3822	1119	766.03	7613	7613	2	2148	2148	0	7613	2148	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
342	102	3553	Saturday	15:56:49	7947	3395	994.72	7711	7711	0	2050	2050	0	7711	2050	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
353	17	974	Wednesday	07:35:12	5392	2464	158.69	8345	8345	0	1416	1416	0	8345	1416	37	Short Circuit / Overload	Central UA ground impact point below flight path
355	15	1500	Friday	07:24:22	3917	1474	140.61	8443	8443	0	1318	1318	0	8443	1318	25	Generator Failure	UA approaches Emergency landing site
366	21	692	Tuesday	07:58:09	6424	2994	196.94	8394	8394	0	1367	1367	0	8394	1367	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
37	26	696	Tuesday	08:27:25	6409	2987	245.72	8394	8394	0	1367	1367	0	8394	1367	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
379	11	8	Monday	06:58:32	7938	3430	97.56	8296	8296	0	1465	1465	0	8296	1465	78	Degradation of altitude	Central UA ground impact point below flight path
390	101	1893	Friday	15:48:16	3772	1126	980.47	7564	7564	0	2197	2197	0	7564	2197	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
396	121	23	Thursday	17:42:17	7933	3437	1170.47	7271	7271	0	2490	2490	0	7271	2490	9	Engine Out	UA ground impact tangential to trajectory
40	112	2607	Friday	16:53:48	5652	1797	1089.69	7662	7662	0	2099	2099	0	7662	2099	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
40	49	1457	Friday	10:43:16	3991	1539	472.11	7711	7711	0	2050	2050	0	7711	2050	20	Engine Fire	UA structural desintegration - Debris Impact
402	28	3319	Wednesday	08:43:24	7770	3142	272.33	8296	8296	0	1465	1465	0	8296	1465	71	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate
403	50	2317	Thursday	10:50:31	4650	1343	484.20	7808	7808	14	1953	1953	0	7808	1953	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
407	119	1758	Monday	17:33:24	3711	1189	1155.67	7223	7223	0	2538	2538	0	7223	2538	75	Degradation of altitude	UA approaches Emergency landing site
409	98	1200	Wednesday	15:29:36	4629	2004	949.33	7613	7613	0	2148	2148	0	7613	2148	50	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
41	23	895	Saturday	08:10:12	5681	2623	217.00	8004	8004	0	1757	1757	0	8004	1757	74	Degradation of altitude	Central UA ground impact point below flight path
41	62	3440	Saturday	12:02:34	7905	3294	604.28	7125	7125	0	2636	2636	0	7125	2636	75	Degradation of altitude	UA approaches Emergency landing site
418	67	788	Friday	12:27:30	6076	2826	645.86	7711	7711	0	2050	2050	0	7711	2050	43	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
420	33	2656	Sunday	09:11:34	5833	1889	319.31	8736	8736	1	1025	1025	0	8736	1025	9	Engine Out	UA ground impact tangential to trajectory
425	68	3186	Friday	12:37:16	7523	2932	662.11	7711	7711	0	2050	2050	0	7711	2050	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
430	91	2911	Wednesday	14:51:25	6744	2404	885.70	7613	7613	2	2148	2148	1	7613	2148	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
441	113	812	Sunday	16:56:45	5988	2782	1094.58	7125	7125	0	2636	2636	0	7125	2636	25	Generator Failure	UA approaches Emergency landing site
444	20	612	Wednesday	07:52:11	6701	3118	186.97	8345	8345	0	1416	1416	0	8345	1416	13	Engine Anomaly	UA approaches Emergency landing site
448	73	278	Sunday	13:01:47	7620	3443	703.00	6979	6979	0	2782	2782	0	6979	2782	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
48	57	3097	Saturday	11:32:44	7306	2771	554.58	7125	7125	0	2636	2636	0	7125	2636	73	Degradation of altitude	Central UA ground impact point below flight path
480	24	760	Thursday	08:15:49	6179	2877	226.39	8296	8296	0	1465	1465	0	8296	1465	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
500	111	3193	Wednesday	16:48:54	7538	2944	1081.53	7223	7223	0	2538	2538	0	7223	2538	78	Degradation of altitude	Central UA ground impact point below flight path
505	109	2632	Monday	16:36:18	5744	1844	1060.50	7223	7223	0	2538	2538	0	7223	2538	7	Engine Out	Central UA ground impact point below flight path
508	56	833	Thursday	11:23:13	5910	2743	538.70	7808	7808	0	1953	1953	0	7808	1953	78	Degradation of altitude	Central UA ground impact point below flight path
521	40	2288	Wednesday	09:51:56	4563	1309	386.58	8296	8296	0	1465	1465	0	8296	1465	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
524	58	2061	Saturday	11:36:55	4005	1138	561.53	7125	7125	9	2636	2636	1	7125	2636	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
531	88	2884	Saturday	14:33:49	6653	2349	856.36	7711	7711	0	2050	2050	0	7711	2050	79	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
532	24	2514	Sunday	08:18:41	5313	1631	231.14	8736	8736	4	1025	1025	0	8736	1025	20	Engine Fire	UA structural desintegration - Debris Impact
542	29	580	Wednesday	08:44:48	6807	3164	274.67	8296	8296	0	1465	1465	0	8296	1465	70	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate
544	28	1934	Friday	08:41:08	3813	1120	268.58	8394	8394	0	1367	1367	0	8394	1367	74	Degradation of altitude	Central UA ground impact point below flight path
554	89	1868	Monday	14:38:01	3752	1133	863.36	7564	7564	0	2197	2197	0	7564	2197	30	Connection Failure	Central UA ground impact point below flight path
556	1	3240	Wednesday	06:05:16	7635	3022	8.78	8345	8345	0	1416	1416	0	8345	1416	8	Engine Out	UA ground impact tangential to trajectory
566	128	3582	Saturday	18:29:02	7945	3415	1248.39	7759	7759	0	2002	2002	0	7759	2002	78	Degradation of altitude	Central UA ground impact point below flight path
58	136	147	Tuesday	19:10:15	7830	3469	1317.11	8931	8931	0	830	830	0	8931	830	1	Engine Out	No Ground Effect
58	41	1518	Tuesday	09:56:32	3889	1448	394.25	8394	8394	0	1367	1367	0	8394	1367	17	Engine Fire	Central UA ground impact point below flight path
582	59	2100	Monday	11:42:49	4083	1155	571.39	7906	7906	8	1855	1855	1	7906	1855	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
585	83	2747	Thursday	14:04:20	6168	2069	807.22	7613	7613	0	2148	2148	2	7613	2148	18	Engine Fire	UA structural desintegration - Debris Impact
599	26	1886	Thursday	08:29:22	3766	1128	248.95	8296	8296	0	1465	1465	0	8296	1465	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
611	130	657	Tuesday	18:35:58	6547	3050	1259.97	7320	7320	0	2441	2441	0	7320	2441	27	Generator Failure	UA ground impact tangential to trajectory
621	58	3516	Friday	11:39:16	7943	3367	565.47	7711	7711	0	2050	2050	0	7711	2050	31	Connection Failure	UA ground impact tangential to trajectory
632	100	828	Tuesday	15:40:41	5929	2752	967.83	7759	7759	0	2002	2002	0	7759	2002	76	Degradation of altitude	Central UA ground impact point below flight path
650	78	2999	Saturday	13:35:29	7026	2582	759.14	7711	7711	0	2050	2050	0	7711	2050	78	Degradation of altitude	Central UA ground impact point below flight path
652	118	1523	Monday	17:27:09	3882	1441	1145.28	7223	7223	0	2538	2538	0	7223	2538	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
652	64	1110	Monday	12:10:29	4917	2186	617.47	7906	7906	0	1855	1855	0	7906	1855	29	Connection Failure	UA approaches Emergency landing site
653	68	2889	Tuesday	12:36:47	6670	2359	661.31	8004	8004	0	1757	1757	0	8004	1757	37	Short Circuit / Overload	Central UA ground impact point below flight path
658	116	172	Sunday	17:13:15	7797	3469	1122.11	7125	7125	1	2636	2636	0	7125	2636	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
666	103	15	Monday	15:56:56	7936	3433	994.89	7223	7223	2	2538	2538	0	7223	2538	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
668	72	607	Wednesday	12:56:28	6718	3126	694.14	7613	7613	0	2148	2148	0	7613	2148	68	Degradation of lateral and horizontal navigation data accurracy.	UA approaches Emergency landing site
67	120	1449	Thursday	17:38:45	4006	1552	1164.58	7271	7271	0	2490	2490	0	7271	2490	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
671	89	1868	Saturday	14:38:01	3752	1133	863.36	7711	7711	0	2050	2050	0	7711	2050	78	Degradation of altitude	Central UA ground impact point below flight path
674	122	1980	Tuesday	17:51:19	3872	1120	1185.53	7320	7320	2	2441	2441	0	7320	2441	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
679	98	1272	Sunday	15:29:43	4420	1864	949.53	6979	6979	1	2782	2782	0	6979	2782	66	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point below flight path
683	99	1434	Thursday	15:35:49	4034	1576	959.72	7613	7613	0	2148	2148	0	7613	2148	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site

687	114	2759	Monday	17:05:46	6211	2093	1109.61	7223	7223	0	2538	2538	0	7223	2538	28	Generator Failure	UA ground impact tangential to trajectory
688	11	274	Tuesday	06:58:57	7628	3445	98.28	8248	8248	0	1513	1513	0	8248	1513	28	Generator Failure	UA ground impact tangential to trajectory
697	91	1178	Thursday	14:48:35	4697	2048	881.00	7613	7613	0	2148	2148	0	7613	2148	37	Short Circuit / Overload	Central UA ground impact point below flight path
701	37	1349	Monday	09:32:52	4221	1721	354.78	8296	8296	0	1465	1465	0	8296	1465	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
713	143	3060	Saturday	19:55:57	7205	2701	1393.28	8882	8882	0	879	879	0	8882	879	74	Degradation of altitude	Central UA ground impact point below flight path
732	85	2959	Thursday	14:16:22	6901	2501	827.30	7613	7613	0	2148	2148	0	7613	2148	72	Degradation of altitude	UA approaches Emergency landing site
74	123	2286	Thursday	17:57:40	4557	1307	1196.11	7271	7271	0	2490	2490	0	7271	2490	31	Connection Failure	UA ground impact tangential to trajectory
755	114	380	Saturday	17:01:54	7391	3382	1103.17	7759	7759	0	2002	2002	0	7759	2002	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
756	109	1709	Sunday	16:34:48	3717	1227	1058.00	7125	7125	0	2636	2636	0	7125	2636	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
76	130	2226	Saturday	18:38:32	4387	1246	1264.22	7759	7759	0	2002	2002	0	7759	2002	19	Engine Fire	Central UA ground impact point below flight path
762	5	1184	Saturday	06:25:19	4678	2036	42.22	9272	9272	0	489	489	0	9272	489	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
775	87	209	Friday	14:23:36	7743	3465	839.36	7564	7564	0	2197	2197	0	7564	2197	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
787	136	2054	Wednesday	19:13:21	3992	1135	1322.28	8980	8980	0	781	781	0	8980	781	2	Engine Out	UA approaches Emergency landing site
789	68	1392	Friday	12:34:21	4122	1646	657.25	7711	7711	0	2050	2050	0	7711	2050	33	Connection Failure	Central UA ground impact point below flight path
790	117	130	Saturday	17:19:02	7849	3468	1131.75	7759	7759	0	2002	2002	0	7759	2002	20	Engine Fire	UA structural desintegration - Debris Impact
797	127	2322	Saturday	18:21:08	4666	1349	1235.22	7759	7759	0	2002	2002	0	7759	2002	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
802	15	1233	Thursday	07:23:55	4531	1939	139.89	8394	8394	0	1367	1367	0	8394	1367	1	Engine Out	No Ground Effect
816	54	1563	Thursday	11:12:41	3828	1386	521.17	7808	7808	0	1953	1953	0	7808	1953	38	Short Circuit / Overload	Central UA ground impact point below flight path
816	83	3280	Thursday	14:05:12	7708	3084	808.67	7613	7613	0	2148	2148	0	7613	2148	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
819	62	2507	Sunday	12:01:03	5288	1619	601.75	7174	7174	0	2587	2587	0	7174	2587	67	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
822	128	2505	Wednesday	18:27:16	5281	1616	1245.47	7223	7223	0	2538	2538	0	7223	2538	66	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
840	25	1159	Sunday	08:22:20	4757	2087	237.22	8736	8736	0	1025	1025	0	8736	1025	4	Engine Out	Central ground impact point below flight path with B/G Ratio.
849	54	2824	Tuesday	11:14:44	6445	2226	524.58	8004	8004	0	1757	1757	0	8004	1757	73	Degradation of altitude	Central UA ground impact point below flight path
850	19	705	Wednesday	07:46:28	6377	2972	177.47	8345	8345	0	1416	1416	0	8345	1416	17	Engine Fire	Central UA ground impact point below flight path
853	25	1918	Saturday	08:23:34	3796	1121	239.28	8004	8004	0	1757	1757	0	8004	1757	12	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
866	131	953	Friday	18:42:18	5469	2507	1270.53	7662	7662	0	2099	2099	0	7662	2099	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
867	54	938	Saturday	11:11:41	5523	2537	519.47	7125	7125	0	2636	2636	0	7125	2636	28	Generator Failure	UA ground impact tangential to trajectory
869	84	2889	Monday	14:10:25	6670	2359	817.36	7564	7564	0	2197	2197	0	7564	2197	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
872	7	1284	Thursday	06:37:11	4387	1841	62.00	8394	8394	0	1367	1367	0	8394	1367	11	Engine Anomaly	Central UA ground impact point below flight path
873	10	2552	Friday	06:56:49	5450	1697	94.69	8443	8443	0	1318	1318	0	8443	1318	22	Generator Failure	UA approaches Emergency landing site
876	16	350	Monday	07:28:20	7464	3403	147.25	8296	8296	0	1465	1465	0	8296	1465	29	Connection Failure	UA approaches Emergency landing site
888	101	3503	Saturday	15:50:53	7939	3355	984.83	7711	7711	0	2050	2050	0	7711	2050	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
89	128	2864	Friday	18:27:52	6585	2308	1246.44	7662	7662	0	2099	2099	0	7662	2099	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
899	116	398	Wednesday	17:13:38	7345	3367	1122.72	7223	7223	0	2538	2538	0	7223	2538	70	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
92	30	3480	Monday	08:55:21	7929	3334	292.28	8296	8296	0	1465	1465	0	8296	1465	50	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
922	39	1828	Friday	09:45:20	3728	1149	375.58	8394	8394	0	1367	1367	0	8394	1367	78	Degradation of altitude	Central UA ground impact point below flight path
924	8	3323	Sunday	06:46:21	7776	3147	77.28	9419	9419	0	342	342	1	9419	342	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
927	110	416	Wednesday	16:38:33	7298	3352	1064.25	7223	7223	0	2538	2538	0	7223	2538	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
929	59	1875	Friday	11:42:28	3757	1131	570.78	7711	7711	0	2050	2050	0	7711	2050	28	Generator Failure	UA ground impact tangential to trajectory
929	5	1584	Friday	06:25:58	3804	1360	43.31	8443	8443	0	1318	1318	0	8443	1318	39	Short Circuit / Overload	Central UA ground impact point below flight path
931	8	1580	Sunday	06:43:31	3809	1365	72.55	9419	9419	0	342	342	0	9419	342	50	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
94	117	181	Wednesday	17:19:07	7785	3468	1131.89	7223	7223	0	2538	2538	0	7223	2538	35	Connection Failure	UA ground impact tangential to trajectory
949	74	769	Thursday	13:08:27	6146	2861	714.08	7613	7613	0	2148	2148	0	7613	2148	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
954	52	2724	Tuesday	11:02:52	6083	2023	504.80	8004	8004	0	1757	1757	0	8004	1757	67	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
960	11	1556	Monday	07:01:02	3837	1395	101.75	8296	8296	0	1465	1465	0	8296	1465	1	Engine Out	No Ground Effect
984	66	1486	Thursday	12:22:47	3940	1494	638.00	7808	7808	0	1953	1953	0	7808	1953	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
985	84	1546	Friday	14:08:14	3850	1409	813.72	7564	7564	0	2197	2197	0	7564	2197	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
989	105	3293	Tuesday	16:13:58	7730	3104	1023.28	7320	7320	0	2441	2441	2	7320	2441	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
991	48	2165	Thursday	10:38:33	4230	1195	464.28	7808	7808	0	1953	1953	0	7808	1953	19	Engine Fire	Central UA ground impact point below flight path
996	62	1881	Tuesday	12:00:01	3762	1129	600.06	8004	8004	0	1757	1757	0	8004	1757	68	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
997	39	1459	Wednesday	09:44:44	3987	1536	374.58	8296	8296	0	1465	1465	0	8296	1465	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
999	40	750	Friday	09:49:26	6215	2895	382.42	8394	8394	0	1367	1367	0	8394	1367	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.

O.R.C.U.S. 02.00 - tTest of the Simulation

nProbes	1400
nEvents	193
nEvents_cor	179
tMission	14
x_cross_ATB	0.064285714
x_cross_OTW	0.013571429
x_cross_TOT	0.077857143
s2ATB	0.006083062
sATB	0.077993989
tATB	26.04284608
s2OTW	0.000292921
sOTW	0.017114923
tOTW	7.807842237
s2TOT	0.008419717
sTOT	0.091759014
tTOT	27.67010759

UADay/Prot	HIT_TOT_ATB	HIT_TOT_OTW	UADay/Prot cor	HIT_TOT_mean_ATB	HIT_TOT_mean_OTW	HIT_TOT_mean_ATB/Fh	HIT_TOT_mean_OTW/Fh	x_i-x_cross ATB	x_i-x_cross OTW	(x_i-x_cross ATB)^2	(x_i-x_cross OTW)^2
16	0	0	16	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
32	0	0	32	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
33	0	0	33	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
33	0	0	37	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
37	0	0	40	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
40	0	0	41	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
40	0	0	48	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
41	0	0	58	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
41	0	0	67	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
48	0	0	74	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
58	0	0	76	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
58	0	0	89	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
67	0	0	92	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
74	0	0	94	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
76	0	0	103	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
89	0	0	107	3	1	0.214285714	0.071428571	0.15	0.057857143	0.0225	0.003347449
92	0	0	108	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
94	0	0	113	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
103	0	0	121	1	0	0.071428571	0	0.007142857	-0.013571429	5.10204E-05	0.000184184
107	0	0	133	4	4	0.285714286	0.285714286	0.221428571	0.272142857	0.049030612	0.074061735
107	3	1	144	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
108	0	0	152	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
113	0	0	155	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
121	1	0	172	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
133	4	0	179	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
133	0	4	186	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
144	0	0	194	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
152	0	0	207	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
155	0	0	210	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
172	0	0	212	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
179	0	0	214	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
179	0	0	221	3	0	0.214285714	0	0.15	-0.013571429	0.0225	0.000184184
186	0	0	225	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
194	0	0	257	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
207	0	0	279	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
210	0	0	280	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
210	0	0	326	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
212	0	0	340	2	0	0.142857143	0	0.078571429	-0.013571429	0.006173469	0.000184184
214	0	0	342	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
221	3	0	353	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
225	0	0	355	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
257	0	0	366	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
279	0	0	379	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
280	0	0	390	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
326	0	0	396	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
340	2	0	402	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
342	0	0	403	14	0	1	0	0.935714286	-0.013571429	0.875561224	0.000184184
353	0	0	407	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
355	0	0	409	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
366	0	0	418	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
379	0	0	420	1	0	0.071428571	0	0.007142857	-0.013571429	5.10204E-05	0.000184184
390	0	0	425	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
396	0	0	430	2	1	0.142857143	0.071428571	0.078571429	0.057857143	0.006173469	0.003347449
402	0	0	441	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
403	14	0	444	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
407	0	0	448	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
409	0	0	480	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
418	0	0	500	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
420	1	0	505	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
425	0	0	508	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
430	2	1	521	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
441	0	0	524	9	1	0.642857143	0.071428571	0.578571429	0.057857143	0.334744898	0.003347449
444	0	0	531	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
448	0	0	532	4	0	0.285714286	0	0.221428571	-0.013571429	0.049030612	0.000184184
480	0	0	542	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
500	0	0	544	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
505	0	0	554	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
508	0	0	556	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
521	0	0	566	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
524	9	1	582	8	1	0.571428571	0.071428571	0.507142857	0.057857143	0.257193878	0.003347449
531	0	0	585	0	2	0	0.142857143	-0.064285714	0.129285714	0.004132653	0.016714796
532	4	0	599	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
542	0	0	611	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
544	0	0	621	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
554	0	0	632	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
556	0	0	650	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
566	0	0	652	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
582	8	1	653	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
585	0	2	658	1	0	0.071428571	0	0.007142857	-0.013571429	5.10204E-05	0.000184184
599	0	0	666	2	0	0.142857143	0	0.078571429	-0.013571429	0.006173469	0.000184184
611	0	0	668	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
621	0	0	671	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
632	0	0	674	2	0	0.142857143	0	0.078571429	-0.013571429	0.006173469	0.000184184
650	0	0	679	1	0	0.071428571	0	0.007142857	-0.013571429	5.10204E-05	0.000184184
652	0	0	683	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
652	0	0	687	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
653	0	0	688	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
658	1	0	697	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
666	2	0	701	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
668	0	0	713	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
671	0	0	732	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
674	2	0	755	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
679	1	0	756	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
683	0	0	762	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
687	0	0	775	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
688	0	0	787	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
697	0	0	789	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
701	0	0	790	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
713	0	0	797	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
732	0	0	802	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
755	0	0	816	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
756	0	0	819	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
762	0	0	822	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
775	0	0	840	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
787	0	0	849	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
789	0	0	850	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
790	0	0	853	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
797	0	0	866	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
802	0	0	867	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
816	0	0	869	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
816	0	0	872	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
819	0	0	873	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
822	0	0	876	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
840	0	0	888	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
849	0	0	899	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
850	0	0	922	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
853	0	0	924	0	1	0	0.071428571	-0.064285714	0.057857143	0.004132653	0.003347449
866	0	0	927	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
867	0	0	929	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
869	0	0	931	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
872	0	0	949	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
873	0	0	954	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
876	0	0	960	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
888	0	0	984	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
899	0	0	985	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
922	0	0	989	0	2	0	0.142857143	-0.064285714	0.129285714	0.004132653	0.016714796
924	0	1	991	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
927	0	0	996	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
929	0	0	997	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
929	0	0	999	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
931	0	0	1017	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
949	0	0	1018	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
954	0	0	1024	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
960	0	0	1030	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
984	0	0	1035	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
985	0	0	1036	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
989	0	2	1060	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
991	0	0	1063	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
996	0	0	1064	12	1	0.857142857	0.071428571	0.792857143	0.057857143	0.628622449	0.003347449
997	0	0	1071	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
999	0	0	1081	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
1017	0	0	1090	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
1018	0	0	1100	0	1	0	0.071428571	-0.064285714	0.057857143	0.004132653	0.003347449
1024	0	0	1107	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
1030	0	0	1120	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
1035	0	0	1152	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
1036	0	0	1153	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
1060	0	0	1167	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
1063	0	0	1173	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
1064	9	0	1182	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
1064	3	1	1192	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
1071	0	0	1193	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
1071	0	0	1209	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
1081	0	0	1210	0	1	0	0.071428571	-0.064285714	0.057857143	0.004132653	0.003347449
1090	0	0	1211	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
1100	0	1	1237	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
1107	0	0	1245	7	1	0.5	0.071428571	0.435714286	0.057857143	0.189846939	0.003347449
1120	0	0	1249	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
1152	0	0	1252	1	0	0.071428571	0	0.007142857	-0.013571429	5.10204E-05	0.000184184
1153	0	0	1255	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
1167	0	0	1256	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
1173	0	0	1261	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
1182	0	0	1262	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
1192	0	0	1263	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
1193	0	0	1264	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
1209	0	0	1266	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
1210	0	1	1280	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
1211	0	0	1296	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
1237	0	0	1328	1	0	0.071428571	0	0.007142857	-0.013571429	5.10204E-05	0.000184184
1245	7	1	1340	3	0	0.214285714	0	0.15	-0.013571429	0.0225	0.000184184
1249	0	0	1346	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
1252	1	0	1353	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
1255	0	0	1354	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
1256	0	0	1370	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
1261	0	0	1372	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
1262	0	0	1375	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
1263	0	0	1389	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
1264	0	0	1394	9	2	0.642857143	0.142857143	0.578571429	0.129285714	0.334744898	0.016714796
1266	0	0	1400	0	0	0	0	-0.064285714	-0.013571429	0.004132653	0.000184184
1280	0	0									
1296	0	0									
1328	1	0									
1340	3	0									
1346	0	0									
1353	0	0									
1354	0	0									
1370	0	0									
1370	0	0									
1372	0	0									
1375	0	0									
1389	0	0									
1394	9	2									
1400	0	0									

11.4.11.2 Schwedt/Oder – C4 – Phase 2

O.R.C.U.S. 02.00 - Simulation Summary

UA Parameters

MTOW [kg]	Wingspan [m]	Length [m]	L/D
90	5	4	8

v [km/h]	Alt [m]	CCF [m]
100	100	9753.4262

P_CumCat [1/Fh]	Engine [%]	ESys [%]	FCS [%]	NavSys [%]	Struct [%]
0.01	20	20	20	20	20

General map parameters

	Name	Area [km2]	PPL	PPL/km2
City	Schwedt/Oder, Stadt	205.56	30075	146
County	Uckermark	3076.96	120349	39
FS	BB	29654.46	2504040	84

Mission specific map parameters

	Area [km2]	PPL	Tourists	Total PPL
City	66.8555	9761	0	9761
Map total	66.8555	9761	0	9761

PPL MOD NA

Sim FH [Fh] 19600 Ev/Fh [1/Fh] 0.0108673
Events total 213

Hits due to UA impacts		Hits/Fh [1/Fh]
City ATB	107	0.0054592
City OTW	25	0.0012755
Total	132	0.0067347

Prot	cyc	k_UA	Day	Time of impact	UA X Pos	UA Y Pos	Travelled Distance [km]	PPL_TD_CITY_ATB	PPL_CITY_ATB_COUNT	HIT_CITY_ATB_COUNT	PPL_TD_CITY_OTW	PPL_CITY_OTW_COUNT	HIT_CITY_OTW_COUNT	PPL_ALL_ATB_COUNT	PPL_ALL_OTW_COUNT	E	Case	Outcome
1028	128	2967	Saturday	18:28:02	6926	2518	1246.72	7759	7759	0	2002	2002	0	7759	2002	40	Short Circuit / Overload	Central UA ground impact point below flight path
1041	29	2835	Friday	08:48:27	6484	2248	280.78	8394	8394	0	1367	1367	0	8394	1367	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1042	142	1267	Saturday	19:47:11	4434	1873	1378.67	8882	8882	0	879	879	0	8882	879	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
1044	52	2878	Monday	11:03:07	6633	2336	505.22	7906	7906	0	1855	1855	0	7906	1855	71	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate
1058	19	1228	Monday	07:47:19	4545	1949	178.89	8296	8296	0	1465	1465	0	8296	1465	68	Degradation of lateral and horizontal navigation data accurracy.	UA approaches Emergency landing site
1064	27	1392	Sunday	08:34:24	4122	1646	257.36	8736	8736	0	1025	1025	0	8736	1025	36	Short Circuit / Overload	Central UA ground impact point below flight path
107	18	747	Tuesday	07:40:41	6226	2900	167.83	8248	8248	0	1513	1513	0	8248	1513	35	Connection Failure	UA ground impact tangential to trajectory
1082	53	3102	Thursday	11:09:20	7319	2781	515.58	7808	7808	4	1953	1953	0	7808	1953	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1086	57	2626	Monday	11:31:59	5722	1832	553.31	7906	7906	1	1855	1855	0	7906	1855	57	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
1086	6	1593	Monday	06:31:50	3795	1348	53.08	8296	8296	0	1465	1465	0	8296	1465	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1092	125	1709	Sunday	18:08:25	3717	1227	1214.06	7125	7125	0	2636	2636	0	7125	2636	35	Connection Failure	UA ground impact tangential to trajectory
1093	139	2040	Monday	19:30:53	3967	1131	1351.50	8833	8833	0	928	928	0	8833	928	72	Degradation of altitude	UA approaches Emergency landing site
1095	53	3277	Wednesday	11:09:38	7703	3080	516.06	7808	7808	0	1953	1953	0	7808	1953	67	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate
1101	125	879	Tuesday	18:07:05	5740	2654	1211.81	7320	7320	0	2441	2441	0	7320	2441	57	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
1108	49	1364	Tuesday	10:43:06	4185	1695	471.86	8004	8004	0	1757	1757	0	8004	1757	75	Degradation of altitude	UA approaches Emergency landing site
1108	84	582	Tuesday	14:06:40	6801	3161	811.11	7759	7759	0	2002	2002	0	7759	2002	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1113	65	2400	Sunday	12:18:25	4917	1452	630.72	7174	7174	15	2587	2587	2	7174	2587	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1123	43	644	Wednesday	10:06:49	6592	3070	411.39	7808	7808	2	1953	1953	0	7808	1953	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1123	95	476	Wednesday	15:10:52	7130	3292	918.11	7613	7613	0	2148	2148	0	7613	2148	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
1128	56	2514	Monday	11:25:56	5313	1631	543.25	7906	7906	0	1855	1855	0	7906	1855	40	Short Circuit / Overload	Central UA ground impact point below flight path
1132	39	2095	Friday	09:45:47	4073	1152	376.31	8394	8394	0	1367	1367	0	8394	1367	35	Connection Failure	UA ground impact tangential to trajectory
1141	54	938	Sunday	11:11:41	5523	2537	519.47	7174	7174	0	2587	2587	0	7174	2587	71	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate
115	11	520	Wednesday	06:59:21	6998	3242	98.94	8345	8345	0	1416	1416	0	8345	1416	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
1152	48	2104	Thursday	10:38:28	4091	1157	464.11	7808	7808	8	1953	1953	0	7808	1953	18	Engine Fire	UA structural desintegration - Debris Impact
1157	125	1812	Tuesday	18:08:36	3721	1156	1214.33	7320	7320	0	2441	2441	0	7320	2441	24	Generator Failure	UA ground impact tangential to trajectory
1159	28	2037	Thursday	08:41:19	3962	1130	268.86	8296	8296	0	1465	1465	0	8296	1465	14	Engine Anomaly	Central UA ground impact point below flight path
1159	89	2883	Thursday	14:39:40	6650	2347	866.11	7613	7613	0	2148	2148	0	7613	2148	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1161	47	3500	Saturday	10:34:53	7938	3353	458.14	7125	7125	0	2636	2636	0	7125	2636	28	Generator Failure	UA ground impact tangential to trajectory
1163	38	804	Monday	09:37:49	6017	2797	363.06	8296	8296	0	1465	1465	0	8296	1465	18	Engine Fire	UA structural desintegration - Debris Impact
117	63	2249	Friday	12:06:29	4450	1268	610.81	7711	7711	0	2050	2050	0	7711	2050	12	Engine Anomaly	Central UA ground impact point below flight path with B/G Ratio.
1174	71	1562	Friday	12:52:10	3830	1388	686.97	7711	7711	0	2050	2050	0	7711	2050	66	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point below flight path
1187	73	2288	Thursday	13:05:04	4563	1309	708.45	7613	7613	0	2148	2148	0	7613	2148	35	Connection Failure	UA ground impact tangential to trajectory
1189	101	1791	Saturday	15:48:07	3715	1168	980.19	7711	7711	0	2050	2050	0	7711	2050	29	Connection Failure	UA approaches Emergency landing site
1189	115	2962	Saturday	17:11:56	6910	2507	1119.92	7759	7759	0	2002	2002	0	7759	2002	74	Degradation of altitude	Central UA ground impact point below flight path
1189	116	1710	Saturday	17:15:45	3717	1227	1126.28	7759	7759	0	2002	2002	1	7759	2002	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
119	123	1250	Sunday	17:55:58	4482	1906	1193.30	7125	7125	0	2636	2636	0	7125	2636	17	Engine Fire	Central UA ground impact point below flight path
1196	78	2814	Saturday	13:35:10	6409	2205	758.64	7711	7711	0	2050	2050	1	7711	2050	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1198	70	1266	Monday	12:45:50	4436	1875	676.42	7906	7906	0	1855	1855	0	7906	1855	62	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
1198	95	3593	Monday	15:15:56	7943	3421	926.56	7564	7564	0	2197	2197	0	7564	2197	22	Generator Failure	UA approaches Emergency landing site
1209	128	1408	Friday	18:25:29	4087	1619	1242.50	7662	7662	0	2099	2099	0	7662	2099	38	Short Circuit / Overload	Central UA ground impact point below flight path
1209	95	3582	Friday	15:15:54	7945	3415	926.53	7564	7564	0	2197	2197	0	7564	2197	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1212	105	3406	Monday	16:14:09	7876	3255	1023.58	7223	7223	0	2538	2538	0	7223	2538	9	Engine Out	UA ground impact tangential to trajectory
1217	31	2423	Saturday	08:59:30	4994	1486	299.17	8004	8004	0	1757	1757	0	8004	1757	75	Degradation of altitude	UA approaches Emergency landing site
1221	21	3245	Wednesday	08:02:18	7645	3030	203.86	8296	8296	0	1465	1465	0	8296	1465	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1221	54	917	Wednesday	11:11:38	5600	2579	519.42	7808	7808	0	1953	1953	2	7808	1953	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1225	68	2950	Sunday	12:36:52	6872	2483	661.47	7174	7174	0	2587	2587	0	7174	2587	5	Engine Out	No Ground Effect
1236	35	1331	Thursday	09:21:08	4265	1754	335.22	8296	8296	0	1465	1465	0	8296	1465	72	Degradation of altitude	UA approaches Emergency landing site
124	130	2687	Friday	18:39:16	5947	1950	1265.47	7662	7662	0	2099	2099	0	7662	2099	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
1249	11	3320	Wednesday	07:03:55	7772	3143	106.53	8345	8345	0	1416	1416	0	8345	1416	31	Connection Failure	UA ground impact tangential to trajectory
1249	34	1035	Wednesday	09:14:48	5174	2340	324.67	8296	8296	0	1465	1465	0	8296	1465	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
1256	33	2338	Wednesday	09:11:03	4716	1369	318.44	8296	8296	3	1465	1465	0	8296	1465	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1261	61	2282	Monday	11:54:49	4545	1302	591.39	7906	7906	0	1855	1855	0	7906	1855	75	Degradation of altitude	UA approaches Emergency landing site
1283	123	1476	Tuesday	17:56:21	3957	1510	1193.92	7320	7320	0	2441	2441	0	7320	2441	20	Engine Fire	UA structural desintegration - Debris Impact
1283	80	3581	Tuesday	13:48:08	7945	3414	780.22	7759	7759	1	2002	2002	3	7759	2002	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1284	140	798	Wednesday	19:34:43	6040	2808	1357.89	8980	8980	0	781	781	0	8980	781	29	Connection Failure	UA approaches Emergency landing site
1292	97	63	Thursday	15:21:53	7910	3453	936.50	7613	7613	0	2148	2148	0	7613	2148	55	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
1304	140	2726	Tuesday	19:37:52	6091	2027	1363.11	8931	8931	0	830	830	0	8931	830	29	Connection Failure	UA approaches Emergency landing site
1312	109	3226	Wednesday	16:37:15	7608	2999	1062.11	7223	7223	0	2538	2538	0	7223	2538	72	Degradation of altitude	UA approaches Emergency landing site
1312	37	1072	Wednesday	09:32:24	5046	2264	354.03	8296	8296	0	1465	1465	0	8296	1465	72	Degradation of altitude	UA approaches Emergency landing site
1325	137	1674	Tuesday	19:18:36	3732	1260	1331.00	8931	8931	0	830	830	0	8931	830	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1325	27	1987	Tuesday	08:35:23	3882	1120	258.97	8394	8394	3	1367	1367	0	8394	1367	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
1329	39	2628	Saturday	09:46:39	5729	1836	377.75	8004	8004	0	1757	1757	0	8004	1757	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
1329	48	2268	Saturday	10:38:44	4504	1287	464.56	7125	7125	0	2636	2636	0	7125	2636	51	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
1346	19	910	Tuesday	07:46:48	5626	2593	178.03	8248	8248	0	1513	1513	0	8248	1513	21	Engine Fire	UA structural desintegration - Debris Impact
135	127	2004	Tuesday	18:20:37	3907	1123	1234.36	7320	7320	4	2441	2441	1	7320	2441	20	Engine Fire	UA structural desintegration - Debris Impact
135	14	2290	Tuesday	07:19:47	4569	1311	133.00	8248	8248	0	1513	1513	0	8248	1513	70	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate
1352	71	14	Monday	12:49:39	7936	3433	682.78	7906	7906	0	1855	1855	0	7906	1855	78	Degradation of altitude	Central UA ground impact point below flight path
1360	47	1100	Tuesday	10:30:58	4951	2207	451.64	8004	8004	0	1757	1757	0	8004	1757	28	Generator Failure	UA ground impact tangential to trajectory
1360	77	293	Tuesday	13:25:13	7589	3437	742.05	7759	7759	0	2002	2002	0	7759	2002	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
1376	52	2160	Thursday	11:01:57	4218	1191	503.28	7808	7808	0	1953	1953	0	7808	1953	29	Connection Failure	UA approaches Emergency landing site
138	142	3072	Friday	19:50:08	7238	2724	1383.56	9077	9077	0	684	684	0	9077	684	37	Short Circuit / Overload	Central UA ground impact point below flight path
1380	100	59	Monday	15:39:26	7913	3452	965.75	7564	7564	0	2197	2197	0	7564	2197	69	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point below flight path
1396	8	196	Wednesday	06:41:16	7763	3467	68.81	8345	8345	2	1416	1416	0	8345	1416	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1400	16	2903	Sunday	07:32:29	6717	2388	154.17	9419	9419	0	342	342	0	9419	342	78	Degradation of altitude	Central UA ground impact point below flight path
1400	78	2978	Sunday	13:35:26	6961	2540	759.08	6979	6979	0	2782	2782	0	6979	2782	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
145	92	2992	Friday	14:57:24	7004	2568	895.67	7564	7564	0	2197	2197	0	7564	2197	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
169	26	1640	Monday	08:28:58	3753	1294	248.28	8296	8296	0	1465	1465	0	8296	1465	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
173	14	2865	Friday	07:20:44	6588	2310	134.56	8443	8443	0	1318	1318	0	8443	1318	10	Engine Anomaly	UA approaches Emergency landing site
181	22	2393	Saturday	08:06:46	4894	1442	211.31	8004	8004	0	1757	1757	0	8004	1757	65	Degradation of lateral and horizontal navigation data accurracy.	UA approaches Emergency landing site
184	120	1193	Tuesday	17:38:20	4651	2018	1163.89	7320	7320	0	2441	2441	0	7320	2441	67	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate
195	73	862	Saturday	13:02:44	5803	2687	704.58	7711	7711	0	2050	2050	0	7711	2050	39	Short Circuit / Overload	Central UA ground impact point below flight path
196	83	2285	Sunday	14:03:34	4554	1306	805.97	6979	6979	0	2782	2782	0	6979	2782	29	Connection Failure	UA approaches Emergency landing site
198	34	2163	Tuesday	09:16:38	4225	1194	327.72	8394	8394	6	1367	1367	0	8394	1367	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
198	35	2612	Tuesday	09:23:12	5670	1806	338.69	8394	8394	11	1367	1367	0	8394	1367	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
198	82	585	Tuesday	13:54:58	6791	3157	791.61	7759	7759	2	2002	2002	2	7759	2002	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
199	24	504	Wednesday	08:15:24	7047	3261	225.69	8296	8296	0	1465	1465	0	8296	1465	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
2	101	2416	Tuesday	15:49:07	4971	1476	981.89	7759	7759	0	2002	2002	0	7759	2002	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
2	57	1006	Tuesday	11:29:21	5277	2399	548.92	8004	8004	0	1757	1757	1	8004	1757	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
207	71	2116	Thursday	12:53:05	4117	1163	688.47	7808	7808	0	1953	1953	0	7808	1953	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
211	140	2931	Monday	19:38:12	6810	2445	1363.67	8833	8833	0	928	928	0	8833	928	77	Degradation of altitude	Central UA ground impact point below flight path
212	4	1309	Tuesday	06:19:41	4321	1794	32.81	8248	8248	0	1513	1513	0	8248	1513	57	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
213	129	2658	Wednesday	18:33:23	5840	1893	1255.64	7223	7223	0	2538	2538	0	7223	2538	71	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate
22	12	3493	Monday	07:10:03	7935	3346	116.75	8296	8296	0	1465	1465	0	8296	1465	37	Short Circuit / Overload	Central UA ground impact point below flight path
232	56	576	Monday	11:22:47	6820	3169	538.00	7906	7906	1	1855	1855	0	7906	1855	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
239	14	845	Monday	07:17:27	5866	2720	129.08	8296	8296	0	1465	1465	0	8296	1465	24	Generator Failure	UA ground impact tangential to trajectory
240	20	694	Tuesday	07:52:19	6417	2990	187.20	8248	8248	0	1513	1513	0	8248	1513	55	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
257	76	1433	Friday	13:21:14	4036	1577	735.39	7564	7564	0	2197	2197	0	7564	2197	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
26	106	657	Friday	16:15:32	6547	3050	1025.89	7662	7662	0	2099	2099	0	7662	2099	32	Connection Failure	UA approaches Emergency landing site
260	14	691	Monday	07:17:12	6427	2995	128.67	8296	8296	0	1465	1465	0	8296	1465	67	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate
265	123	850	Saturday	17:55:19	5848	2710	1192.22	7759	7759	0	2002	2002	4	7759	2002	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
265	75	2316	Saturday	13:16:49	4647	1342	728.03	7711	7711	0	2050	2050	0	7711	2050	50	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
281	135	692	Monday	19:05:18	6424	2994	1308.83	8833	8833	0	928	928	0	8833	928	22	Generator Failure	UA approaches Emergency landing site
284	117	151	Thursday	17:19:05	7825	3469	1131.81	7271	7271	0	2490	2490	0	7271	2490	40	Short Circuit / Overload	Central UA ground impact point below flight path
29	78	846	Monday	13:31:59	5862	2718	753.31	7564	7564	0	2197	2197	0	7564	2197	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
29	83	1096	Monday	14:01:39	4964	2215	802.75	7564	7564	0	2197	2197	0	7564	2197	31	Connection Failure	UA ground impact tangential to trajectory
291	94	1082	Thursday	15:06:00	5012	2243	910.00	7613	7613	0	2148	2148	0	7613	2148	37	Short Circuit / Overload	Central UA ground impact point below flight path
294	45	2569	Sunday	10:21:39	5512	1727	436.11	7174	7174	0	2587	2587	0	7174	2587	76	Degradation of altitude	Central UA ground impact point below flight path
3	80	1520	Wednesday	13:44:46	3886	1445	774.64	7613	7613	0	2148	2148	0	7613	2148	78	Degradation of altitude	Central UA ground impact point below flight path
310	115	645	Tuesday	17:08:10	6588	3069	1113.64	7320	7320	0	2441	2441	0	7320	2441	17	Engine Fire	Central UA ground impact point below flight path
325	80	3396	Wednesday	13:47:49	7866	3243	779.72	7613	7613	0	2148	2148	1	7613	2148	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
337	92	1320	Monday	14:54:40	4292	1774	891.14	7564	7564	1	2197	2197	1	7564	2197	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
340	134	1001	Thursday	18:59:57	5295	2409	1299.92	8833	8833	0	928	928	1	8833	928	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
343	120	742	Sunday	17:37:36	6244	2909	1162.67	7125	7125	0	2636	2636	0	7125	2636	32	Connection Failure	UA approaches Emergency landing site
350	105	2134	Sunday	16:12:04	4157	1174	1020.14	7125	7125	0	2636	2636	0	7125	2636	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
351	109	2621	Monday	16:36:16	5703	1823	1060.47	7223	7223	0	2538	2538	0	7223	2538	50	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
352	9	1856	Tuesday	06:49:50	3743	1137	83.06	8248	8248	0	1513	1513	0	8248	1513	42	Partial Lock of Flight Control Surfaces	Central UA ground impact point below flight path
364	135	2968	Sunday	19:09:00	6929	2520	1315.00	8638	8638	2	1123	1123	0	8638	1123	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
370	137	1079	Saturday	19:17:38	5022	2250	1329.39	8882	8882	0	879	879	0	8882	879	73	Degradation of altitude	Central UA ground impact point below flight path
378	136	2895	Sunday	19:14:44	6691	2371	1324.56	8638	8638	0	1123	1123	0	8638	1123	75	Degradation of altitude	UA approaches Emergency landing site
39	65	503	Thursday	12:15:20	7050	3262	625.58	7808	7808	0	1953	1953	0	7808	1953	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
390	76	951	Friday	13:20:27	5476	2511	734.08	7564	7564	0	2197	2197	0	7564	2197	49	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
392	96	1613	Sunday	15:18:34	3775	1325	930.95	6979	6979	0	2782	2782	0	6979	2782	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
398	97	412	Saturday	15:22:28	7309	3355	937.45	7711	7711	0	2050	2050	0	7711	2050	29	Connection Failure	UA approaches Emergency landing site
404	85	3503	Friday	14:17:16	7939	3355	828.78	7564	7564	0	2197	2197	0	7564	2197	22	Generator Failure	UA approaches Emergency landing site
412	91	788	Saturday	14:47:57	6076	2826	879.94	7711	7711	0	2050	2050	0	7711	2050	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
418	6	332	Friday	06:29:47	7505	3415	49.67	8443	8443	0	1318	1318	0	8443	1318	72	Degradation of altitude	UA approaches Emergency landing site
418	89	2883	Friday	14:39:40	6650	2347	866.11	7564	7564	0	2197	2197	0	7564	2197	19	Engine Fire	Central UA ground impact point below flight path
431	20	3585	Thursday	07:57:01	7945	3417	195.03	8394	8394	0	1367	1367	0	8394	1367	36	Short Circuit / Overload	Central UA ground impact point below flight path
440	35	1515	Saturday	09:21:25	3894	1452	335.72	8004	8004	0	1757	1757	0	8004	1757	74	Degradation of altitude	Central UA ground impact point below flight path
449	1	2010	Monday	06:03:16	3917	1124	5.45	8296	8296	0	1465	1465	0	8296	1465	76	Degradation of altitude	Central UA ground impact point below flight path
450	136	967	Tuesday	19:11:35	5418	2479	1319.33	8931	8931	0	830	830	0	8931	830	9	Engine Out	UA ground impact tangential to trajectory
46	127	2240	Thursday	18:21:00	4425	1259	1235.00	7271	7271	0	2490	2490	0	7271	2490	71	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate
469	95	1511	Sunday	15:12:32	3900	1458	920.92	6979	6979	0	2782	2782	0	6979	2782	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
47	49	462	Friday	10:41:38	7171	3307	469.42	7711	7711	0	2050	2050	0	7711	2050	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
471	95	3111	Tuesday	15:15:09	7342	2797	925.25	7759	7759	0	2002	2002	0	7759	2002	17	Engine Fire	Central UA ground impact point below flight path
480	117	1555	Thursday	17:21:21	3838	1397	1135.61	7271	7271	0	2490	2490	0	7271	2490	63	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
480	8	3395	Thursday	06:46:28	7865	3242	77.47	8394	8394	0	1367	1367	0	8394	1367	65	Degradation of lateral and horizontal navigation data accurracy.	UA approaches Emergency landing site
487	114	3292	Thursday	17:06:38	7728	3102	1111.06	7271	7271	0	2490	2490	0	7271	2490	42	Partial Lock of Flight Control Surfaces	Central UA ground impact point below flight path
487	2	1885	Thursday	06:08:54	3765	1128	14.86	8394	8394	0	1367	1367	0	8394	1367	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
497	23	239	Sunday	08:09:08	7693	3457	215.22	8736	8736	0	1025	1025	0	8736	1025	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
515	53	1769	Thursday	11:07:10	3711	1182	511.97	7808	7808	0	1953	1953	0	7808	1953	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.

523	113	176	Friday	16:55:42	7792	3469	1092.86	7662	7662	0	2099	2099	0	7662	2099	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
529	114	2277	Thursday	17:04:59	4530	1297	1108.31	7271	7271	0	2490	2490	0	7271	2490	78	Degradation of altitude	Central UA ground impact point below flight path
53	124	736	Thursday	18:00:59	6266	2919	1201.67	7271	7271	4	2490	2490	0	7271	2490	21	Engine Fire	UA structural desintegration - Debris Impact
53	30	199	Thursday	08:50:01	7758	3466	283.39	8296	8296	0	1465	1465	0	8296	1465	51	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
532	91	2634	Sunday	14:50:58	5751	1847	884.94	6979	6979	1	2782	2782	0	6979	2782	66	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
556	34	2993	Wednesday	09:17:58	7007	2570	329.97	8296	8296	1	1465	1465	0	8296	1465	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
564	126	1431	Thursday	18:13:49	4040	1581	1223.06	7271	7271	0	2490	2490	0	7271	2490	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
575	79	2116	Monday	13:39:54	4117	1163	766.50	7564	7564	9	2197	2197	0	7564	2197	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
582	37	2395	Monday	09:34:34	4900	1445	357.61	8296	8296	0	1465	1465	0	8296	1465	30	Connection Failure	Central UA ground impact point below flight path
585	69	119	Thursday	12:38:07	7861	3467	663.56	7808	7808	0	1953	1953	0	7808	1953	39	Short Circuit / Overload	Central UA ground impact point below flight path
587	17	3404	Saturday	07:39:09	7874	3253	165.28	9272	9272	0	489	489	0	9272	489	78	Degradation of altitude	Central UA ground impact point below flight path
587	39	3417	Saturday	09:47:55	7886	3268	379.89	8004	8004	0	1757	1757	0	8004	1757	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
597	106	2810	Tuesday	16:19:02	6395	2197	1031.72	7320	7320	0	2441	2441	0	7320	2441	19	Engine Fire	Central UA ground impact point below flight path
601	90	2840	Saturday	14:45:26	6501	2258	875.75	7711	7711	6	2050	2050	0	7711	2050	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
608	26	3506	Saturday	08:32:00	7940	3358	253.33	8004	8004	0	1757	1757	0	8004	1757	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
617	59	1321	Monday	11:41:33	4290	1772	569.28	7906	7906	0	1855	1855	0	7906	1855	67	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
626	83	2829	Wednesday	14:04:28	6462	2236	807.45	7613	7613	0	2148	2148	0	7613	2148	52	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
632	131	851	Tuesday	18:42:09	5844	2708	1270.25	7320	7320	0	2441	2441	0	7320	2441	10	Engine Anomaly	UA approaches Emergency landing site
637	47	895	Sunday	10:30:38	5681	2623	451.08	7174	7174	0	2587	2587	0	7174	2587	63	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
641	143	241	Thursday	19:51:23	7689	3457	1385.64	8833	8833	0	928	928	0	8833	928	29	Connection Failure	UA approaches Emergency landing site
643	130	3077	Saturday	18:39:55	7252	2734	1266.53	7759	7759	4	2002	2002	0	7759	2002	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
647	103	466	Wednesday	15:57:40	7159	3303	996.11	7223	7223	0	2538	2538	0	7223	2538	72	Degradation of altitude	UA approaches Emergency landing site
655	114	2133	Thursday	17:04:44	4155	1174	1107.92	7271	7271	0	2490	2490	0	7271	2490	8	Engine Out	UA ground impact tangential to trajectory
664	63	2023	Saturday	12:06:06	3938	1126	610.19	7125	7125	1	2636	2636	3	7125	2636	20	Engine Fire	UA structural desintegration - Debris Impact
665	63	926	Sunday	12:04:19	5567	2561	607.22	7174	7174	0	2587	2587	0	7174	2587	3	Engine Out	Central UA ground impact point below flight path
672	107	2132	Sunday	16:23:47	4153	1173	1039.64	7125	7125	0	2636	2636	0	7125	2636	40	Short Circuit / Overload	Central UA ground impact point below flight path
681	80	3396	Tuesday	13:47:49	7866	3243	779.72	7759	7759	0	2002	2002	0	7759	2002	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
681	8	2011	Tuesday	06:44:14	3918	1124	73.72	8248	8248	2	1513	1513	1	8248	1513	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
685	30	2885	Saturday	08:54:23	6657	2351	290.67	8004	8004	2	1757	1757	0	8004	1757	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
687	52	3011	Monday	11:03:20	7062	2605	505.58	7906	7906	3	1855	1855	0	7906	1855	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
688	19	2202	Tuesday	07:48:54	4323	1224	181.53	8248	8248	0	1513	1513	0	8248	1513	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
690	110	1092	Thursday	16:39:38	4978	2223	1066.08	7271	7271	0	2490	2490	0	7271	2490	70	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
699	26	1804	Saturday	08:29:14	3718	1161	248.72	8004	8004	0	1757	1757	0	8004	1757	77	Degradation of altitude	Central UA ground impact point below flight path
72	127	1153	Tuesday	18:19:13	4776	2099	1232.06	7320	7320	0	2441	2441	0	7320	2441	66	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
725	83	3557	Thursday	14:05:39	7947	3398	809.42	7613	7613	0	2148	2148	0	7613	2148	40	Short Circuit / Overload	Central UA ground impact point below flight path
725	91	2726	Thursday	14:51:06	6091	2027	885.19	7613	7613	0	2148	2148	0	7613	2148	4	Engine Out	Central ground impact point below flight path with B/G Ratio.
728	109	1217	Sunday	16:34:00	4578	1971	1056.67	7125	7125	0	2636	2636	0	7125	2636	22	Generator Failure	UA approaches Emergency landing site
730	110	3317	Tuesday	16:43:15	7767	3139	1072.11	7320	7320	0	2441	2441	0	7320	2441	1	Engine Out	No Ground Effect
742	99	1045	Sunday	15:35:12	5139	2319	958.67	6979	6979	0	2782	2782	0	6979	2782	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
747	54	1225	Friday	11:12:09	4554	1955	520.25	7711	7711	0	2050	2050	0	7711	2050	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
750	102	641	Monday	15:52:05	6602	3075	986.83	7564	7564	0	2197	2197	0	7564	2197	23	Generator Failure	Central UA ground impact point below flight path
777	55	229	Sunday	11:16:22	7710	3460	527.31	7174	7174	0	2587	2587	0	7174	2587	37	Short Circuit / Overload	Central UA ground impact point below flight path
778	141	2745	Monday	19:43:45	6160	2065	1372.92	8833	8833	0	928	928	0	8833	928	75	Degradation of altitude	UA approaches Emergency landing site
780	24	1068	Wednesday	08:16:20	5060	2272	227.22	8296	8296	0	1465	1465	0	8296	1465	73	Degradation of altitude	Central UA ground impact point below flight path
799	75	1403	Monday	13:15:19	4098	1627	725.55	7564	7564	0	2197	2197	0	7564	2197	62	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
813	123	256	Monday	17:54:22	7662	3452	1190.61	7223	7223	0	2538	2538	0	7223	2538	37	Short Circuit / Overload	Central UA ground impact point below flight path
818	16	2226	Saturday	07:31:23	4387	1246	152.33	9272	9272	0	489	489	0	9272	489	36	Short Circuit / Overload	Central UA ground impact point below flight path
818	96	157	Saturday	15:16:12	7817	3469	927.00	7711	7711	0	2050	2050	0	7711	2050	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
839	135	3573	Saturday	19:09:59	7946	3409	1316.64	8882	8882	2	879	879	0	8882	879	18	Engine Fire	UA structural desintegration - Debris Impact
844	81	832	Thursday	13:49:31	5914	2744	782.53	7613	7613	0	2148	2148	0	7613	2148	29	Connection Failure	UA approaches Emergency landing site
856	29	1585	Tuesday	08:46:26	3803	1358	277.39	8394	8394	0	1367	1367	0	8394	1367	67	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
864	53	3430	Wednesday	11:09:52	7897	3283	516.47	7808	7808	0	1953	1953	0	7808	1953	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
869	135	2404	Monday	19:08:05	4930	1458	1313.47	8833	8833	0	928	928	0	8833	928	22	Generator Failure	UA approaches Emergency landing site
873	116	2859	Friday	17:17:38	6567	2297	1129.39	7662	7662	0	2099	2099	0	7662	2099	37	Short Circuit / Overload	Central UA ground impact point below flight path
882	53	1852	Sunday	11:07:19	3741	1139	512.20	7174	7174	0	2587	2587	0	7174	2587	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
901	9	3291	Friday	06:52:09	7726	3101	86.94	8443	8443	0	1318	1318	0	8443	1318	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
903	48	2494	Sunday	10:39:06	5241	1598	465.17	7174	7174	0	2587	2587	0	7174	2587	37	Short Circuit / Overload	Central UA ground impact point below flight path
912	83	327	Tuesday	14:00:24	7516	3418	800.67	7759	7759	0	2002	2002	0	7759	2002	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
916	84	2089	Sunday	14:09:06	4060	1150	815.19	7711	7711	0	2050	2050	0	7711	2050	30	Connection Failure	Central UA ground impact point below flight path
924	30	148	Sunday	08:49:57	7828	3469	283.25	8736	8736	0	1025	1025	0	8736	1025	68	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
930	132	3382	Saturday	18:52:07	7852	3226	1286.86	7759	7759	0	2002	2002	0	7759	2002	78	Degradation of altitude	Central UA ground impact point below flight path
930	60	2171	Saturday	11:48:48	4245	1199	581.33	7125	7125	0	2636	2636	0	7125	2636	69	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
941	13	1400	Wednesday	07:12:30	4104	1632	120.83	8345	8345	0	1416	1416	0	8345	1416	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
951	63	24	Saturday	12:02:51	7932	3438	604.78	7125	7125	0	2636	2636	0	7125	2636	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
97	62	528	Saturday	11:57:50	6974	3232	596.39	7125	7125	1	2636	2636	0	7125	2636	34	Connection Failure	UA ground impact tangential to trajectory
973	80	2125	Sunday	13:45:46	4137	1169	776.28	6979	6979	0	2782	2782	0	6979	2782	78	Degradation of altitude	Central UA ground impact point below flight path
981	50	2470	Monday	10:50:45	5157	1559	484.61	7906	7906	0	1855	1855	0	7906	1855	67	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
987	83	2377	Sunday	14:03:43	4841	1420	806.22	6979	6979	2	2782	2782	1	6979	2782	21	Engine Fire	UA structural desintegration - Debris Impact
988	17	708	Monday	07:34:47	6367	2967	157.97	8296	8296	2	1465	1465	0	8296	1465	15	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
988	70	2907	Monday	12:48:31	6731	2396	680.86	7906	7906	1	1855	1855	0	7906	1855	66	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
99	17	800	Monday	07:34:56	6032	2804	158.22	8296	8296	0	1465	1465	0	8296	1465	73	Degradation of altitude	Central UA ground impact point below flight path
993	79	1060	Saturday	13:38:11	5087	2289	763.64	7711	7711	0	2050	2050	0	7711	2050	78	Degradation of altitude	Central UA ground impact point below flight path

O.R.C.U.S. 02.00 - tTest of the Simulation

nProbes	200
nEvents	213
nEvents_cor	181
tMission	14
x_cross_ATB	0.535
x_cross_OTW	0.125
x_cross_TOT	0.66
s2ATB	0.26972
sATB	0.5193458
tATB	14.296104
s2OTW	0.0148703
sOTW	0.1219437
tOTW	13.336855
s2TOT	0.4040652
sTOT	0.6356612
tTOT	14.461143

UADay/Prot	HIT_TOT_ATB	HIT_TOT_OTW	UADay/Prot cor	HIT_TOT_mean_ATB	HIT_TOT_mean_OTW	HIT_TOT_mean_ATB/Fh	HIT_TOT_mean_OTW/Fh	x_i-x_cross ATB	x_i-x_cross OTW	(x_i-x_cross ATB)^2	(x_i-x_cross OTW)^2
2	0	0	2	0	1	0	0.071428571	-0.535	-0.053571429	0.286225	0.002869898
2	0	1	3	0	0	0	0	-0.535	-0.125	0.286225	0.015625
3	0	0	22	0	0	0	0	-0.535	-0.125	0.286225	0.015625
22	0	0	26	0	0	0	0	-0.535	-0.125	0.286225	0.015625
26	0	0	29	0	0	0	0	-0.535	-0.125	0.286225	0.015625
29	0	0	39	0	0	0	0	-0.535	-0.125	0.286225	0.015625
29	0	0	46	0	0	0	0	-0.535	-0.125	0.286225	0.015625
39	0	0	47	0	0	0	0	-0.535	-0.125	0.286225	0.015625
46	0	0	53	4	0	0.285714286	0	-0.249285714	-0.125	0.062143367	0.015625
47	0	0	72	0	0	0	0	-0.535	-0.125	0.286225	0.015625
53	4	0	97	1	0	0.071428571	0	-0.463571429	-0.125	0.214898469	0.015625
53	0	0	99	0	0	0	0	-0.535	-0.125	0.286225	0.015625
72	0	0	107	0	0	0	0	-0.535	-0.125	0.286225	0.015625
97	1	0	115	0	0	0	0	-0.535	-0.125	0.286225	0.015625
99	0	0	117	0	0	0	0	-0.535	-0.125	0.286225	0.015625
107	0	0	119	0	0	0	0	-0.535	-0.125	0.286225	0.015625
115	0	0	124	0	0	0	0	-0.535	-0.125	0.286225	0.015625
117	0	0	135	4	1	0.285714286	0.071428571	-0.249285714	-0.053571429	0.062143367	0.002869898
119	0	0	138	0	0	0	0	-0.535	-0.125	0.286225	0.015625
124	0	0	145	0	0	0	0	-0.535	-0.125	0.286225	0.015625
135	4	1	169	0	0	0	0	-0.535	-0.125	0.286225	0.015625
135	0	0	173	0	0	0	0	-0.535	-0.125	0.286225	0.015625
138	0	0	181	0	0	0	0	-0.535	-0.125	0.286225	0.015625
145	0	0	184	0	0	0	0	-0.535	-0.125	0.286225	0.015625
169	0	0	195	0	0	0	0	-0.535	-0.125	0.286225	0.015625
173	0	0	196	0	0	0	0	-0.535	-0.125	0.286225	0.015625
181	0	0	198	19	2	1.357142857	0.142857143	0.822142857	0.017857143	0.675918878	0.000318878
184	0	0	199	0	0	0	0	-0.535	-0.125	0.286225	0.015625
195	0	0	207	0	0	0	0	-0.535	-0.125	0.286225	0.015625
196	0	0	211	0	0	0	0	-0.535	-0.125	0.286225	0.015625
198	6	0	212	0	0	0	0	-0.535	-0.125	0.286225	0.015625
198	11	0	213	0	0	0	0	-0.535	-0.125	0.286225	0.015625
198	2	2	232	1	0	0.071428571	0	-0.463571429	-0.125	0.214898469	0.015625
199	0	0	239	0	0	0	0	-0.535	-0.125	0.286225	0.015625
207	0	0	240	0	0	0	0	-0.535	-0.125	0.286225	0.015625
211	0	0	257	0	0	0	0	-0.535	-0.125	0.286225	0.015625
212	0	0	260	0	0	0	0	-0.535	-0.125	0.286225	0.015625
213	0	0	265	0	4	0	0.285714286	-0.535	0.160714286	0.286225	0.025829082
232	1	0	281	0	0	0	0	-0.535	-0.125	0.286225	0.015625
239	0	0	284	0	0	0	0	-0.535	-0.125	0.286225	0.015625
240	0	0	291	0	0	0	0	-0.535	-0.125	0.286225	0.015625
257	0	0	294	0	0	0	0	-0.535	-0.125	0.286225	0.015625
260	0	0	310	0	0	0	0	-0.535	-0.125	0.286225	0.015625
265	0	4	325	0	1	0	0.071428571	-0.535	-0.053571429	0.286225	0.002869898
265	0	0	337	1	1	0.071428571	0.071428571	-0.463571429	-0.053571429	0.214898469	0.002869898
281	0	0	340	0	1	0	0.071428571	-0.535	-0.053571429	0.286225	0.002869898
284	0	0	343	0	0	0	0	-0.535	-0.125	0.286225	0.015625
291	0	0	350	0	0	0	0	-0.535	-0.125	0.286225	0.015625
294	0	0	351	0	0	0	0	-0.535	-0.125	0.286225	0.015625
310	0	0	352	0	0	0	0	-0.535	-0.125	0.286225	0.015625
325	0	1	364	2	0	0.142857143	0	-0.392142857	-0.125	0.15377602	0.015625
337	1	1	370	0	0	0	0	-0.535	-0.125	0.286225	0.015625
340	0	1	378	0	0	0	0	-0.535	-0.125	0.286225	0.015625
343	0	0	390	0	0	0	0	-0.535	-0.125	0.286225	0.015625
350	0	0	392	0	0	0	0	-0.535	-0.125	0.286225	0.015625
351	0	0	398	0	0	0	0	-0.535	-0.125	0.286225	0.015625
352	0	0	404	0	0	0	0	-0.535	-0.125	0.286225	0.015625
364	2	0	412	0	0	0	0	-0.535	-0.125	0.286225	0.015625
370	0	0	418	0	0	0	0	-0.535	-0.125	0.286225	0.015625
378	0	0	431	0	0	0	0	-0.535	-0.125	0.286225	0.015625
390	0	0	440	0	0	0	0	-0.535	-0.125	0.286225	0.015625
392	0	0	449	0	0	0	0	-0.535	-0.125	0.286225	0.015625
398	0	0	450	0	0	0	0	-0.535	-0.125	0.286225	0.015625
404	0	0	469	0	0	0	0	-0.535	-0.125	0.286225	0.015625
412	0	0	471	0	0	0	0	-0.535	-0.125	0.286225	0.015625
418	0	0	480	0	0	0	0	-0.535	-0.125	0.286225	0.015625
418	0	0	487	0	0	0	0	-0.535	-0.125	0.286225	0.015625
431	0	0	497	0	0	0	0	-0.535	-0.125	0.286225	0.015625
440	0	0	515	0	0	0	0	-0.535	-0.125	0.286225	0.015625
449	0	0	523	0	0	0	0	-0.535	-0.125	0.286225	0.015625
450	0	0	529	0	0	0	0	-0.535	-0.125	0.286225	0.015625
469	0	0	532	1	0	0.071428571	0	-0.463571429	-0.125	0.214898469	0.015625
471	0	0	556	1	0	0.071428571	0	-0.463571429	-0.125	0.214898469	0.015625
480	0	0	564	0	0	0	0	-0.535	-0.125	0.286225	0.015625
480	0	0	575	9	0	0.642857143	0	0.107857143	-0.125	0.011633163	0.015625
487	0	0	582	0	0	0	0	-0.535	-0.125	0.286225	0.015625
487	0	0	585	0	0	0	0	-0.535	-0.125	0.286225	0.015625
497	0	0	587	0	0	0	0	-0.535	-0.125	0.286225	0.015625
515	0	0	597	0	0	0	0	-0.535	-0.125	0.286225	0.015625
523	0	0	601	6	0	0.428571429	0	-0.106428571	-0.125	0.011327041	0.015625
529	0	0	608	0	0	0	0	-0.535	-0.125	0.286225	0.015625
532	1	0	617	0	0	0	0	-0.535	-0.125	0.286225	0.015625
556	1	0	626	0	0	0	0	-0.535	-0.125	0.286225	0.015625
564	0	0	632	0	0	0	0	-0.535	-0.125	0.286225	0.015625
575	9	0	637	0	0	0	0	-0.535	-0.125	0.286225	0.015625
582	0	0	641	0	0	0	0	-0.535	-0.125	0.286225	0.015625
585	0	0	643	4	0	0.285714286	0	-0.249285714	-0.125	0.062143367	0.015625
587	0	0	647	0	0	0	0	-0.535	-0.125	0.286225	0.015625
587	0	0	655	0	0	0	0	-0.535	-0.125	0.286225	0.015625
597	0	0	664	1	3	0.071428571	0.214285714	-0.463571429	0.089285714	0.214898469	0.007971939
601	6	0	665	0	0	0	0	-0.535	-0.125	0.286225	0.015625
608	0	0	672	0	0	0	0	-0.535	-0.125	0.286225	0.015625
617	0	0	681	2	1	0.142857143	0.071428571	-0.392142857	-0.053571429	0.15377602	0.002869898
626	0	0	685	2	0	0.142857143	0	-0.392142857	-0.125	0.15377602	0.015625
632	0	0	687	3	0	0.214285714	0	-0.320714286	-0.125	0.102857653	0.015625
637	0	0	688	0	0	0	0	-0.535	-0.125	0.286225	0.015625
641	0	0	690	0	0	0	0	-0.535	-0.125	0.286225	0.015625
643	4	0	699	0	0	0	0	-0.535	-0.125	0.286225	0.015625
647	0	0	725	0	0	0	0	-0.535	-0.125	0.286225	0.015625
655	0	0	728	0	0	0	0	-0.535	-0.125	0.286225	0.015625
664	1	3	730	0	0	0	0	-0.535	-0.125	0.286225	0.015625
665	0	0	742	0	0	0	0	-0.535	-0.125	0.286225	0.015625
672	0	0	747	0	0	0	0	-0.535	-0.125	0.286225	0.015625
681	0	0	750	0	0	0	0	-0.535	-0.125	0.286225	0.015625
681	2	1	777	0	0	0	0	-0.535	-0.125	0.286225	0.015625
685	2	0	778	0	0	0	0	-0.535	-0.125	0.286225	0.015625
687	3	0	780	0	0	0	0	-0.535	-0.125	0.286225	0.015625
688	0	0	799	0	0	0	0	-0.535	-0.125	0.286225	0.015625
690	0	0	813	0	0	0	0	-0.535	-0.125	0.286225	0.015625
699	0	0	818	0	0	0	0	-0.535	-0.125	0.286225	0.015625
725	0	0	839	2	0	0.142857143	0	-0.392142857	-0.125	0.15377602	0.015625
725	0	0	844	0	0	0	0	-0.535	-0.125	0.286225	0.015625
728	0	0	856	0	0	0	0	-0.535	-0.125	0.286225	0.015625
730	0	0	864	0	0	0	0	-0.535	-0.125	0.286225	0.015625
742	0	0	869	0	0	0	0	-0.535	-0.125	0.286225	0.015625
747	0	0	873	0	0	0	0	-0.535	-0.125	0.286225	0.015625
750	0	0	882	0	0	0	0	-0.535	-0.125	0.286225	0.015625
777	0	0	901	0	0	0	0	-0.535	-0.125	0.286225	0.015625
778	0	0	903	0	0	0	0	-0.535	-0.125	0.286225	0.015625
780	0	0	912	0	0	0	0	-0.535	-0.125	0.286225	0.015625
799	0	0	916	0	0	0	0	-0.535	-0.125	0.286225	0.015625
813	0	0	924	0	0	0	0	-0.535	-0.125	0.286225	0.015625
818	0	0	930	0	0	0	0	-0.535	-0.125	0.286225	0.015625
818	0	0	941	0	0	0	0	-0.535	-0.125	0.286225	0.015625
839	2	0	951	0	0	0	0	-0.535	-0.125	0.286225	0.015625
844	0	0	973	0	0	0	0	-0.535	-0.125	0.286225	0.015625
856	0	0	981	0	0	0	0	-0.535	-0.125	0.286225	0.015625
864	0	0	987	2	1	0.142857143	0.071428571	-0.392142857	-0.053571429	0.15377602	0.002869898
869	0	0	988	3	0	0.214285714	0	-0.320714286	-0.125	0.102857653	0.015625
873	0	0	993	0	0	0	0	-0.535	-0.125	0.286225	0.015625
882	0	0	1028	0	0	0	0	-0.535	-0.125	0.286225	0.015625
901	0	0	1041	0	0	0	0	-0.535	-0.125	0.286225	0.015625
903	0	0	1042	0	0	0	0	-0.535	-0.125	0.286225	0.015625
912	0	0	1044	0	0	0	0	-0.535	-0.125	0.286225	0.015625
916	0	0	1058	0	0	0	0	-0.535	-0.125	0.286225	0.015625
924	0	0	1064	0	0	0	0	-0.535	-0.125	0.286225	0.015625
930	0	0	1082	4	0	0.285714286	0	-0.249285714	-0.125	0.062143367	0.015625
930	0	0	1086	1	0	0.071428571	0	-0.463571429	-0.125	0.214898469	0.015625
941	0	0	1092	0	0	0	0	-0.535	-0.125	0.286225	0.015625
951	0	0	1093	0	0	0	0	-0.535	-0.125	0.286225	0.015625
973	0	0	1095	0	0	0	0	-0.535	-0.125	0.286225	0.015625
981	0	0	1101	0	0	0	0	-0.535	-0.125	0.286225	0.015625
987	2	1	1108	0	0	0	0	-0.535	-0.125	0.286225	0.015625
988	2	0	1113	15	2	1.071428571	0.142857143	0.536428571	0.017857143	0.287755612	0.000318878
988	1	0	1123	2	0	0.142857143	0	-0.392142857	-0.125	0.15377602	0.015625
993	0	0	1128	0	0	0	0	-0.535	-0.125	0.286225	0.015625
1028	0	0	1132	0	0	0	0	-0.535	-0.125	0.286225	0.015625
1041	0	0	1141	0	0	0	0	-0.535	-0.125	0.286225	0.015625
1042	0	0	1152	8	0	0.571428571	0	0.036428571	-0.125	0.001327041	0.015625
1044	0	0	1157	0	0	0	0	-0.535	-0.125	0.286225	0.015625
1058	0	0	1159	0	0	0	0	-0.535	-0.125	0.286225	0.015625
1064	0	0	1161	0	0	0	0	-0.535	-0.125	0.286225	0.015625
1082	4	0	1163	0	0	0	0	-0.535	-0.125	0.286225	0.015625
1086	1	0	1174	0	0	0	0	-0.535	-0.125	0.286225	0.015625
1086	0	0	1187	0	0	0	0	-0.535	-0.125	0.286225	0.015625
1092	0	0	1189	0	1	0	0.071428571	-0.535	-0.053571429	0.286225	0.002869898
1093	0	0	1196	0	1	0	0.071428571	-0.535	-0.053571429	0.286225	0.002869898
1095	0	0	1198	0	0	0	0	-0.535	-0.125	0.286225	0.015625
1101	0	0	1209	0	0	0	0	-0.535	-0.125	0.286225	0.015625
1108	0	0	1212	0	0	0	0	-0.535	-0.125	0.286225	0.015625
1108	0	0	1217	0	0	0	0	-0.535	-0.125	0.286225	0.015625
1113	15	2	1221	0	2	0	0.142857143	-0.535	0.017857143	0.286225	0.000318878
1123	2	0	1225	0	0	0	0	-0.535	-0.125	0.286225	0.015625
1123	0	0	1236	0	0	0	0	-0.535	-0.125	0.286225	0.015625
1128	0	0	1249	0	0	0	0	-0.535	-0.125	0.286225	0.015625
1132	0	0	1256	3	0	0.214285714	0	-0.320714286	-0.125	0.102857653	0.015625
1141	0	0	1261	0	0	0	0	-0.535	-0.125	0.286225	0.015625
1152	8	0	1283	1	3	0.071428571	0.214285714	-0.463571429	0.089285714	0.214898469	0.007971939
1157	0	0	1284	0	0	0	0	-0.535	-0.125	0.286225	0.015625
1159	0	0	1292	0	0	0	0	-0.535	-0.125	0.286225	0.015625
1159	0	0	1304	0	0	0	0	-0.535	-0.125	0.286225	0.015625
1161	0	0	1312	0	0	0	0	-0.535	-0.125	0.286225	0.015625
1163	0	0	1325	3	0	0.214285714	0	-0.320714286	-0.125	0.102857653	0.015625
1174	0	0	1329	0	0	0	0	-0.535	-0.125	0.286225	0.015625
1187	0	0	1346	0	0	0	0	-0.535	-0.125	0.286225	0.015625
1189	0	0	1352	0	0	0	0	-0.535	-0.125	0.286225	0.015625
1189	0	0	1360	0	0	0	0	-0.535	-0.125	0.286225	0.015625
1189	0	1	1376	0	0	0	0	-0.535	-0.125	0.286225	0.015625
1196	0	1	1380	0	0	0	0	-0.535	-0.125	0.286225	0.015625
1198	0	0	1396	2	0	0.142857143	0	-0.392142857	-0.125	0.15377602	0.015625
1198	0	0	1400	0	0	0	0	-0.535	-0.125	0.286225	0.015625
1209	0	0									
1209	0	0									
1212	0	0									
1217	0	0									
1221	0	0									
1221	0	2									
1225	0	0									
1236	0	0									
1249	0	0									
1249	0	0									
1256	3	0									
1261	0	0									
1283	0	0									
1283	1	3									
1284	0	0									
1292	0	0									
1304	0	0									
1312	0	0									
1312	0	0									
1325	0	0									
1325	3	0									
1329	0	0									
1329	0	0									
1346	0	0									
1352	0	0									
1360	0	0									
1360	0	0									
1376	0	0									
1380	0	0									
1396	2	0									
1400	0	0									
1400	0	0									

11.4.12 Kemberg – C5

11.4.12.1 Kemberg – C5 – Phase 1

O.R.C.U.S. 02.00 - Simulation Summary

UA Parameters

MTOW [kg]	Wingspan [m]	Length [m]	L/D
90	5	4	8

v [km/h]	Alt [m]	CCF [m]
100	100	8296.0218

P_CumCat [1/Fh]	Engine [%]	ESys [%]	FCS [%]	NavSys [%]	Struct [%]
0.01	20	20	20	20	20

General map parameters

	Name	Area [km2]	PPL	PPL/km2
City	Kemberg, Stadt	235.22	9799	42
County	Wittenberg	1930.47	126815	66
FS	ST	20453.79	2223081	109

Mission specific map parameters

	Area [km2]	PPL	Tourists	Total PPL
City-SMP	15.2596	9799	0	9799
SurM	51.5959	3406	0	3406
Map total	66.8555	13205	0	13205

PPL MOD NA

Sim FH [Fh] 19600 Ev/Fh [1/Fh] 0.0109694
Events total 215

Hits due to UA impacts		Hits/Fh [1/Fh]
City-SMP ATB	96	0.004898
SurM ATB	0	0
Total ATB	96	0.004898
City-SMP OTW	53	0.0027041
SurM OTW	3	0.0001531
Total OTW	56	0.0028571
Total	152	0.0077551

Prot	cyc	k_UA	Day	Time of impact	UA X Pos	UA Y Pos	Travelled Distance [km]	PPL_TD_CITY_ATB	PPL_CITY_ATB_COUNT	HIT_CITY_ATB_COUNT	PPL_TD_CITY_OTW	PPL_CITY_OTW_COUNT	HIT_CITY_OTW_COUNT	PPL_TD_SURM_ATB	PPL_SURM_ATB_COUNT	HIT_SURM_ATB_COUNT	PPL_TD_SURM_OTW	PPL_SURM_OTW_COUNT	HIT_SURM_OTW_COUNT	PPL_ALL_ATB_COUNT	PPL_ALL_OTW_COUNT	E	Case	Outcome
10	13	2436	Wednesday	07:03:05	6860	1933	105.17	8182	8182	0	1617	1617	0	2844	2833	0	562	562	0	11015	2179	71	Degradation of lateral and horizontal navigation data accuracy.	Central UA ground impact point on a random Map coordinate
1005	50	155	Thursday	10:04:07	8863	3962	406.86	8133	8133	0	1666	1666	0	2741	2734	0	665	665	0	10867	2331	78	Degradation of altitude	Central UA ground impact point below flight path
1006	62	2253	Friday	11:06:44	6370	1761	511.25	7839	7839	0	1960	1960	0	2656	2654	0	750	750	0	10493	2710	13	Engine Anomaly	UA approaches Emergency landing site
1009	108	2359	Monday	14:55:51	6645	1848	893.11	7741	7741	0	2058	2058	0	2690	2684	0	716	716	0	10425	2774	39	Short Circuit / Overload	Central UA ground impact point below flight path
101	136	2547	Wednesday	17:15:29	7183	2084	1125.83	7251	7251	0	2548	2548	0	2741	2735	0	665	665	0	9986	3213	71	Degradation of lateral and horizontal navigation data accuracy.	Central UA ground impact point on a random Map coordinate
1024	4	1350	Tuesday	06:16:47	5932	2472	28.00	8231	8231	0	1568	1568	0	2844	2835	0	562	562	0	11066	2130	12	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
1024	51	1183	Tuesday	10:10:30	6269	2798	417.53	7839	7839	0	1960	1960	0	2741	2733	0	665	665	0	10572	2625	50	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
1027	94	1409	Friday	13:44:51	5840	2362	774.78	7496	7496	0	2303	2303	0	2707	2696	0	699	699	0	10192	3002	35	Connection Failure	UA ground impact tangential to trajectory
1034	164	35	Friday	19:31:23	8983	3894	1352.33	8966	8966	0	833	833	0	3150	3141	0	256	256	0	12107	1089	2	Engine Out	UA approaches Emergency landing site
1043	12	2914	Sunday	06:58:46	8226	2745	97.97	9554	9554	0	245	245	0	3150	3138	0	256	256	0	12692	501	73	Degradation of altitude	Central UA ground impact point below flight path
1055	78	1211	Friday	12:24:57	6205	2742	641.58	7839	7839	0	1960	1960	5	2656	2649	0	750	750	0	10488	2710	18	Engine Fire	UA structural desintegration - Debris Impact
1073	157	1441	Tuesday	18:58:30	5796	2305	1297.50	8868	8868	0	931	931	2	3184	3173	0	222	222	0	12041	1153	21	Engine Fire	UA structural desintegration - Debris Impact
108	66	221	Wednesday	11:23:51	8767	3979	539.75	8133	8133	0	1666	1666	2	2605	2601	0	801	801	0	10734	2467	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1080	162	3390	Tuesday	19:26:04	9003	3616	1343.47	8868	8868	0	931	931	0	3184	3172	0	222	222	0	12040	1153	44	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
1081	78	3284	Wednesday	12:27:49	8917	3449	646.36	8133	8133	0	1666	1666	0	2605	2602	0	801	801	0	10735	2467	74	Degradation of altitude	Central UA ground impact point below flight path
1084	29	429	Saturday	08:19:57	8350	3934	233.28	8329	8329	0	1470	1470	0	2673	2669	0	733	733	0	10998	2203	10	Engine Anomaly	UA approaches Emergency landing site
1086	106	2074	Monday	14:45:31	5985	1698	875.86	7741	7741	0	2058	2058	0	2690	2685	0	716	716	0	10426	2774	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1116	115	532	Wednesday	15:28:11	8090	3857	946.97	7839	7839	0	1960	1960	0	2486	2479	0	920	920	0	10318	2880	70	Degradation of lateral and horizontal navigation data accuracy.	Central UA ground impact point on a random Map coordinate
1116	92	2956	Wednesday	13:37:02	8329	2828	761.75	7839	7839	4	1960	1960	1	2486	2479	0	920	920	0	10318	2880	63	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
1117	39	1495	Thursday	09:11:12	5734	2213	318.69	8329	8329	0	1470	1470	0	2895	2888	0	511	511	0	11217	1981	72	Degradation of altitude	UA approaches Emergency landing site
112	150	2	Sunday	18:21:40	9004	3867	1236.11	7398	7398	0	2401	2401	0	2520	2514	0	886	886	0	9912	3287	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
113	77	531	Monday	12:19:01	8092	3858	631.72	7741	7741	0	2058	2058	0	2775	2770	0	631	631	0	10511	2689	57	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
1130	35	1382	Wednesday	08:51:08	5880	2412	285.25	8525	8525	0	1274	1274	0	2844	2836	0	562	562	0	11361	1836	37	Short Circuit / Overload	Central UA ground impact point below flight path
1135	45	2701	Monday	09:42:44	7639	2338	371.25	8329	8329	0	1470	1470	0	2895	2887	0	511	511	0	11216	1981	2	Engine Out	UA approaches Emergency landing site
1138	154	838	Thursday	18:42:44	7209	3452	1271.22	7300	7300	0	2499	2499	1	2503	2498	0	903	903	0	9798	3402	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1150	168	100	Tuesday	19:51:23	8927	3937	1385.67	8868	8868	0	931	931	0	3184	3175	0	222	222	0	12043	1153	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
1151	55	428	Wednesday	10:29:22	8352	3934	448.97	8133	8133	0	1666	1666	0	2605	2598	0	801	801	0	10731	2467	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1164	82	3590	Tuesday	12:48:09	9010	3856	680.25	7839	7839	0	1960	1960	0	2741	2735	0	665	665	0	10574	2625	24	Generator Failure	UA ground impact tangential to trajectory
1168	131	2708	Saturday	16:50:50	7659	2350	1084.72	7692	7692	13	2107	2107	3	2673	2670	0	733	733	0	10362	2840	18	Engine Fire	UA structural desintegration - Debris Impact
1170	108	1069	Monday	14:54:04	6553	3024	890.14	7741	7741	0	2058	2058	0	2690	2681	0	716	716	0	10422	2774	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1170	30	771	Monday	08:25:25	7408	3560	242.36	8329	8329	0	1470	1470	0	2895	2882	0	511	511	0	11211	1981	23	Generator Failure	Central UA ground impact point below flight path
1179	119	1392	Wednesday	15:49:16	5865	2393	982.14	7839	7839	0	1960	1960	0	2486	2484	0	920	920	0	10323	2880	78	Degradation of altitude	Central UA ground impact point below flight path
1184	64	1659	Monday	11:15:53	5633	1969	526.47	7741	7741	0	2058	2058	0	2775	2769	0	631	631	0	10510	2689	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1192	143	1178	Tuesday	17:48:26	6281	2808	1180.75	7349	7349	0	2450	2450	0	2622	2613	0	784	784	0	9962	3234	10	Engine Anomaly	UA approaches Emergency landing site
1199	62	3326	Tuesday	11:08:13	8958	3518	513.72	7839	7839	11	1960	1960	0	2741	2735	0	665	665	0	10574	2625	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
120	79	1203	Monday	12:29:55	6223	2758	649.86	7741	7741	0	2058	2058	1	2775	2769	0	631	631	0	10510	2689	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1204	114	1396	Sunday	15:24:24	5859	2386	940.67	6908	6908	0	2891	2891	1	2639	2638	0	767	767	0	9546	3658	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
1215	109	3135	Thursday	15:01:55	8704	3180	903.19	7790	7790	0	2009	2009	0	2758	2746	0	648	648	0	10536	2657	72	Degradation of altitude	UA approaches Emergency landing site
1218	132	2471	Sunday	16:55:29	6960	1977	1092.47	7398	7398	0	2401	2401	1	2520	2513	0	886	886	0	9911	3287	20	Engine Fire	UA structural desintegration - Debris Impact
1233	141	519	Monday	17:37:35	8124	3869	1162.64	7153	7153	0	2646	2646	0	2401	2394	0	1005	1005	0	9547	3651	22	Generator Failure	UA approaches Emergency landing site
1243	1	1037	Thursday	06:01:26	6638	3087	2.39	8378	8378	0	1421	1421	0	2792	2786	0	614	614	0	11164	2035	12	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
1260	65	3375	Sunday	11:23:14	8994	3594	538.72	7251	7251	0	2548	2548	1	2503	2500	0	903	903	0	9751	3451	20	Engine Fire	UA structural desintegration - Debris Impact
1267	65	1555	Sunday	11:20:43	5681	2116	534.53	7251	7251	0	2548	2548	0	2503	2499	0	903	903	0	9750	3451	75	Degradation of altitude	UA approaches Emergency landing site
1272	70	1732	Friday	11:45:51	5633	1882	576.42	7839	7839	0	1960	1960	0	2656	2652	0	750	750	0	10491	2710	31	Connection Failure	UA ground impact tangential to trajectory
1277	143	286	Wednesday	17:47:12	8655	3981	1178.69	7251	7251	0	2548	2548	0	2741	2738	0	665	665	0	9989	3213	72	Degradation of altitude	UA approaches Emergency landing site
1292	29	3575	Thursday	08:24:18	9017	3842	240.53	8329	8329	0	1470	1470	0	2895	2887	0	511	511	0	11216	1981	78	Degradation of altitude	Central UA ground impact point below flight path
1301	52	2634	Saturday	10:17:30	7441	2222	429.17	7153	7153	0	2646	2646	0	2435	2429	0	971	971	0	9582	3617	63	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
1306	81	1982	Thursday	12:40:56	5836	1709	668.25	8133	8133	0	1666	1666	0	2741	2736	0	665	665	0	10869	2331	37	Short Circuit / Overload	Central UA ground impact point below flight path
1308	114	817	Saturday	15:23:35	7271	3487	939.33	7741	7741	0	2058	2058	0	2622	2616	0	784	784	0	10357	2842	29	Connection Failure	UA approaches Emergency landing site
1320	159	1473	Thursday	19:08:29	5758	2250	1314.17	8966	8966	0	833	833	0	3218	3206	0	188	188	0	12172	1021	66	Degradation of lateral and horizontal navigation data accuracy.	Central UA ground impact point below flight path
1320	32	2334	Thursday	08:37:31	6578	1824	262.56	8329	8329	0	1470	1470	0	2895	2885	0	511	511	0	11214	1981	69	Degradation of lateral and horizontal navigation data accuracy.	Central UA ground impact point below flight path
1334	96	2527	Thursday	13:56:22	7124	2054	793.95	7790	7790	0	2009	2009	4	2758	2753	0	648	648	0	10543	2657	21	Engine Fire	UA structural desintegration - Debris Impact
1336	10	1942	Saturday	06:47:29	5783	1723	79.14	9309	9309	0	490	490	0	3201	3191	0	205	205	0	12500	695	13	Engine Anomaly	UA approaches Emergency landing site
1337	18	2758	Sunday	07:28:25	7803	2442	147.39	9554	9554	0	245	245	0	3150	3139	0	256	256	0	12693	501	72	Degradation of altitude	UA approaches Emergency landing site
1339	37	2210	Tuesday	09:02:14	6268	1736	303.75	8329	8329	0	1470	1470	0	2861	2852	0	545	545	0	11181	2015	35	Connection Failure	UA ground impact tangential to trajectory
1339	85	2144	Tuesday	13:01:05	6122	1710	701.81	7692	7692	0	2107	2107	0	2741	2736	0	665	665	0	10428	2772	15	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
1352	33	868	Monday	08:40:29	7120	3400	267.47	8329	8329	0	1470	1470	0	2895	2887	0	511	511	0	11216	1981	78	Degradation of altitude	Central UA ground impact point below flight path
1355	56	3145	Thursday	10:38:07	8722	3199	463.53	8133	8133	6	1666	1666	0	2741	2735	0	665	665	0	10868	2331	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
1360	54	328	Tuesday	10:24:16	8573	3974	440.45	7839	7839	0	1960	1960	0	2741	2735	0	665	665	0	10574	2625	30	Connection Failure	Central UA ground impact point below flight path
1361	111	2468	Wednesday	15:10:56	6952	1973	918.25	7839	7839	0	1960	1960	0	2486	2480	0	920	920	0	10319	2880	63	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
1367	56	589	Tuesday	10:34:34	7935	3801	457.64	7839	7839	0	1960	1960	0	2741	2734	0	665	665	0	10573	2625	10	Engine Anomaly	UA approaches Emergency landing site
1373	9	3372	Monday	06:44:28	8992	3590	74.14	8280	8280	0	1519	1519	0	2946	2941	0	460	460	0	11221	1979	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1379	140	1515	Sunday	17:33:58	5714	2180	1156.64	7398	7398	0	2401	2401	0	2520	2510	0	886	886	0	9908	3287	66	Degradation of lateral and horizontal navigation data accuracy.	Central UA ground impact point below flight path
1380	141	145	Monday	17:37:03	8875	3958	1161.78	7153	7153	0	2646	2646	0	2401	2400	0	1005	1005	0	9553	3651	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1384	69	1306	Friday	11:40:17	6010	2556	567.14	7839	7839	0	1960	1960	3	2656	2649	0	750	750	0	10488	2710	20	Engine Fire	UA structural desintegration - Debris Impact
154	79	9	Sunday	12:28:15	9000	3873	647.11	7251	7251	0	2548	2548	0	2503	2501	0	903	903	0	9752	3451	25	Generator Failure	UA approaches Emergency landing site
156	148	849	Tuesday	18:12:52	7176	3433	1221.47	7349	7349	0	2450	2450	0	2622	2615	0	784	784	0	9964	3234	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
159	46	1681	Friday	09:46:19	5630	1941	377.19	8427	8427	0	1372	1372	0	2861	2853	0	545	545	0	11280	1917	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
163	95	1811	Tuesday	13:50:23	5663	1806	784.00	7692	7692	0	2107	2107	0	2741	2735	0	665	665	0	10427	2772	27	Generator Failure	UA ground impact tangential to trajectory
178	5	1632	Wednesday	06:22:10	5640	2005	36.94	8182	8182	0	1617	1617	0	2844	2840	0	562	562	0	11022	2179	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
206	140	2323	Wednesday	17:35:06	6548	1815	1158.50	7251	7251	0	2548	2548	0	2741	2734	0	665	665	0	9985	3213	73	Degradation of altitude	Central UA ground impact point below flight path
206	49	2043	Wednesday	10:01:45	5931	1699	402.92	8133	8133	0	1666	1666	0	2605	2601	0	801	801	0	10734	2467	77	Degradation of altitude	Central UA ground impact point below flight path
229	125	3093	Friday	16:21:30	8627	3099	1035.83	7496	7496	0	2303	2303	0	2724	2717	0	682	682	0	10213	2985	10	Engine Anomaly	UA approaches Emergency landing site
238	2	1342	Sunday	06:06:49	5945	2487	11.39	9554	9554	0	245	245	0	3150	3146	0	256	256	0	12700	501	51	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
238	57	171	Sunday	10:38:58	8841	3968	464.97	7251	7251	0	2548	2548	0	2503	2500	0	903	903	0	9751	3451	45	Partial Lock of Flight Control Surfaces	Central UA ground impact point below flight path
25	155	1143	Thursday	18:48:07	6364	2877	1280.22	7300	7300	3	2499	2499	3	2503	2494	0	903	903	0	9794	3402	18	Engine Fire	UA structural desintegration - Debris Impact
255	18	2324	Wednesday	07:27:49	6551	1815	146.39	8182	8182	0	1617	1617	0	2844	2834	0	562	562	0	11016	2179	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
265	146	2987	Saturday	18:05:53	8402	2890	1209.81	7692	7692	0	2107	2107	0	2673	2669	0	733	733	0	10361	2840	1	Engine Out	No Ground Effect
265	17	958	Saturday	07:20:57	6859	3238	134.94	9309	9309	0	490	490	0	3201	3189	0	205	205	0	12498	695	32	Connection Failure	UA approaches Emergency landing site
270	40	1258	Thursday	09:15:51	6105	2649	326.44	8329	8329	0	1470	1470	0	2895	2887	0	511	511	0	11216	1981	78	Degradation of altitude	Central UA ground impact point below flight path
271	106	1025	Friday	14:44:03	6671	3110	873.44	7496	7496	0	2303	2303	0	2707	2701	0	699	699	0	10197	3002	68	Degradation of lateral and horizontal navigation data accuracy.	UA approaches Emergency landing site
274	151	3164	Monday	18:31:01	8754	3235	1251.69	7153	7153	0	2646	2646	0	2401	2399	0	1005	1005	0	9552	3651	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
294	136	2764	Sunday	17:15:47	7821	2454	1126.33	7398	7398	0	2401	2401	0	2520	2516	0	886	886	0	9914	3287	28	Generator Failure	UA ground impact tangential to trajectory
308	12	1203	Sunday	06:56:25	6223	2758	94.03	9554	9554	0	245	245	0	3150	3140	0	256	256	0	12694	501	12	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
311	167	2121	Wednesday	19:49:12	6075	1704	1382.03	8868	8868	0	931	931	0	3201	3183	0	205	205	0	12051	1136	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
319	168	510	Thursday	19:51:57	8148	3877	1386.61	8966	8966	0	833	833	0	3218	3209	0	188	188	0	12175	1021	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
321	3	490	Saturday	06:10:37	8199	3893	17.72	9309	9309	0	490	490	0	3201	3186	0	205	205	0	12495	695	22	Generator Failure	UA approaches Emergency landing site
328	1	121	Saturday	06:00:10	8904	3948	0.28	9309	9309	0	490	490	0	3201	3185	0	205	205	0	12494	695	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
329	159	123	Sunday	19:06:37	8902	3949	1311.05	8917	8917	0	882	882	0	3116	3100	0	290	290	0	12017	1172	72	Degradation of altitude	UA approaches Emergency landing site
332	101	667	Wednesday	14:18:41	7713	3708	831.14	7839	7839	0	1960	1960	0	2486	2484	0	920	920	0	10323	2880	19	Engine Fire	Central UA ground impact point below flight path
369	84	1067	Friday	12:54:37	6558	3028	691.03	7839	7839	0	1960	1960	0	2656	2650	0	750	750	0	10489	2710	78	Degradation of altitude	Central UA ground impact point below flight path
370	30	2109	Saturday	08:27:16	6051	1702	245.44	8329	8329	0	1470	1470	0	2673	2668	0	733	733	0	10997	2203	28	Generator Failure	UA ground impact tangential to trajectory
374	6	1515	Wednesday	06:26:58	5714	2180	44.97	8182	8182	0	1617	1617	0	2844	2837	0	562	562	0	11019	2179	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
386	21	131	Monday	07:39:44	8892	3952	166.22	8280	8280	0	1519	1519	0	2946	2938	0	460	460	0	11218	1979	10	Engine Anomaly	UA approaches Emergency landing site
388	79	636	Wednesday	12:29:07	7802	3747	648.56	8133	8133	0	1666	1666	0	2605	2601	0	801	801	0	10734	2467	39	Short Circuit / Overload	Central UA ground impact point below flight path
389	99	1683	Thursday	14:10:07	5630	1939	816.89	7790	7790	0	2009	2009	0	2758	2755	0	648	648	0	10545	2657	77	Degradation of altitude	Central UA ground impact point below flight path
390	25	2594	Friday	08:03:02	7323	2156	205.08	8427	8427	0	1372	1372	0	2861	2850	0	545	545	0	11277	1917	73	Degradation of altitude	Central UA ground impact point below flight path
397	84	1513	Friday	12:55:14	5716	2183	692.06	7839	7839	0	1960	1960	0	2656	2651	0	750	750	0	10490	2710	75	Degradation of altitude	UA approaches Emergency landing site
398	146	2782	Saturday	18:05:36	7871	2487	1209.33	7692	7692	0	2107	2107	0	2673	2667	0	733	733	0	10359	2840	22	Generator Failure	UA approaches Emergency landing site
41	100	3339	Saturday	14:17:24	8968	3539	829.00	7741	7741	0	2058	2058	0	2622	2620	0	784	784	0	10361	2842	25	Generator Failure	UA approaches Emergency landing site
414	159	907	Monday	19:07:43	7006	3331	1312.86	8966	8966	0	833	833	0	3184	3170	0	222	222	0	12136	1055	35	Connection Failure	UA ground impact tangential to trajectory
421	139	1716	Monday	17:29:16	5630	1900	1148.81	7153	7153	0	2646	2646	0	2401	2397	0	1005	1005	0	9550	3651	39	Short Circuit / Overload	Central UA ground impact point below flight path
421	38	2299	Monday	09:07:21	6486	1794	312.25	8329	8329	0	1470	1470	0	2895	2882	0	511	511	0	11211	1981	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
426	120	987	Saturday	15:53:42	6776	3183	989.50	7741	7741	0	2058	2058	0	2622	2616	0	784	784	0	10357	2842	30	Connection Failure	Central UA ground impact point below flight path
427	38	1563	Sunday	09:06:19	5676	2104	310.55	8623	8623	0	1176	1176	0	3031	3024	0	375	375	0	11647	1551	9	Engine Out	UA ground impact tangential to trajectory
432	13	3220	Friday	07:04:11	8838	3337	106.97	8280	8280	25	1519	1519	0	2912	2905	0	494	494	0	11185	2013	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
432	25	2377	Friday	08:02:44	6694	1866	204.58	8427	8427	0	1372	1372	0	2861	2857	0	545	545	0	11284	1917	13	Engine Anomaly	UA approaches Emergency landing site
439	121	774	Friday	15:58:23	7399	3555	997.31	7496	7496	0	2303	2303	0	2724	2715	0	682	682	0	10211	2985	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
443	159	931	Tuesday	19:07:45	6936	3288	1312.92	8868	8868	0	931	931	0	3184	3169	0	222	222	0	12037	1153	49	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
451	152	3265	Wednesday	18:36:08	8895	3417	1260.22	7251	7251	3	2548	2548	2	2741	2737	0	665	665	0	9988	3213	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
451	5	583	Wednesday	06:20:42	7951	3807	34.53	8182	8182	0	1617	1617	0	2844	2833	0	562	562	0	11015	2179	68	Degradation of lateral and horizontal navigation data accuracy.	UA approaches Emergency landing site
454	156	1473	Saturday	18:53:34	5758	2250	1289.28	7692	7692	0	2107	2107	0	2673	2668	0	733	733	0	10360	2840	67	Degradation of lateral and horizontal navigation data accuracy.	Central UA ground impact point on a random Map coordinate
455	112	2400	Sunday	15:15:50	6758	1891	926.39	6908	6908	0	2891	2891	0	2639	2630	0	767	767	0	9538	3658	23	Generator Failure	Central UA ground impact point below flight path
472	86	1714	Wednesday	13:05:28	5630	1902	709.11	7839	7839	0	1960	1960	0	2486	2477	0	920	920	0	10316	2880	42	Partial Lock of Flight Control Surfaces	Central UA ground impact point below flight path
474	128	176	Friday	16:32:24	8835	3969	1054.00	7496	7496	0	2303	2303	0	2724	2715	0	682	682	0	10211	2985	23	Generator Failure	Central UA ground impact point below flight path
474	147	3159	Friday	18:11:05	8745	3225	1218.50	7496	7496	0	2303	2303	0	2724	2718	0	682	682	0	10214	2985	11	Engine Anomaly	Central UA ground impact point below flight path
476	7	61	Sunday	06:29:57	8963	3913	49.92	9554	9554	0	245	245	0	3150	3138	0	256	256	0	12692	501	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
490	29	1225	Sunday	08:21:04	6174	2714	235.11	8623	8623	0	1176	1176	0	3031	3019	0	375	375	0	11642	1551	71	Degradation of lateral and horizontal navigation data accuracy.	Central UA ground impact point on a random Map coordinate
495	154	886	Friday	18:42:47	7067	3369	1271.33	7496	7496	0	2303	2303	0	2724	2717	0	682	682	0	10213	2985	42	Partial Lock of Flight Control Surfaces	Central UA ground impact point below flight path
496	166	996	Saturday	19:42:40	6751	3166	1371.14	8966	8966	0	833	833	0	3082	3073	0	324	324	0	12039	1157	77	Degradation of altitude	Central UA ground impact point below flight path
505	93	2526	Monday	13:41:25	7121	2053	769.06	7741	7741	0	2058	2058	0	2690	2684	0	716	716	0	10425	2774	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
52	144	1845	Wednesday	17:54:20	5686	1779	1190.58	7251	7251	0	2548	2548	0	2741	2735	0	665	665	0	9986	3213	57	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
521	124	3016	Wednesday	16:16:24	8468	2948	1027.36	7251	7251	0	2548	2548	0	2741	2738	0	665	665	0	9989	3213	67	Degradation of lateral and horizontal navigation data accuracy.	Central UA ground impact point on a random Map coordinate
536	19	1605	Thursday	07:31:48	5651	2042	153.03	8378	8378	0	1421	1421	0	2792	2784	0	614	614	0	11162	2035	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
545	28	3475	Saturday	08:19:12	9031	3732	232.00	8329	8329	0	1470	1470	0	2673	2666	0	733	733	0	10995	2203	71	Degradation of lateral and horizontal navigation data accuracy.	Central UA ground impact point on a random Map coordinate
547	20	2297	Monday	07:37:45	6481	1793	162.92	8280	8280	0	1519	1519	0	2946	2936	0	460	460	0	11216	1979	5	Engine Out	No Ground Effect
554	19	3401	Monday	07:34:17	9009	3632	157.17	8280	8280	0	1519	1519	0	2946	2934	0	460	460	0	11214	1979	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
555	87	1477	Tuesday	13:10:07	5753	2243	716.86	7692	7692	0	2107	2107	0	2741	2736	0	665	665	0	10428	2772	22	Generator Failure	UA approaches Emergency landing site
56	141	2303	Sunday	17:40:03	6496	1798	1166.75	7398	7398	0	2401	2401	0	2520	2516	0	886	886	0	9914	3287	10	Engine Anomaly	UA approaches Emergency landing site
572	142	463	Friday	17:42:29	8267	3912	1170.81	7496	7496	0	2303	2303	0	2724	2721	0	682	682	0	10217	2985	55	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
575	46	885	Monday	09:45:12	7070	3371	375.36	8329	8329	0	1470	1470	4	2895	2890	0	511	511	0	11219	1981	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
576	36	314	Tuesday	08:54:39	8601	3977	291.08	8329	8329	0	1470	1470	0	2861	2848	0	545	545	0	11177	2015	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
584	81	2718	Wednesday	12:41:58	7688	2369	669.95	8133	8133	0	1666	1666	0	2605	2602	0	801	801	0	10735	2467	52	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
598	56	457	Wednesday	10:34:24	8282	3916	457.33	8133	8133	0	1666	1666	0	2605	2597	0	801	801	0	10730	2467	40	Short Circuit / Overload	Central UA ground impact point below flight path
607	114	2420	Friday	15:25:48	6814	1914	943.03	7496	7496	0	2303	2303	0	2707	2700	0	699	699	0	10196	3002	34	Connection Failure	UA ground impact tangential to trajectory
61	114	311	Friday	15:22:54	8607	3978	938.17	7496	7496	0	2303	2303	0	2707	2702	0	699	699	0	10198	3002	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
615	140	1419	Saturday	17:33:51	5826	2344	1156.42	7692	7692	0	2107	2107	1	2673	2669	0	733	733	0	10361	2840	63	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
616	100	1832	Sunday	14:15:19	5677	1789	825.53	6908	6908	0	2891	2891	0	2639	2633	0	767	767	2	9541	3658	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
626	34	426	Wednesday	08:44:51	8357	3935	274.75	8525	8525	5	1274	1274	3	2844	2838	0	562	562	0	11363	1836	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
629	130	1377	Saturday	16:44:00	5888	2421	1073.36	7692	7692	0	2107	2107	0	2673	2668	0	733	733	0	10360	2840	15	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
633	143	612	Wednesday	17:47:40	7870	3775	1179.45	7251	7251	0	2548	2548	0	2741	2739	0	665	665	0	9990	3213	13	Engine Anomaly	UA approaches Emergency landing site
636	8	2693	Saturday	06:38:34	7615	2324	64.28	9309	9309	0	490	490	0	3201	3192	0	205	205	0	12501	695	49	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
637	1	1157	Sunday	06:01:35	6330	2850	2.67	9554	9554	0	245	245	0	3150	3141	0	256	256	0	12695	501	13	Engine Anomaly	UA approaches Emergency landing site
64	39	856	Monday	09:10:19	7156	3421	317.22	8329	8329	0	1470	1470	0	2895	2888	0	511	511	0	11217	1981	71	Degradation of lateral and horizontal navigation data accuracy.	Central UA ground impact point on a random Map coordinate
641	100	614	Thursday	14:13:37	7865	3773	822.72	7790	7790	0	2009	2009	0	2758	2749	0	648	648	0	10539	2657	72	Degradation of altitude	UA approaches Emergency landing site
642	120	516	Friday	15:53:02	8132	3871	988.42	7496	7496	0	2303	2303	0	2707	2705	0	699	699	0	10201	3002	32	Connection Failure	UA approaches Emergency landing site
649	139	788	Friday	17:28:00	7357	3533	1146.67	7496	7496	0	2303	2303	0	2724	2712	0	682	682	0	10208	2985	73	Degradation of altitude	Central UA ground impact point below flight path
651	112	628	Sunday	15:13:23	7825	3757	922.31	6908	6908	0	2891	2891	0	2639	2634	0	767	767	0	9542	3658	37	Short Circuit / Overload	Central UA ground impact point below flight path
658	23	43	Sunday	07:49:34	8978	3900	182.61	9554	9554	0	245	245	0	3150	3142	0	256	256	0	12696	501	22	Generator Failure	UA approaches Emergency landing site
66	80	2075	Wednesday	12:36:06	5987	1698	660.17	8133	8133	0	1666	1666	0	2605	2598	0	801	801	0	10731	2467	19	Engine Fire	Central UA ground impact point below flight path
669	54	1786	Thursday	10:26:16	5650	1828	443.80	8133	8133	0	1666	1666	2	2741	2738	0	665	665	0	10871	2331	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
671	61	670	Saturday	10:59:34	7705	3704	499.31	7153	7153	24	2646	2646	2	2435	2429	0	971	971	0	9582	3617	21	Engine Fire	UA structural desintegration - Debris Impact
674	47	1155	Tuesday	09:50:34	6335	2854	384.28	8329	8329	0	1470	1470	0	2861	2854	0	545	545	0	11183	2015	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
675	125	2430	Wednesday	16:20:35	6843	1926	1034.31	7251	7251	0	2548	2548	0	2741	2733	0	665	665	0	9984	3213	71	Degradation of lateral and horizontal navigation data accuracy.	Central UA ground impact point on a random Map coordinate
675	61	911	Wednesday	10:59:54	6994	3324	499.86	8133	8133	0	1666	1666	0	2605	2599	0	801	801	0	10732	2467	68	Degradation of lateral and horizontal navigation data accuracy.	UA approaches Emergency landing site
687	34	1872	Monday	08:46:50	5708	1760	278.08	8329	8329	0	1470	1470	0	2895	2889	0	511	511	0	11218	1981	51	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
688	154	2055	Tuesday	18:44:24	5951	1698	1274.03	7349	7349	0	2450	2450	0	2622	2616	0	784	784	0	9965	3234	68	Degradation of lateral and horizontal navigation data accuracy.	UA approaches Emergency landing site
694	87	886	Monday	13:09:17	7067	3369	715.50	7741	7741	0	2058	2058	1	2690	2679	0	716	716	0	10420	2774	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
698	7	2809	Friday	06:33:44	7947	2539	56.25	8280	8280	0	1519	1519	0	2912	2904	0	494	494	0	11184	2013	32	Connection Failure	UA approaches Emergency landing site
70	31	2511	Sunday	08:32:48	7077	2031	254.67	8623	8623	0	1176	1176	0	3031	3019	0	375	375	0	11642	1551	65	Degradation of lateral and horizontal navigation data accuracy.	UA approaches Emergency landing site
700	57	1292	Sunday	10:40:31	6037	2583	467.55	7251	7251	0	2548	2548	0	2503	2497	0	903	903	0	9748	3451	15	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
705	152	1927	Friday	18:34:17	5765	1729	1257.14	7496	7496	0	2303	2303	0	2724	2716	0	682	682	0	10212	2985	51	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
708	46	3356	Monday	09:48:37	8981	3565	381.05	8329	8329	0	1470	1470	0	2895	2890	0	511	511	0	11219	1981	28	Generator Failure	UA ground impact tangential to trajectory
712	67	285	Friday	11:28:54	8657	3981	548.19	7839	7839	0	1960	1960	0	2656	2651	0	750	750	0	10490	2710	37	Short Circuit / Overload	Central UA ground impact point below flight path
727	38	2142	Saturday	09:07:08	6118	1709	311.89	8329	8329	0	1470	1470	0	2673	2669	0	733	733	0	10998	2203	68	Degradation of lateral and horizontal navigation data accuracy.	UA approaches Emergency landing site
740	39	1302	Friday	09:10:56	6018	2563	318.25	8427	8427	1	1372	1372	1	2861	2858	0	545	545	0	11285	1917	21	Engine Fire	UA structural desintegration - Debris Impact
742	42	2797	Sunday	09:27:56	7914	2516	346.58	8623	8623	0	1176	1176	2	3031	3023	0	375	375	0	11646	1551	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
745	49	391	Wednesday	09:59:27	8438	3953	399.11	8133	8133	0	1666	1666	0	2605	2600	0	801	801	0	10733	2467	39	Short Circuit / Overload	Central UA ground impact point below flight path
747	95	1209	Friday	13:49:34	6210	2746	782.61	7496	7496	0	2303	2303	1	2707	2698	0	699	699	0	10194	3002	45	Partial Lock of Flight Control Surfaces	Central UA ground impact point below flight path
751	81	2163	Tuesday	12:41:11	6162	1716	668.67	7839	7839	0	1960	1960	0	2741	2740	0	665	665	1	10579	2625	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
753	101	1957	Thursday	14:20:28	5802	1717	834.11	7790	7790	0	2009	2009	0	2758	2752	0	648	648	0	10542	2657	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
756	115	1255	Sunday	15:29:10	6111	2655	948.64	6908	6908	0	2891	2891	0	2639	2637	0	767	767	0	9545	3658	44	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
759	80	2918	Wednesday	12:37:15	8236	2753	662.11	8133	8133	0	1666	1666	1	2605	2598	0	801	801	0	10731	2467	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
766	155	191	Wednesday	18:46:48	8813	3973	1278.03	7251	7251	0	2548	2548	0	2741	2737	0	665	665	0	9988	3213	66	Degradation of lateral and horizontal navigation data accuracy.	Central UA ground impact point below flight path
767	12	3276	Thursday	06:59:17	8908	3435	98.81	8378	8378	0	1421	1421	0	2792	2784	0	614	614	0	11162	2035	72	Degradation of altitude	UA approaches Emergency landing site
774	4	1471	Thursday	06:16:58	5760	2253	28.28	8378	8378	0	1421	1421	0	2792	2787	0	614	614	0	11165	2035	42	Partial Lock of Flight Control Surfaces	Central UA ground impact point below flight path

776	64	3226	Saturday	11:18:03	8846	3348	530.08	7153	7153	0	2646	2646	0	2435	2430	0	971	971	0	9583	3617	19	Engine Fire	Central UA ground impact point below flight path
779	53	1167	Tuesday	10:20:26	6306	2830	434.08	7839	7839	0	1960	1960	0	2741	2739	0	665	665	0	10578	2625	9	Engine Out	UA ground impact tangential to trajectory
788	102	719	Thursday	14:23:43	7561	3637	839.56	7790	7790	0	2009	2009	0	2758	2749	0	648	648	0	10539	2657	26	Generator Failure	Central UA ground impact point below flight path
794	47	2589	Wednesday	09:52:32	7308	2148	387.58	8525	8525	0	1274	1274	0	2844	2835	0	562	562	0	11360	1836	3	Engine Out	Central UA ground impact point below flight path
795	113	1114	Thursday	15:19:01	6436	2935	931.72	7790	7790	0	2009	2009	0	2758	2747	0	648	648	0	10537	2657	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
798	150	2834	Sunday	18:25:34	8015	2587	1242.64	7398	7398	0	2401	2401	0	2520	2516	0	886	886	0	9914	3287	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
798	23	1586	Sunday	07:51:42	5661	2070	186.17	9554	9554	0	245	245	0	3150	3139	0	256	256	0	12693	501	78	Degradation of altitude	Central UA ground impact point below flight path
8	12	359	Monday	06:55:15	8508	3966	92.08	8280	8280	0	1519	1519	1	2946	2938	0	460	460	0	11218	1979	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
800	91	1891	Tuesday	13:30:35	5726	1748	751.00	7692	7692	0	2107	2107	0	2741	2737	0	665	665	0	10429	2772	9	Engine Out	UA ground impact tangential to trajectory
807	82	3529	Tuesday	12:48:03	9030	3795	680.11	7839	7839	0	1960	1960	0	2741	2735	0	665	665	0	10574	2625	66	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
816	58	863	Thursday	10:44:55	7135	3409	474.86	8133	8133	0	1666	1666	2	2741	2732	0	665	665	0	10865	2331	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
835	164	1398	Tuesday	19:33:17	5856	2382	1355.47	8868	8868	0	931	931	1	3184	3166	0	222	222	0	12034	1153	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
835	86	2196	Tuesday	13:06:08	6235	1729	710.22	7692	7692	0	2107	2107	1	2741	2736	0	665	665	0	10428	2772	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
837	70	2142	Thursday	11:46:25	6118	1709	577.36	8133	8133	0	1666	1666	0	2741	2735	0	665	665	0	10868	2331	19	Engine Fire	Central UA ground impact point below flight path
839	67	2756	Saturday	11:32:19	7798	2439	553.89	7153	7153	0	2646	2646	0	2435	2432	0	971	971	0	9585	3617	72	Degradation of altitude	UA approaches Emergency landing site
85	94	1494	Monday	13:44:59	5735	2214	774.97	7741	7741	0	2058	2058	0	2690	2685	0	716	716	0	10426	2774	1	Engine Out	No Ground Effect
877	47	3577	Tuesday	09:53:54	9016	3844	389.86	8329	8329	0	1470	1470	0	2861	2852	0	545	545	0	11181	2015	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
882	164	1181	Sunday	19:32:59	6274	2802	1354.97	8917	8917	0	882	882	0	3116	3100	0	290	290	0	12017	1172	67	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
886	83	1870	Thursday	12:50:44	5707	1761	684.58	8133	8133	0	1666	1666	0	2741	2738	0	665	665	0	10871	2331	43	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
887	111	286	Friday	15:07:55	8655	3981	913.22	7496	7496	0	2303	2303	0	2707	2702	0	699	699	0	10198	3002	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
900	118	725	Thursday	15:43:22	7544	3629	972.31	7790	7790	0	2009	2009	0	2758	2752	0	648	648	0	10542	2657	57	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
91	102	2961	Sunday	14:26:49	8341	2838	844.72	6908	6908	0	2891	2891	0	2639	2637	0	767	767	0	9545	3658	75	Degradation of altitude	UA approaches Emergency landing site
915	153	1473	Friday	18:38:38	5758	2250	1264.39	7496	7496	0	2303	2303	0	2724	2716	0	682	682	0	10212	2985	34	Connection Failure	UA ground impact tangential to trajectory
92	19	1159	Monday	07:31:11	6326	2846	152.00	8280	8280	0	1519	1519	0	2946	2939	0	460	460	0	11219	1979	26	Generator Failure	Central UA ground impact point below flight path
931	67	2105	Sunday	11:31:25	6043	1701	552.39	7251	7251	0	2548	2548	0	2503	2499	0	903	903	0	9750	3451	21	Engine Fire	UA structural desintegration - Debris Impact
934	25	2920	Wednesday	08:03:30	8241	2757	205.83	8525	8525	0	1274	1274	0	2844	2837	0	562	562	0	11362	1836	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
935	28	2643	Thursday	08:18:02	7468	2237	230.08	8329	8329	0	1470	1470	0	2895	2891	0	511	511	0	11220	1981	73	Degradation of altitude	Central UA ground impact point below flight path
945	127	2896	Sunday	16:31:11	8180	2709	1051.97	7398	7398	1	2401	2401	0	2520	2518	0	886	886	0	9916	3287	62	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
946	141	3340	Monday	17:41:29	8969	3540	1169.14	7153	7153	0	2646	2646	0	2401	2399	0	1005	1005	0	9552	3651	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
963	127	1907	Thursday	16:29:48	5743	1739	1049.69	7300	7300	0	2499	2499	0	2503	2500	0	903	903	0	9800	3402	17	Engine Fire	Central UA ground impact point below flight path
964	112	544	Friday	15:13:16	8058	3846	922.11	7496	7496	0	2303	2303	0	2707	2702	0	699	699	0	10198	3002	14	Engine Anomaly	Central UA ground impact point below flight path
966	2	607	Sunday	06:05:49	7884	3781	9.69	9554	9554	0	245	245	0	3150	3140	0	256	256	0	12694	501	62	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
969	101	1294	Wednesday	14:19:33	6033	2579	832.58	7839	7839	0	1960	1960	0	2486	2481	0	920	920	0	10320	2880	17	Engine Fire	Central UA ground impact point below flight path
972	158	3181	Saturday	19:05:53	8781	3266	1309.81	8966	8966	0	833	833	0	3082	3068	0	324	324	0	12034	1157	3	Engine Out	Central UA ground impact point below flight path
973	114	1613	Sunday	15:24:42	5648	2031	941.17	6908	6908	0	2891	2891	0	2639	2632	0	767	767	0	9540	3658	74	Degradation of altitude	Central UA ground impact point below flight path
974	11	765	Monday	06:50:50	7425	3569	84.72	8280	8280	0	1519	1519	0	2946	2936	0	460	460	0	11216	1979	22	Generator Failure	UA approaches Emergency landing site
981	119	2815	Monday	15:51:15	7963	2551	985.42	7741	7741	0	2058	2058	0	2690	2685	0	716	716	0	10426	2774	10	Engine Anomaly	UA approaches Emergency landing site
987	48	3521	Sunday	09:58:48	9031	3786	398.03	8623	8623	0	1176	1176	0	3031	3020	0	375	375	0	11643	1551	25	Generator Failure	UA approaches Emergency landing site
995	167	687	Monday	19:47:14	7655	3682	1378.72	8966	8966	0	833	833	0	3184	3170	0	222	222	0	12136	1055	66	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path

O.R.C.U.S. 02.00 - tTest of the Simulation

nProbes	1400
nEvents	215
nEvents_cor	200
tMission	14
x_cross_ATB	0.068571429
x_cross_OTW	0.04
x_cross_TOT	0.108571429
s2ATB	0.00982451
sATB	0.099118667
tATB	22.11028701
s2OTW	0.001890271
sOTW	0.043477252
tOTW	25.81803481
s2TOT	0.017310032
sTOT	0.131567595
tTOT	28.03277775

UADay/Prot	HIT_TOT_ATB	HIT_TOT_OTW	UADay/Prot cor	HIT_TOT_mean_ATB	HIT_TOT_mean_OTW	HIT_TOT_mean_ATB/Fh	HIT_TOT_mean_OTW/Fh	x_i-x_cross ATB	x_i-x_cross OTW	(x_i-x_cross ATB)^2	(x_i-x_cross OTW)^2
8	0	1	8	0	1	0	0.071428571	-0.068571429	0.031428571	0.004702041	0.000987755
10	0	0	10	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
25	3	3	25	3	3	0.214285714	0.214285714	0.145714286	0.174285714	0.021232653	0.03037551
41	0	0	41	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
52	0	0	52	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
56	0	0	56	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
61	0	0	61	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
64	0	0	64	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
66	0	0	66	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
70	0	0	70	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
85	0	0	85	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
91	0	0	91	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
92	0	0	92	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
101	0	0	101	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
108	0	2	108	0	2	0	0.142857143	-0.068571429	0.102857143	0.004702041	0.010579592
112	0	0	112	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
113	0	0	113	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
120	0	1	120	0	1	0	0.071428571	-0.068571429	0.031428571	0.004702041	0.000987755
154	0	0	154	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
156	0	0	156	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
159	0	0	159	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
163	0	0	163	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
178	0	0	178	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
206	0	0	206	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
206	0	0	229	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
229	0	0	238	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
238	0	0	255	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
238	0	0	265	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
255	0	0	270	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
265	0	0	271	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
265	0	0	274	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
270	0	0	294	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
271	0	0	308	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
274	0	0	311	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
294	0	0	319	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
308	0	0	321	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
311	0	0	328	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
319	0	0	329	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
321	0	0	332	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
328	0	0	369	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
329	0	0	370	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
332	0	0	374	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
369	0	0	386	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
370	0	0	388	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
374	0	0	389	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
386	0	0	390	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
388	0	0	397	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
389	0	0	398	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
390	0	0	414	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
397	0	0	421	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
398	0	0	426	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
414	0	0	427	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
421	0	0	432	25	0	1.785714286	0	1.717142857	-0.04	2.948579592	0.0016
421	0	0	439	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
426	0	0	443	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
427	0	0	451	3	2	0.214285714	0.142857143	0.145714286	0.102857143	0.021232653	0.010579592
432	25	0	454	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
432	0	0	455	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
439	0	0	472	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
443	0	0	474	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
451	3	2	476	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
451	0	0	490	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
454	0	0	495	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
455	0	0	496	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
472	0	0	505	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
474	0	0	521	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
474	0	0	536	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
476	0	0	545	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
490	0	0	547	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
495	0	0	554	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
496	0	0	555	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
505	0	0	572	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
521	0	0	575	0	4	0	0.285714286	-0.068571429	0.245714286	0.004702041	0.06037551
536	0	0	576	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
545	0	0	584	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
547	0	0	598	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
554	0	0	607	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
555	0	0	615	0	1	0	0.071428571	-0.068571429	0.031428571	0.004702041	0.000987755
572	0	0	616	0	2	0	0.142857143	-0.068571429	0.102857143	0.004702041	0.010579592
575	0	4	626	5	3	0.357142857	0.214285714	0.288571429	0.174285714	0.083273469	0.03037551
576	0	0	629	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
584	0	0	633	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
598	0	0	636	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
607	0	0	637	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
615	0	1	641	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
616	0	2	642	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
626	5	3	649	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
629	0	0	651	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
633	0	0	658	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
636	0	0	669	0	2	0	0.142857143	-0.068571429	0.102857143	0.004702041	0.010579592
637	0	0	671	24	2	1.714285714	0.142857143	1.645714286	0.102857143	2.70837551	0.010579592
641	0	0	674	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
642	0	0	675	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
649	0	0	687	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
651	0	0	688	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
658	0	0	694	0	1	0	0.071428571	-0.068571429	0.031428571	0.004702041	0.000987755
669	0	2	698	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
671	24	2	700	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
674	0	0	705	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
675	0	0	708	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
675	0	0	712	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
687	0	0	727	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
688	0	0	740	1	1	0.071428571	0.071428571	0.002857143	0.031428571	8.16327E-06	0.000987755
694	0	1	742	0	2	0	0.142857143	-0.068571429	0.102857143	0.004702041	0.010579592
698	0	0	745	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
700	0	0	747	0	1	0	0.071428571	-0.068571429	0.031428571	0.004702041	0.000987755
705	0	0	751	0	1	0	0.071428571	-0.068571429	0.031428571	0.004702041	0.000987755
708	0	0	753	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
712	0	0	756	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
727	0	0	759	0	1	0	0.071428571	-0.068571429	0.031428571	0.004702041	0.000987755
740	1	1	766	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
742	0	2	767	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
745	0	0	774	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
747	0	1	776	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
751	0	1	779	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
753	0	0	788	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
756	0	0	794	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
759	0	1	795	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
766	0	0	798	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
767	0	0	800	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
774	0	0	807	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
776	0	0	816	0	2	0	0.142857143	-0.068571429	0.102857143	0.004702041	0.010579592
779	0	0	835	0	2	0	0.142857143	-0.068571429	0.102857143	0.004702041	0.010579592
788	0	0	837	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
794	0	0	839	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
795	0	0	877	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
798	0	0	882	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
798	0	0	886	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
800	0	0	887	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
807	0	0	900	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
816	0	2	915	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
835	0	1	931	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
835	0	1	934	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
837	0	0	935	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
839	0	0	945	1	0	0.071428571	0	0.002857143	-0.04	8.16327E-06	0.0016
877	0	0	946	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
882	0	0	963	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
886	0	0	964	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
887	0	0	966	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
900	0	0	969	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
915	0	0	972	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
931	0	0	973	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
934	0	0	974	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
935	0	0	981	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
945	1	0	987	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
946	0	0	995	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
963	0	0	1005	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
964	0	0	1006	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
966	0	0	1009	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
969	0	0	1024	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
972	0	0	1027	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
973	0	0	1034	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
974	0	0	1043	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
981	0	0	1055	0	5	0	0.357142857	-0.068571429	0.317142857	0.004702041	0.100579592
987	0	0	1073	0	2	0	0.142857143	-0.068571429	0.102857143	0.004702041	0.010579592
995	0	0	1080	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
1005	0	0	1081	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
1006	0	0	1084	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
1009	0	0	1086	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
1024	0	0	1116	4	1	0.285714286	0.071428571	0.217142857	0.031428571	0.04715102	0.000987755
1024	0	0	1117	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
1027	0	0	1130	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
1034	0	0	1135	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
1043	0	0	1138	0	1	0	0.071428571	-0.068571429	0.031428571	0.004702041	0.000987755
1055	0	5	1150	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
1073	0	2	1151	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
1080	0	0	1164	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
1081	0	0	1168	13	3	0.928571429	0.214285714	0.86	0.174285714	0.7396	0.03037551
1084	0	0	1170	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
1086	0	0	1179	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
1116	0	0	1184	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
1116	4	1	1192	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
1117	0	0	1199	11	0	0.785714286	0	0.717142857	-0.04	0.514293878	0.0016
1130	0	0	1204	0	1	0	0.071428571	-0.068571429	0.031428571	0.004702041	0.000987755
1135	0	0	1215	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
1138	0	1	1218	0	1	0	0.071428571	-0.068571429	0.031428571	0.004702041	0.000987755
1150	0	0	1233	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
1151	0	0	1243	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
1164	0	0	1260	0	1	0	0.071428571	-0.068571429	0.031428571	0.004702041	0.000987755
1168	13	3	1267	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
1170	0	0	1272	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
1170	0	0	1277	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
1179	0	0	1292	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
1184	0	0	1301	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
1192	0	0	1306	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
1199	11	0	1308	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
1204	0	1	1320	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
1215	0	0	1334	0	4	0	0.285714286	-0.068571429	0.245714286	0.004702041	0.06037551
1218	0	1	1336	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
1233	0	0	1337	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
1243	0	0	1339	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
1260	0	1	1352	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
1267	0	0	1355	6	0	0.428571429	0	0.36	-0.04	0.1296	0.0016
1272	0	0	1360	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
1277	0	0	1361	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
1292	0	0	1367	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
1301	0	0	1373	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
1306	0	0	1379	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
1308	0	0	1380	0	0	0	0	-0.068571429	-0.04	0.004702041	0.0016
1320	0	0	1384	0	3	0	0.214285714	-0.068571429	0.174285714	0.004702041	0.03037551
1320	0	0									
1334	0	4									
1336	0	0									
1337	0	0									
1339	0	0									
1339	0	0									
1352	0	0									
1355	6	0									
1360	0	0									
1361	0	0									
1367	0	0									
1373	0	0									
1379	0	0									
1380	0	0									
1384	0	3									

11.4.12.2 Kemberg – C5 – Phase 2

O.R.C.U.S. 02.00 - Simulation Summary

UA Parameters

MTOW [kg]	Wingspan [m]	Length [m]	L/D
90	5	4	8

v [km/h]	Alt [m]	CCF [m]
100	100	8296.0218

P_CumCat [1/Fh]	Engine [%]	ESys [%]	FCS [%]	NavSys [%]	Struct [%]
0.01	20	20	20	20	20

General map parameters

	Name	Area [km2]	PPL	PPL/km2
City	Kemberg, Stadt	235.22	9799	42
County	Wittenberg	1930.47	126815	66
FS	ST	20453.79	2223081	109

Mission specific map parameters

	Area [km2]	PPL	Tourists	Total PPL
City-SMP	15.2596	9799	0	9799
SurM	51.5959	3406	0	3406
Map total	66.8555	13205	0	13205

PPL MOD NA

Sim FH [Fh] 19600 Ev/Fh [1/Fh] 0.0116327
Events total 228

Hits due to UA impacts		Hits/Fh [1/Fh]
City-SMP ATB	109	0.0055612
SurM ATB	0	0
Total ATB	109	0.0055612
City-SMP OTW	62	0.0031633
SurM OTW	3	0.0001531
Total OTW	65	0.0033163
Total	174	0.0088776

Prot	cyc	k_UA	Day	Time of impact	UA X Pos	UA Y Pos	Travelled Distance [km]	PPL_TD_CITY_ATB	PPL_CITY_ATB_COUNT	HIT_CITY_ATB_COUNT	PPL_TD_CITY_OTW	PPL_CITY_OTW_COUNT	HIT_CITY_OTW_COUNT	PPL_TD_SURM_ATB	PPL_SURM_ATB_COUNT	HIT_SURM_ATB_COUNT	PPL_TD_SURM_OTW	PPL_SURM_OTW_COUNT	HIT_SURM_OTW_COUNT	PPL_ALL_ATB_COUNT	PPL_ALL_OTW_COUNT	E	Case	Outcome
1000	132	3302	Saturday	16:56:37	8935	3479	1094.39	7692	7692	0	2107	2107	0	2673	2664	0	733	733	0	10356	2840	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
1003	22	2618	Tuesday	07:48:08	7394	2195	180.25	8231	8231	0	1568	1568	0	2844	2835	0	562	562	0	11066	2130	19	Engine Fire	Central UA ground impact point below flight path
1015	164	2772	Sunday	19:35:11	7843	2469	1358.64	8917	8917	0	882	882	0	3116	3105	0	290	290	0	12022	1172	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1026	109	1941	Thursday	15:00:15	5782	1723	900.44	7790	7790	0	2009	2009	0	2758	2752	0	648	648	0	10542	2657	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1028	72	3295	Saturday	11:57:57	8928	3467	596.61	7153	7153	0	2646	2646	0	2435	2433	0	971	971	0	9586	3617	2	Engine Out	UA approaches Emergency landing site
103	92	2365	Friday	13:36:13	6661	1854	760.39	7496	7496	0	2303	2303	0	2707	2702	0	699	699	0	10198	3002	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
1034	19	1461	Friday	07:31:37	5771	2270	152.70	8280	8280	0	1519	1519	0	2912	2907	0	494	494	0	11187	2013	67	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
1035	112	2677	Saturday	15:16:12	7568	2295	927.03	7741	7741	0	2058	2058	0	2622	2615	0	784	784	0	10356	2842	74	Degradation of altitude	Central UA ground impact point below flight path
1039	43	3452	Wednesday	09:33:49	9027	3702	356.39	8525	8525	0	1274	1274	2	2844	2839	0	562	562	0	11364	1836	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1041	89	3582	Friday	13:22:58	9014	3849	738.30	7496	7496	0	2303	2303	0	2707	2700	0	699	699	0	10196	3002	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1044	84	1790	Monday	12:55:37	5652	1824	692.69	7741	7741	0	2058	2058	0	2775	2764	0	631	631	0	10505	2689	73	Degradation of altitude	Central UA ground impact point below flight path
1051	12	1793	Monday	06:57:13	5653	1821	95.39	8280	8280	0	1519	1519	0	2946	2940	0	460	460	0	11220	1979	30	Connection Failure	Central UA ground impact point below flight path
1063	55	754	Saturday	10:29:50	7458	3586	449.72	7153	7153	0	2646	2646	0	2435	2430	0	971	971	0	9583	3617	22	Generator Failure	UA approaches Emergency landing site
1077	87	2441	Saturday	13:11:26	6874	1939	719.08	7741	7741	0	2058	2058	0	2622	2614	0	784	784	0	10355	2842	40	Short Circuit / Overload	Central UA ground impact point below flight path
1098	109	3436	Saturday	15:02:19	9023	3681	903.89	7741	7741	0	2058	2058	0	2622	2617	0	784	784	0	10358	2842	22	Generator Failure	UA approaches Emergency landing site
11	168	3210	Thursday	19:55:41	8824	3319	1392.83	8966	8966	0	833	833	0	3218	3204	0	188	188	0	12170	1021	72	Degradation of altitude	Central UA ground impact point below flight path
110	162	3029	Friday	19:25:35	8496	2974	1342.64	8966	8966	0	833	833	0	3150	3136	0	256	256	0	12102	1089	78	Degradation of altitude	Central UA ground impact point below flight path
1113	21	1397	Sunday	07:41:29	5857	2384	169.14	9554	9554	0	245	245	0	3150	3136	0	256	256	0	12690	501	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
1118	148	2332	Friday	18:14:56	6572	1823	1224.89	7496	7496	0	2303	2303	0	2724	2717	0	682	682	0	10213	2985	77	Degradation of altitude	Central UA ground impact point below flight path
1119	139	1451	Saturday	17:28:55	5784	2288	1148.19	7692	7692	0	2107	2107	0	2673	2667	0	733	733	0	10359	2840	76	Degradation of altitude	Central UA ground impact point below flight path
112	18	673	Sunday	07:25:32	7696	3700	142.58	9554	9554	3	245	245	0	3150	3141	0	256	256	0	12695	501	9	Engine Out	UA ground impact tangential to trajectory
1136	61	3527	Tuesday	11:03:32	9030	3793	505.89	7839	7839	0	1960	1960	0	2741	2732	0	665	665	0	10571	2625	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
115	143	3071	Wednesday	17:51:04	8584	3056	1185.11	7251	7251	0	2548	2548	0	2741	2735	0	665	665	0	9986	3213	11	Engine Anomaly	Central UA ground impact point below flight path
1152	150	556	Thursday	18:22:25	8025	3835	1237.39	7300	7300	2	2499	2499	0	2503	2497	0	903	903	0	9797	3402	37	Short Circuit / Overload	Central UA ground impact point below flight path
1157	25	15	Tuesday	07:59:29	8997	3878	199.14	8329	8329	0	1470	1470	1	2861	2855	0	545	545	0	11184	2015	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1159	79	407	Thursday	12:28:48	8401	3946	648.03	8133	8133	0	1666	1666	0	2741	2731	0	665	665	0	10864	2331	39	Short Circuit / Overload	Central UA ground impact point below flight path
1171	3	1660	Tuesday	06:12:15	5633	1967	20.42	8231	8231	0	1568	1568	0	2844	2843	0	562	562	0	11074	2130	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
118	124	2751	Saturday	16:16:03	7783	2429	1026.75	7692	7692	0	2107	2107	0	2673	2666	0	733	733	0	10358	2840	35	Connection Failure	UA ground impact tangential to trajectory
1184	83	243	Monday	12:48:30	8731	3981	680.83	7741	7741	0	2058	2058	0	2775	2767	0	631	631	0	10508	2689	66	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
1185	55	2369	Tuesday	10:32:03	6672	1858	453.44	7839	7839	0	1960	1960	0	2741	2737	0	665	665	0	10576	2625	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1194	114	3565	Thursday	15:27:23	9021	3832	945.67	7790	7790	0	2009	2009	0	2758	2755	0	648	648	0	10545	2657	32	Connection Failure	UA approaches Emergency landing site
1197	94	23	Sunday	13:42:56	8992	3884	771.58	6908	6908	0	2891	2891	0	2639	2638	0	767	767	0	9546	3658	22	Generator Failure	UA approaches Emergency landing site
1199	62	2603	Tuesday	11:07:14	7349	2171	512.06	7839	7839	0	1960	1960	0	2741	2734	0	665	665	0	10573	2625	74	Degradation of altitude	Central UA ground impact point below flight path
1200	56	637	Wednesday	10:34:38	7799	3746	457.75	8133	8133	1	1666	1666	0	2605	2596	0	801	801	0	10729	2467	79	Separation of essential UA parts (tail or main wing).	UA approaches Emergency landing site
1200	6	1672	Wednesday	06:27:11	5631	1952	45.33	8182	8182	0	1617	1617	0	2844	2836	0	562	562	0	11018	2179	78	Degradation of altitude	Central UA ground impact point below flight path
1212	71	1362	Monday	11:50:18	5912	2449	583.86	7741	7741	0	2058	2058	0	2775	2770	0	631	631	0	10511	2689	65	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
1214	76	3324	Wednesday	12:17:55	8956	3515	629.86	8133	8133	0	1666	1666	0	2605	2598	0	801	801	0	10731	2467	35	Connection Failure	UA approaches Emergency landing site
1219	102	309	Monday	14:23:09	8611	3978	838.61	7741	7741	0	2058	2058	2	2690	2683	0	716	716	0	10424	2774	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1221	148	210	Wednesday	18:11:59	8785	3977	1220.00	7251	7251	0	2548	2548	0	2741	2736	0	665	665	0	9987	3213	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
1221	84	2610	Wednesday	12:56:45	7370	2182	694.58	8133	8133	0	1666	1666	0	2605	2599	0	801	801	0	10732	2467	30	Connection Failure	Central UA ground impact point below flight path
1228	16	3305	Wednesday	07:19:14	8938	3484	132.06	8182	8182	0	1617	1617	0	2844	2839	0	562	562	0	11021	2179	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
123	93	1357	Thursday	13:39:49	5920	2458	766.36	7790	7790	0	2009	2009	0	2758	2751	0	648	648	0	10541	2657	10	Engine Anomaly	UA approaches Emergency landing site
1232	100	1386	Sunday	14:14:42	5874	2404	824.50	6908	6908	0	2891	2891	1	2639	2635	0	767	767	0	9543	3658	21	Engine Fire	UA structural desintegration - Debris Impact
1233	46	3260	Monday	09:48:30	8889	3408	380.83	8329	8329	0	1470	1470	0	2895	2888	0	511	511	0	11217	1981	25	Generator Failure	Central UA ground impact point below flight path
1243	160	2080	Thursday	19:14:18	5996	1699	1323.86	8966	8966	0	833	833	0	3218	3209	0	188	188	0	12175	1021	9	Engine Out	UA ground impact tangential to trajectory
1251	7	2122	Friday	06:32:47	6077	1704	54.67	8280	8280	0	1519	1519	0	2912	2906	0	494	494	0	11186	2013	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1252	137	3431	Saturday	17:21:41	9021	3674	1136.17	7692	7692	0	2107	2107	1	2673	2669	0	733	733	0	10361	2840	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1258	132	1711	Friday	16:54:25	5630	1905	1090.72	7496	7496	0	2303	2303	0	2724	2719	0	682	682	0	10215	2985	3	Engine Out	Central UA ground impact point below flight path
1260	77	3075	Sunday	12:22:33	8592	3064	637.58	7251	7251	0	2548	2548	5	2503	2500	0	903	903	0	9751	3451	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1261	95	1643	Monday	13:50:10	5637	1990	783.61	7741	7741	0	2058	2058	0	2690	2682	0	716	716	0	10423	2774	25	Generator Failure	UA approaches Emergency landing site
1264	154	2345	Thursday	18:44:49	6607	1835	1274.70	7300	7300	0	2499	2499	0	2503	2500	0	903	903	0	9800	3402	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1266	60	2438	Saturday	10:57:03	6865	1935	495.08	7153	7153	0	2646	2646	0	2435	2428	0	971	971	0	9581	3617	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
127	54	2859	Monday	10:27:45	8083	2636	446.28	7741	7741	0	2058	2058	0	2775	2767	0	631	631	0	10508	2689	57	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
1277	26	2177	Wednesday	08:07:27	6193	1721	212.42	8525	8525	0	1274	1274	0	2844	2837	0	562	562	0	11362	1836	9	Engine Out	UA ground impact tangential to trajectory
1280	33	1314	Saturday	08:41:06	5995	2540	268.50	8329	8329	0	1470	1470	0	2673	2665	0	733	733	0	10994	2203	67	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
129	154	1923	Wednesday	18:44:14	5760	1731	1273.72	7251	7251	0	2548	2548	0	2741	2733	0	665	665	0	9984	3213	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1292	102	1587	Thursday	14:24:55	5661	2068	841.56	7790	7790	0	2009	2009	0	2758	2753	0	648	648	0	10543	2657	37	Short Circuit / Overload	Central UA ground impact point below flight path
1296	25	1449	Monday	08:01:27	5786	2291	202.44	8329	8329	0	1470	1470	0	2895	2887	0	511	511	0	11216	1981	31	Connection Failure	UA ground impact tangential to trajectory
1297	117	1468	Tuesday	15:39:25	5763	2258	965.72	7692	7692	0	2107	2107	0	2741	2730	0	665	665	0	10422	2772	30	Connection Failure	Central UA ground impact point below flight path
1304	168	1450	Tuesday	19:53:15	5785	2289	1388.78	8868	8868	0	931	931	0	3184	3166	0	222	222	0	12034	1153	67	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
131	3	2178	Friday	06:12:58	6195	1721	21.61	8280	8280	0	1519	1519	0	2912	2907	0	494	494	1	11187	2013	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
131	57	2655	Friday	10:42:25	7504	2257	470.70	7839	7839	0	1960	1960	0	2656	2648	0	750	750	0	10487	2710	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
1313	106	760	Thursday	14:43:42	7440	3577	872.83	7790	7790	0	2009	2009	0	2758	2748	0	648	648	0	10538	2657	47	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
1314	24	1530	Friday	07:56:36	5701	2156	194.33	8280	8280	0	1519	1519	0	2912	2907	0	494	494	0	11187	2013	75	Degradation of altitude	UA approaches Emergency landing site
1314	80	86	Friday	12:33:21	8941	3929	655.58	7839	7839	0	1960	1960	0	2656	2650	0	750	750	0	10489	2710	72	Degradation of altitude	Central UA ground impact point below flight path
1317	114	588	Monday	15:23:16	7938	3802	938.81	7741	7741	0	2058	2058	0	2690	2684	0	716	716	0	10425	2774	35	Connection Failure	UA ground impact tangential to trajectory
1320	87	814	Thursday	13:09:12	7280	3491	715.33	7790	7790	0	2009	2009	0	2758	2750	0	648	648	0	10540	2657	37	Short Circuit / Overload	Central UA ground impact point below flight path
1325	100	892	Tuesday	14:14:01	7050	3358	823.36	7692	7692	0	2107	2107	0	2741	2736	0	665	665	0	10428	2772	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
1331	40	2512	Monday	09:17:36	7080	2033	329.33	8329	8329	0	1470	1470	2	2895	2890	0	511	511	0	11219	1981	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1346	9	322	Tuesday	06:40:15	8585	3976	67.11	8231	8231	0	1568	1568	0	2844	2841	0	562	562	0	11072	2130	9	Engine Out	UA ground impact tangential to trajectory
1353	144	1664	Tuesday	17:54:05	5632	1962	1190.17	7349	7349	0	2450	2450	0	2622	2619	0	784	784	0	9968	3234	76	Degradation of altitude	Central UA ground impact point below flight path
1359	12	841	Monday	06:55:54	7200	3447	93.19	8280	8280	0	1519	1519	0	2946	2933	0	460	460	0	11213	1979	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
1361	155	2698	Wednesday	18:50:16	7630	2333	1283.80	7251	7251	0	2548	2548	0	2741	2732	0	665	665	0	9983	3213	23	Generator Failure	UA approaches Emergency landing site
1361	34	1450	Wednesday	08:46:15	5785	2289	277.11	8525	8525	0	1274	1274	0	2844	2835	0	562	562	0	11360	1836	81	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1368	19	1485	Wednesday	07:31:39	5744	2229	152.75	8182	8182	0	1617	1617	0	2844	2835	0	562	562	0	11017	2179	66	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
137	130	1028	Thursday	16:43:32	6663	3104	1072.56	7300	7300	0	2499	2499	0	2503	2497	0	903	903	0	9797	3402	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1387	98	3005	Monday	14:06:59	8443	2926	811.64	7741	7741	0	2058	2058	0	2690	2686	0	716	716	0	10427	2774	49	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
141	127	509	Monday	16:27:52	8150	3877	1046.47	7153	7153	0	2646	2646	0	2401	2399	0	1005	1005	0	9552	3651	47	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
144	121	1256	Thursday	15:59:03	6109	2653	998.42	7300	7300	3	2499	2499	3	2503	2500	0	903	903	0	9800	3402	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
144	127	1510	Thursday	16:29:16	5719	2188	1048.78	7300	7300	0	2499	2499	0	2503	2497	0	903	903	0	9797	3402	25	Generator Failure	UA approaches Emergency landing site
146	80	749	Saturday	12:34:16	7473	3593	657.11	7153	7153	0	2646	2646	0	2435	2433	0	971	971	0	9586	3617	29	Connection Failure	UA approaches Emergency landing site
158	157	3080	Thursday	19:00:45	8602	3074	1301.28	8966	8966	0	833	833	0	3218	3205	0	188	188	0	12171	1021	2	Engine Out	UA approaches Emergency landing site
161	143	3444	Sunday	17:51:34	9025	3692	1185.97	7398	7398	0	2401	2401	2	2520	2513	0	886	886	0	9911	3287	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
168	72	1704	Sunday	11:55:45	5630	1914	592.94	7251	7251	0	2548	2548	0	2503	2497	0	903	903	0	9748	3451	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
181	25	184	Saturday	07:59:43	8823	3972	199.53	8329	8329	0	1470	1470	0	2673	2669	0	733	733	0	10998	2203	73	Degradation of altitude	Central UA ground impact point below flight path
187	45	3316	Friday	09:43:35	8949	3502	372.67	8427	8427	1	1372	1372	0	2861	2855	0	545	545	0	11282	1917	66	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
192	72	1933	Wednesday	11:56:04	5772	1727	593.47	8133	8133	0	1666	1666	0	2605	2598	0	801	801	0	10731	2467	73	Degradation of altitude	Central UA ground impact point below flight path
199	79	1480	Wednesday	12:30:18	5750	2238	650.50	8133	8133	0	1666	1666	0	2605	2599	0	801	801	0	10732	2467	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
202	66	1788	Saturday	11:26:01	5651	1826	543.36	7153	7153	0	2646	2646	0	2435	2431	0	971	971	0	9584	3617	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
208	14	2284	Friday	07:07:52	6447	1783	113.11	8280	8280	0	1519	1519	0	2912	2902	0	494	494	0	11182	2013	32	Connection Failure	UA approaches Emergency landing site
208	80	1376	Friday	12:35:08	5889	2423	658.56	7839	7839	0	1960	1960	0	2656	2654	0	750	750	0	10493	2710	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
21	149	3011	Sunday	18:20:50	8457	2938	1234.75	7398	7398	3	2401	2401	5	2520	2514	0	886	886	0	9912	3287	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
221	95	1763	Thursday	13:50:19	5641	1850	783.89	7790	7790	0	2009	2009	0	2758	2752	0	648	648	0	10542	2657	10	Engine Anomaly	UA approaches Emergency landing site
236	71	3050	Friday	11:52:39	8541	3015	587.75	7839	7839	0	1960	1960	0	2656	2651	0	750	750	0	10490	2710	67	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
239	153	2172	Monday	18:39:36	6182	1719	1266.00	7153	7153	0	2646	2646	0	2401	2398	0	1005	1005	1	9551	3651	21	Engine Fire	Central UA ground impact point below flight path
240	48	2786	Tuesday	09:57:47	7883	2495	396.33	8329	8329	0	1470	1470	3	2861	2858	0	545	545	0	11187	2015	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
247	20	1200	Tuesday	07:36:14	6230	2764	160.39	8231	8231	0	1568	1568	0	2844	2837	0	562	562	0	11068	2130	17	Engine Fire	Central UA ground impact point below flight path
251	19	2642	Saturday	07:33:15	7465	2235	155.42	9309	9309	2	490	490	0	3201	3188	0	205	205	0	12497	695	27	Generator Failure	UA ground impact tangential to trajectory
252	95	2619	Sunday	13:51:31	7397	2197	785.86	6908	6908	0	2891	2891	0	2639	2634	0	767	767	0	9542	3658	62	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
265	137	3058	Saturday	17:21:11	8557	3031	1135.31	7692	7692	0	2107	2107	0	2673	2671	0	733	733	0	10363	2840	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
265	61	3418	Saturday	11:03:22	9017	3656	505.64	7153	7153	0	2646	2646	0	2435	2431	0	971	971	0	9584	3617	40	Short Circuit / Overload	UA approaches Emergency landing site
270	70	780	Thursday	11:44:32	7381	3546	574.22	8133	8133	0	1666	1666	0	2741	2733	0	665	665	0	10866	2331	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
271	140	888	Friday	17:33:06	7061	3365	1155.19	7496	7496	0	2303	2303	0	2724	2715	0	682	682	0	10211	2985	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
279	124	2956	Saturday	16:16:20	8329	2828	1027.22	7692	7692	0	2107	2107	0	2673	2671	0	733	733	0	10363	2840	36	Short Circuit / Overload	Central UA ground impact point below flight path
283	158	3579	Wednesday	19:06:26	9015	3846	1310.72	8868	8868	0	931	931	0	3201	3185	0	205	205	0	12053	1136	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
285	119	2911	Friday	15:51:22	8218	2739	985.64	7496	7496	0	2303	2303	0	2707	2702	0	699	699	0	10198	3002	48	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
286	75	210	Saturday	12:08:38	8785	3977	614.39	7153	7153	0	2646	2646	0	2435	2432	0	971	971	0	9585	3617	31	Connection Failure	UA ground impact tangential to trajectory
286	88	975	Saturday	13:14:24	6810	3206	724.00	7741	7741	0	2058	2058	0	2622	2619	0	784	784	0	10360	2842	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
288	151	2971	Monday	18:30:44	8365	2858	1251.25	7153	7153	0	2646	2646	0	2401	2395	0	1005	1005	0	9548	3651	47	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
298	98	1185	Sunday	14:04:28	6264	2794	807.44	7692	7692	0	2107	2107	0	2741	2734	0	665	665	0	10426	2772	19	Engine Fire	Central UA ground impact point below flight path
307	144	2388	Saturday	17:55:06	6724	1878	1191.83	7692	7692	0	2107	2107	0	2673	2668	0	733	733	0	10360	2840	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
308	141	3135	Sunday	17:41:12	8704	3180	1168.67	7398	7398	0	2401	2401	0	2520	2518	0	886	886	0	9916	3287	32	Connection Failure	UA approaches Emergency landing site
309	161	1771	Monday	19:18:52	5644	1842	1331.44	8966	8966	0	833	833	0	3184	3173	0	222	222	0	12139	1055	62	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
328	124	1738	Saturday	16:14:38	5634	1876	1024.42	7692	7692	0	2107	2107	0	2673	2666	0	733	733	0	10358	2840	18	Engine Fire	UA structural desintegration - Debris Impact
347	15	299	Thursday	07:10:06	8630	3980	116.83	8378	8378	0	1421	1421	1	2792	2785	0	614	614	0	11163	2035	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
351	166	20	Monday	19:41:20	8993	3882	1376.85	8966	8966	2	833	833	0	3184	3176	0	222	222	0	12142	1055	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
356	96	2105	Saturday	13:55:47	6043	1701	792.97	7741	7741	0	2058	2058	0	2622	2618	0	784	784	0	10359	2842	31	Connection Failure	UA ground impact tangential to trajectory
36	85	902	Monday	12:59:22	7020	3340	698.94	7741	7741	0	2058	2058	0	2690	2683	0	716	716	0	10424	2774	46	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
368	116	2983	Thursday	15:36:33	8393	2882	960.92	7790	7790	0	2009	2009	0	2758	2747	0	648	648	0	10537	2657	65	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
371	120	685	Sunday	15:53:16	7661	3684	988.81	6908	6908	0	2891	2891	0	2639	2632	0	767	767	0	9540	3658	25	Generator Failure	UA approaches Emergency landing site
377	71	591	Saturday	11:49:15	7929	3799	582.08	7153	7153	0	2646	2646	0	2435	2431	0	971	971	0	9584	3617	5	Engine Out	No Ground Effect
391	33	1977	Saturday	08:42:01	5829	1710	270.03	8329	8329	0	1470	1470	0	2673	2671	0	733	733	0	11000	2203	17	Engine Fire	Central UA ground impact point below flight path
392	44	2420	Sunday	09:37:23	6814	1914	362.31	8623	8623	0	1176	1176	0	3031	3022	0	375	375	0	11645	1551	42	Partial Lock of Flight Control Surfaces	Central UA ground impact point below flight path
394	90	1971	Tuesday	13:25:43	5821	1712	742.89	7692	7692	0	2107	2107	0	2741	2735	0	665	665	0	10427	2772	78	Degradation of altitude	Central UA ground impact point below flight path
404	5	1210	Friday	06:21:35	6208	2744	35.97	8280	8280	0	1519	1519	0	2912	2898	0	494	494	0	11178	2013	69	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
41	67	1888	Saturday	11:31:07	5723	1750	551.89	7153	7153	0	2646	2646	0	2435	2432	0	971	971	1	9585	3617	63	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
411	27	1855	Friday	08:11:58	5694	1772	219.97	8427	8427	0	1372	1372	0	2861	2852	0	545	545	0	11279	1917	3	Engine Out	Central UA ground impact point below flight path
413	73	2287	Sunday	12:01:33	6455	1785	602.58	7251	7251	0	2548	2548	0	2503	2498	0	903	903	0	9749	3451	10	Engine Anomaly	UA approaches Emergency landing site
417	126	1168	Thursday	16:23:48	6304	2828	1039.69	7300	7300	0	2499	2499	0	2503	2498	0	903	903	0	9798	3402	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
424	82	3324	Thursday	12:47:46	8956	3515	679.64	8133	8133	22	1666	1666	4	2741	2739	0	665	665	0	10872	2331	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
433	108	2359	Saturday	14:55:51	6645	1848	893.11	7741	7741	0	2058	2058	0	2622	2613	0	784	784	0	10354	2842	74	Degradation of altitude	Central UA ground impact point below flight path
437	20	1007	Wednesday	07:35:58	6721	3145	159.94	8182	8182	0	1617	1617	0	2844	2839	0	562	562	0	11021	2179	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
44	102	2961	Tuesday	14:26:49	8341	2838	844.72	7692	7692	0	2107	2107	0	2741	2737	0	665	665	0	10429	2772	71	Degradation of lateral and horizontal navigation data accuracy.	Central UA ground impact point on a random Map coordinate
447	151	2465	Saturday	18:30:03	6943	1969	1250.08	7692	7692	0	2107	2107	0	2673	2668	0	733	733	0	10360	2840	67	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
448	29	3021	Sunday	08:23:33	8479	2958	239.25	8623	8623	0	1176	1176	0	3031	3024	0	375	375	0	11647	1551	38	Short Circuit / Overload	Central UA ground impact point below flight path
45	46	2259	Wednesday	09:47:06	6385	1765	378.53	8525	8525	0	1274	1274	0	2844	2839	0	562	562	0	11364	1836	78	Degradation of altitude	Central UA ground impact point below flight path
453	119	874	Friday	15:48:34	7102	3390	980.94	7496	7496	0	2303	2303	0	2707	2702	0	699	699	0	10198	3002	74	Degradation of altitude	Central UA ground impact point below flight path
462	22	2064	Sunday	07:47:23	5967	1698	178.97	9554	9554	0	245	245	0	3150	3133	0	256	256	0	12687	501	43	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
467	36	3074	Friday	08:58:28	8590	3062	297.44	8427	8427	0	1372	1372	0	2861	2853	0	545	545	0	11280	1917	17	Engine Fire	Central UA ground impact point below flight path
474	81	2597	Friday	12:41:47	7332	2161	669.67	7839	7839	0	1960	1960	4	2656	2652	0	750	750	0	10491	2710	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
479	42	1664	Wednesday	09:26:22	5632	1962	343.97	8525	8525	0	1274	1274	0	2844	2840	0	562	562	0	11365	1836	78	Degradation of altitude	Central UA ground impact point below flight path
484	74	1278	Monday	12:05:07	6064	2610	608.55	7741	7741	0	2058	2058	0	2775	2767	0	631	631	0	10508	2689	75	Degradation of altitude	UA approaches Emergency landing site
503	89	690	Saturday	13:18:59	7646	3678	731.64	7741	7741	0	2058	2058	0	2622	2618	0	784	784	0	10359	2842	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
514	17	2899	Wednesday	07:23:39	8187	2715	139.42	8182	8182	0	1617	1617	0	2844	2836	0	562	562	0	11018	2179	66	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point below flight path
520	155	2747	Tuesday	18:50:21	7772	2422	1283.92	7349	7349	5	2450	2450	3	2622	2616	0	784	784	0	9965	3234	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
522	138	1507	Thursday	17:24:01	5722	2193	1140.03	7300	7300	0	2499	2499	0	2503	2498	0	903	903	0	9798	3402	18	Engine Fire	UA structural desintegration - Debris Impact
545	45	1809	Saturday	09:41:30	5662	1807	369.19	8329	8329	0	1470	1470	0	2673	2663	0	733	733	0	10992	2203	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
550	106	2363	Thursday	14:45:54	6656	1852	876.53	7790	7790	0	2009	2009	0	2758	2754	0	648	648	0	10544	2657	22	Generator Failure	UA approaches Emergency landing site
551	135	844	Friday	17:08:10	7191	3441	1113.61	7496	7496	0	2303	2303	0	2724	2718	0	682	682	0	10214	2985	25	Generator Failure	UA approaches Emergency landing site
560	91	2554	Sunday	13:31:30	7204	2094	752.53	6908	6908	0	2891	2891	1	2639	2631	0	767	767	0	9539	3658	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
563	2	3006	Wednesday	06:09:08	8446	2928	15.22	8182	8182	0	1617	1617	0	2844	2835	0	562	562	0	11017	2179	19	Engine Fire	Central UA ground impact point below flight path
564	116	1151	Thursday	15:34:01	6345	2862	956.69	7790	7790	0	2009	2009	0	2758	2752	0	648	648	0	10542	2657	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
568	30	2338	Monday	08:27:35	6588	1828	245.97	8329	8329	0	1470	1470	0	2895	2886	0	511	511	0	11215	1981	17	Engine Fire	Central UA ground impact point below flight path
570	140	1865	Wednesday	17:34:28	5702	1765	1157.44	7251	7251	0	2548	2548	0	2741	2739	0	665	665	0	9990	3213	73	Degradation of altitude	Central UA ground impact point below flight path
584	107	3175	Wednesday	14:52:01	8771	3255	886.69	7839	7839	0	1960	1960	0	2486	2480	0	920	920	0	10319	2880	43	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
594	43	632	Saturday	09:29:56	7814	3752	349.89	8329	8329	0	1470	1470	0	2673	2668	0	733	733	0	10997	2203	53	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
600	23	3129	Friday	07:53:50	8694	3169	189.72	8280	8280	1	1519	1519	1	2912	2905	0	494	494	0	11185	2013	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
600	73	2673	Friday	12:02:05	7557	2288	603.47	7839	7839	0	1960	1960	0	2656	2647	0	750	750	0	10486	2710	17	Engine Fire	Central UA ground impact point below flight path
605	121	171	Wednesday	15:57:33	8841	3968	995.92	7251	7251	0	2548	2548	0	2741	2734	0	665	665	0	9985	3213	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
606	72	3078	Thursday	11:57:39	8598	3070	596.11	8133	8133	0	1666	1666	0	2741	2737	0	665	665	0	10870	2331	17	Engine Fire	Central UA ground impact point below flight path
616	165	2053	Sunday	19:39:10	5948	1698	1365.28	8917	8917	0	882	882	0	3116	3101	0	290	290	0	12018	1172	28	Generator Failure	UA ground impact tangential to trajectory
619	14	632	Wednesday	07:05:34	7814	3752	109.30	8182	8182	0	1617	1617	0	2844	2839	0	562	562	0	11021	2179	74	Degradation of altitude	Central UA ground impact point below flight path
628	2	2367	Friday	06:08:15	6667	1856	13.75	8280	8280	0	1519	1519	0	2912	2906	0	494	494	0	11186	2013	53	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
63	12	3589	Sunday	06:59:42	9011	3855	99.53	9554	9554	2	245	245	0	3150	3139	0	256	256	0	12693	501	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
640	147	1761	Wednesday	18:09:09	5640	1852	1215.28	7251	7251	0	2548	2548	0	2741	2736	0	665	665	0	9987	3213	17	Engine Fire	Central UA ground impact point below flight path
643	57	581	Saturday	10:39:32	7957	3809	465.92	7153	7153	0	2646	2646	0	2435	2430	0	971	971	0	9583	3617	38	Short Circuit / Overload	Central UA ground impact point below flight path
663	57	1425	Friday	10:40:42	5817	2334	467.86	7839	7839	0	1960	1960	0	2656	2650	0	750	750	0	10489	2710	34	Connection Failure	UA ground impact tangential to trajectory
666	164	397	Monday	19:31:53	8424	3950	1353.17	8966	8966	0	833	833	0	3184	3174	0	222	222	0	12140	1055	1	Engine Out	No Ground Effect
673	54	2160	Monday	10:26:48	6156	1715	444.67	7741	7741	0	2058	2058	0	2775	2771	0	631	631	0	10512	2689	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
68	22	882	Friday	07:45:44	7079	3376	176.25	8280	8280	5	1519	1519	0	2912	2904	0	494	494	0	11184	2013	28	Generator Failure	UA ground impact tangential to trajectory
69	83	2015	Saturday	12:50:57	5885	1702	684.92	7153	7153	0	2646	2646	0	2435	2431	0	971	971	0	9584	3617	63	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
692	109	3484	Saturday	15:02:23	9032	3743	904.00	7741	7741	0	2058	2058	0	2622	2616	0	784	784	0	10357	2842	50	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
693	145	1705	Sunday	17:59:08	5630	1912	1198.56	7398	7398	0	2401	2401	0	2520	2516	0	886	886	0	9914	3287	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
697	151	1621	Thursday	18:28:52	5644	2020	1248.14	7300	7300	0	2499	2499	0	2503	2501	0	903	903	0	9801	3402	63	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
699	75	800	Saturday	12:09:26	7322	3514	615.75	7153	7153	0	2646	2646	0	2435	2429	0	971	971	0	9582	3617	72	Degradation of altitude	UA approaches Emergency landing site
70	121	3582	Sunday	16:02:15	9014	3849	1003.78	7398	7398	0	2401	2401	2	2520	2513	0	886	886	0	9911	3287	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact

700	79	1625	Sunday	12:30:30	5643	2014	650.83	7251	7251	0	2548	2548	0	2503	2498	0	903	903	0	9749	3451	75	Degradation of altitude	UA approaches Emergency landing site
702	107	559	Tuesday	14:48:23	8017	3832	880.67	7692	7692	0	2107	2107	0	2741	2740	0	665	665	0	10432	2772	38	Short Circuit / Overload	Central UA ground impact point below flight path
707	132	795	Sunday	16:53:09	7336	3522	1088.61	7398	7398	0	2401	2401	0	2520	2516	0	886	886	0	9914	3287	73	Degradation of altitude	Central UA ground impact point below flight path
712	109	1700	Friday	14:59:55	5629	1918	899.89	7496	7496	0	2303	2303	0	2707	2699	0	699	699	0	10195	3002	58	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
715	72	2415	Monday	11:56:44	6800	1908	594.58	7741	7741	0	2058	2058	0	2775	2767	0	631	631	0	10508	2689	71	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate
722	7	326	Monday	06:30:18	8577	3975	50.53	8280	8280	0	1519	1519	0	2946	2934	0	460	460	0	11214	1979	30	Connection Failure	Central UA ground impact point below flight path
725	91	3121	Thursday	13:32:18	8680	3153	753.83	7790	7790	0	2009	2009	0	2758	2752	0	648	648	0	10542	2657	50	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
732	133	1535	Thursday	16:59:10	5697	2148	1098.61	7300	7300	0	2499	2499	0	2503	2497	0	903	903	0	9797	3402	7	Engine Out	Central UA ground impact point below flight path
732	25	3294	Thursday	08:04:01	8927	3466	206.70	8329	8329	0	1470	1470	0	2895	2889	0	511	511	0	11218	1981	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
736	44	2384	Monday	09:37:20	6713	1874	362.22	8329	8329	0	1470	1470	0	2895	2882	0	511	511	0	11211	1981	22	Generator Failure	UA approaches Emergency landing site
737	39	3364	Tuesday	09:13:48	8987	3577	323.00	8329	8329	1	1470	1470	0	2861	2851	0	545	545	0	11180	2015	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
743	53	1625	Monday	10:21:04	5643	2014	435.14	7741	7741	0	2058	2058	0	2775	2763	0	631	631	0	10504	2689	19	Engine Fire	Central UA ground impact point below flight path
756	103	2893	Sunday	14:31:42	8172	2703	852.86	6908	6908	0	2891	2891	0	2639	2631	0	767	767	0	9539	3658	22	Generator Failure	UA approaches Emergency landing site
764	36	1627	Monday	08:56:27	5642	2011	294.11	8329	8329	0	1470	1470	0	2895	2885	0	511	511	0	11214	1981	67	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate
766	32	3238	Wednesday	08:38:46	8862	3369	264.64	8525	8525	1	1274	1274	0	2844	2837	0	562	562	0	11362	1836	9	Engine Out	UA ground impact tangential to trajectory
773	28	2028	Wednesday	08:17:11	5906	1700	228.67	8525	8525	0	1274	1274	0	2844	2837	0	562	562	0	11362	1836	24	Generator Failure	UA ground impact tangential to trajectory
782	9	3203	Friday	06:44:14	8814	3307	73.75	8280	8280	30	1519	1519	0	2912	2901	0	494	494	0	11181	2013	20	Engine Fire	UA structural desintegration - Debris Impact
794	159	2534	Wednesday	19:09:57	7145	2064	1316.61	8868	8868	0	931	931	1	3201	3192	0	205	205	0	12060	1136	4	Engine Out	Central ground impact point below flight path with B/G Ratio.
80	147	1641	Wednesday	18:09:00	5637	1992	1215.00	7251	7251	0	2548	2548	0	2741	2737	0	665	665	0	9988	3213	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
801	31	871	Wednesday	08:30:31	7111	3395	250.89	8525	8525	0	1274	1274	0	2844	2839	0	562	562	0	11364	1836	5	Engine Out	No Ground Effect
817	18	1565	Friday	07:26:46	5674	2101	144.64	8280	8280	0	1519	1519	0	2912	2907	0	494	494	0	11187	2013	47	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
819	122	971	Sunday	16:03:38	6822	3213	1006.06	7398	7398	0	2401	2401	1	2520	2516	0	886	886	0	9914	3287	15	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
829	113	415	Wednesday	15:18:03	8383	3941	930.11	7839	7839	0	1960	1960	0	2486	2477	0	920	920	0	10316	2880	15	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
831	42	2195	Friday	09:27:07	6233	1729	345.20	8427	8427	0	1372	1372	0	2861	2854	0	545	545	0	11281	1917	17	Engine Fire	Central UA ground impact point below flight path
841	35	502	Monday	08:49:55	8168	3883	283.22	8329	8329	0	1470	1470	0	2895	2887	0	511	511	0	11216	1981	4	Engine Out	Central ground impact point below flight path with B/G Ratio.
853	79	3083	Saturday	12:32:30	8608	3080	654.19	7153	7153	0	2646	2646	1	2435	2431	0	971	971	0	9584	3617	78	Degradation of altitude	Central UA ground impact point below flight path
855	13	2906	Monday	07:03:44	8205	2729	106.25	8280	8280	0	1519	1519	0	2946	2939	0	460	460	0	11219	1979	55	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
859	115	448	Friday	15:28:04	8304	3922	946.78	7496	7496	0	2303	2303	0	2707	2699	0	699	699	0	10195	3002	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
860	165	3499	Saturday	19:41:09	9033	3761	1368.61	8966	8966	0	833	833	1	3082	3073	0	324	324	0	12039	1157	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
866	139	2596	Friday	17:30:30	7329	2159	1150.83	7496	7496	0	2303	2303	3	2724	2721	0	682	682	0	10217	2985	18	Engine Fire	UA structural desintegration - Debris Impact
867	79	2336	Saturday	12:31:29	6583	1826	652.47	7153	7153	0	2646	2646	0	2435	2432	0	971	971	0	9585	3617	37	Short Circuit / Overload	Central UA ground impact point below flight path
868	52	1983	Sunday	10:16:36	5837	1709	427.67	7251	7251	0	2548	2548	0	2503	2499	0	903	903	0	9750	3451	28	Generator Failure	UA ground impact tangential to trajectory
877	109	2858	Tuesday	15:01:32	8080	2634	902.56	7692	7692	0	2107	2107	0	2741	2737	0	665	665	0	10429	2772	35	Connection Failure	UA ground impact tangential to trajectory
877	56	1264	Tuesday	10:35:30	6092	2637	459.19	7839	7839	0	1960	1960	0	2741	2734	0	665	665	0	10573	2625	51	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
878	9	395	Wednesday	06:40:22	8429	3951	67.28	8182	8182	8	1617	1617	2	2844	2835	0	562	562	0	11017	2179	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
890	60	3113	Monday	10:57:59	8665	3138	496.64	7741	7741	0	2058	2058	0	2775	2771	0	631	631	0	10512	2689	51	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
892	1	193	Wednesday	06:00:16	8810	3974	0.44	8182	8182	0	1617	1617	0	2844	2833	0	562	562	0	11015	2179	37	Short Circuit / Overload	Central UA ground impact point below flight path
90	124	1003	Saturday	16:13:37	6732	3152	1022.72	7692	7692	0	2107	2107	0	2673	2665	0	733	733	0	10357	2840	72	Degradation of altitude	UA approaches Emergency landing site
900	117	1275	Thursday	15:39:09	6070	2616	965.28	7790	7790	0	2009	2009	0	2758	2752	0	648	648	0	10542	2657	47	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
906	61	501	Wednesday	10:59:20	8171	3884	498.92	8133	8133	8	1666	1666	3	2605	2598	0	801	801	0	10731	2467	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
907	110	2307	Thursday	15:05:44	6507	1801	909.58	7790	7790	0	2009	2009	0	2758	2749	0	648	648	0	10539	2657	39	Short Circuit / Overload	Central UA ground impact point below flight path
908	146	3312	Friday	18:06:19	8945	3495	1210.56	7496	7496	0	2303	2303	0	2724	2717	0	682	682	0	10213	2985	76	Degradation of altitude	Central UA ground impact point below flight path
909	39	3147	Saturday	09:13:30	8725	3203	322.50	8329	8329	0	1470	1470	0	2673	2663	0	733	733	0	10992	2203	28	Generator Failure	UA ground impact tangential to trajectory
911	50	215	Monday	10:04:12	8777	3978	407.00	7741	7741	0	2058	2058	0	2775	2763	0	631	631	0	10504	2689	55	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
921	69	3126	Thursday	11:42:47	8689	3163	571.33	8133	8133	0	1666	1666	0	2741	2732	0	665	665	0	10865	2331	71	Degradation of lateral and horizontal navigation data accurracy.	Central UA ground impact point on a random Map coordinate
929	12	142	Friday	06:54:57	8879	3957	91.58	8280	8280	0	1519	1519	2	2912	2900	0	494	494	0	11180	2013	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
93	141	2291	Tuesday	17:40:02	6465	1788	1166.72	7349	7349	0	2450	2450	0	2622	2616	0	784	784	0	9965	3234	72	Degradation of altitude	UA approaches Emergency landing site
939	154	3261	Monday	18:46:05	8891	3410	1276.81	7153	7153	0	2646	2646	0	2401	2401	0	1005	1005	0	9554	3651	52	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
949	121	2618	Thursday	16:00:56	7394	2195	1001.56	7300	7300	0	2499	2499	0	2503	2500	0	903	903	0	9800	3402	17	Engine Fire	Central UA ground impact point below flight path
963	18	70	Thursday	07:24:42	8955	3919	141.19	8378	8378	0	1421	1421	0	2792	2782	0	614	614	0	11160	2035	35	Connection Failure	UA ground impact tangential to trajectory
969	6	1298	Wednesday	06:26:40	6025	2571	44.47	8182	8182	3	1617	1617	0	2844	2837	0	562	562	0	11019	2179	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
976	165	425	Wednesday	19:36:54	8359	3936	1361.53	8868	8868	0	931	931	0	3201	3186	0	205	205	0	12054	1136	65	Degradation of lateral and horizontal navigation data accurracy.	UA approaches Emergency landing site

O.R.C.U.S. 02.00 - tTest of the Simulation

nProbes	200
nEvents	228
nEvents_cor	216
tMission	14
x_cross_ATB	0.545
x_cross_OTW	0.325
x_cross_TOT	0.87
s2ATB	0.2989191
sATB	0.5467349
tATB	13.838594
s2OTW	0.0955287
sOTW	0.3090771
tOTW	14.413143
s2TOT	0.7090514
sTOT	0.8420519
tTOT	14.443572

UADay/Prot	HIT_TOT_ATB	HIT_TOT_OTW	UADay/Prot cor	HIT_TOT_mean_ATB	HIT_TOT_mean_OTW	HIT_TOT_mean_ATB/Fh	HIT_TOT_mean_OTW/Fh	x_i-x_cross ATB	x_i-x_cross OTW	(x_i-x_cross ATB)^2	(x_i-x_cross OTW)^2
11	0	0	11	0	0	0	0	-0.545	-0.325	0.297025	0.105625
21	3	5	21	3	5	0.214285714	0.357142857	-0.330714286	0.032142857	0.109371939	0.001033163
36	0	0	36	0	0	0	0	-0.545	-0.325	0.297025	0.105625
41	0	1	41	0	1	0	0.071428571	-0.545	-0.253571429	0.297025	0.064298469
44	0	0	44	0	0	0	0	-0.545	-0.325	0.297025	0.105625
45	0	0	45	0	0	0	0	-0.545	-0.325	0.297025	0.105625
63	2	0	63	2	0	0.142857143	0	-0.402142857	-0.325	0.161718878	0.105625
68	5	0	68	5	0	0.357142857	0	-0.187857143	-0.325	0.035290306	0.105625
69	0	0	69	0	0	0	0	-0.545	-0.325	0.297025	0.105625
70	0	2	70	0	2	0	0.142857143	-0.545	-0.182142857	0.297025	0.03317602
80	0	0	80	0	0	0	0	-0.545	-0.325	0.297025	0.105625
90	0	0	90	0	0	0	0	-0.545	-0.325	0.297025	0.105625
93	0	0	93	0	0	0	0	-0.545	-0.325	0.297025	0.105625
103	0	0	103	0	0	0	0	-0.545	-0.325	0.297025	0.105625
110	0	0	110	0	0	0	0	-0.545	-0.325	0.297025	0.105625
112	3	0	112	3	0	0.214285714	0	-0.330714286	-0.325	0.109371939	0.105625
115	0	0	115	0	0	0	0	-0.545	-0.325	0.297025	0.105625
118	0	0	118	0	0	0	0	-0.545	-0.325	0.297025	0.105625
123	0	0	123	0	0	0	0	-0.545	-0.325	0.297025	0.105625
127	0	0	127	0	0	0	0	-0.545	-0.325	0.297025	0.105625
129	0	0	129	0	0	0	0	-0.545	-0.325	0.297025	0.105625
131	0	1	131	0	1	0	0.071428571	-0.545	-0.253571429	0.297025	0.064298469
131	0	0	137	0	0	0	0	-0.545	-0.325	0.297025	0.105625
137	0	0	141	0	0	0	0	-0.545	-0.325	0.297025	0.105625
141	0	0	144	3	3	0.214285714	0.214285714	-0.330714286	-0.110714286	0.109371939	0.012257653
144	3	3	146	0	0	0	0	-0.545	-0.325	0.297025	0.105625
144	0	0	158	0	0	0	0	-0.545	-0.325	0.297025	0.105625
146	0	0	161	0	2	0	0.142857143	-0.545	-0.182142857	0.297025	0.03317602
158	0	0	168	0	0	0	0	-0.545	-0.325	0.297025	0.105625
161	0	2	181	0	0	0	0	-0.545	-0.325	0.297025	0.105625
168	0	0	187	1	0	0.071428571	0	-0.473571429	-0.325	0.224269898	0.105625
181	0	0	192	0	0	0	0	-0.545	-0.325	0.297025	0.105625
187	1	0	199	0	0	0	0	-0.545	-0.325	0.297025	0.105625
192	0	0	202	0	0	0	0	-0.545	-0.325	0.297025	0.105625
199	0	0	208	0	0	0	0	-0.545	-0.325	0.297025	0.105625
202	0	0	221	0	0	0	0	-0.545	-0.325	0.297025	0.105625
208	0	0	236	0	0	0	0	-0.545	-0.325	0.297025	0.105625
208	0	0	239	0	1	0	0.071428571	-0.545	-0.253571429	0.297025	0.064298469
221	0	0	240	0	3	0	0.214285714	-0.545	-0.110714286	0.297025	0.012257653
236	0	0	247	0	0	0	0	-0.545	-0.325	0.297025	0.105625
239	0	1	251	2	0	0.142857143	0	-0.402142857	-0.325	0.161718878	0.105625
240	0	3	252	0	0	0	0	-0.545	-0.325	0.297025	0.105625
247	0	0	265	0	0	0	0	-0.545	-0.325	0.297025	0.105625
251	2	0	270	0	0	0	0	-0.545	-0.325	0.297025	0.105625
252	0	0	271	0	0	0	0	-0.545	-0.325	0.297025	0.105625
265	0	0	279	0	0	0	0	-0.545	-0.325	0.297025	0.105625
265	0	0	283	0	0	0	0	-0.545	-0.325	0.297025	0.105625
270	0	0	285	0	0	0	0	-0.545	-0.325	0.297025	0.105625
271	0	0	286	8	2	0.571428571	0.142857143	0.026428571	-0.182142857	0.000698469	0.03317602
279	0	0	288	0	0	0	0	-0.545	-0.325	0.297025	0.105625
283	0	0	303	0	0	0	0	-0.545	-0.325	0.297025	0.105625
285	0	0	307	0	0	0	0	-0.545	-0.325	0.297025	0.105625
286	0	0	308	0	0	0	0	-0.545	-0.325	0.297025	0.105625
286	8	2	309	0	0	0	0	-0.545	-0.325	0.297025	0.105625
288	0	0	328	0	1	0	0.071428571	-0.545	-0.253571429	0.297025	0.064298469
303	0	0	347	0	1	0	0.071428571	-0.545	-0.253571429	0.297025	0.064298469
307	0	0	351	0	2	0	0.142857143	-0.545	-0.182142857	0.297025	0.03317602
308	0	0	356	0	0	0	0	-0.545	-0.325	0.297025	0.105625
309	0	0	368	0	0	0	0	-0.545	-0.325	0.297025	0.105625
328	0	1	371	0	0	0	0	-0.545	-0.325	0.297025	0.105625
347	0	1	377	0	0	0	0	-0.545	-0.325	0.297025	0.105625
351	0	2	391	0	0	0	0	-0.545	-0.325	0.297025	0.105625
356	0	0	392	0	0	0	0	-0.545	-0.325	0.297025	0.105625
368	0	0	394	0	0	0	0	-0.545	-0.325	0.297025	0.105625
371	0	0	404	0	0	0	0	-0.545	-0.325	0.297025	0.105625
377	0	0	411	0	0	0	0	-0.545	-0.325	0.297025	0.105625
391	0	0	413	0	0	0	0	-0.545	-0.325	0.297025	0.105625
392	0	0	417	0	0	0	0	-0.545	-0.325	0.297025	0.105625
394	0	0	424	22	4	1.571428571	0.285714286	1.026428571	-0.039285714	1.053555612	0.001543367
404	0	0	433	0	0	0	0	-0.545	-0.325	0.297025	0.105625
411	0	0	437	0	0	0	0	-0.545	-0.325	0.297025	0.105625
413	0	0	447	0	0	0	0	-0.545	-0.325	0.297025	0.105625
417	0	0	448	0	0	0	0	-0.545	-0.325	0.297025	0.105625
424	22	4	453	0	0	0	0	-0.545	-0.325	0.297025	0.105625
433	0	0	462	0	0	0	0	-0.545	-0.325	0.297025	0.105625
437	0	0	467	0	0	0	0	-0.545	-0.325	0.297025	0.105625
447	0	0	474	0	4	0	0.285714286	-0.545	-0.039285714	0.297025	0.001543367
448	0	0	479	0	0	0	0	-0.545	-0.325	0.297025	0.105625
453	0	0	484	0	0	0	0	-0.545	-0.325	0.297025	0.105625
462	0	0	503	0	0	0	0	-0.545	-0.325	0.297025	0.105625
467	0	0	514	0	0	0	0	-0.545	-0.325	0.297025	0.105625
474	0	4	520	5	3	0.357142857	0.214285714	-0.187857143	-0.110714286	0.035290306	0.012257653
479	0	0	522	0	0	0	0	-0.545	-0.325	0.297025	0.105625
484	0	0	545	0	0	0	0	-0.545	-0.325	0.297025	0.105625
503	0	0	550	0	0	0	0	-0.545	-0.325	0.297025	0.105625
514	0	0	551	0	0	0	0	-0.545	-0.325	0.297025	0.105625
520	5	3	560	0	1	0	0.071428571	-0.545	-0.253571429	0.297025	0.064298469
522	0	0	563	0	0	0	0	-0.545	-0.325	0.297025	0.105625
545	0	0	564	0	0	0	0	-0.545	-0.325	0.297025	0.105625
550	0	0	568	0	0	0	0	-0.545	-0.325	0.297025	0.105625
551	0	0	570	0	0	0	0	-0.545	-0.325	0.297025	0.105625
560	0	1	584	0	0	0	0	-0.545	-0.325	0.297025	0.105625
563	0	0	594	0	0	0	0	-0.545	-0.325	0.297025	0.105625
564	0	0	600	1	1	0.071428571	0.071428571	-0.473571429	-0.253571429	0.224269898	0.064298469
568	0	0	605	0	0	0	0	-0.545	-0.325	0.297025	0.105625
570	0	0	606	0	0	0	0	-0.545	-0.325	0.297025	0.105625
584	0	0	616	0	0	0	0	-0.545	-0.325	0.297025	0.105625
594	0	0	619	0	0	0	0	-0.545	-0.325	0.297025	0.105625
600	1	1	628	0	0	0	0	-0.545	-0.325	0.297025	0.105625
600	0	0	640	0	0	0	0	-0.545	-0.325	0.297025	0.105625
605	0	0	643	0	0	0	0	-0.545	-0.325	0.297025	0.105625
606	0	0	663	0	0	0	0	-0.545	-0.325	0.297025	0.105625
616	0	0	666	0	0	0	0	-0.545	-0.325	0.297025	0.105625
619	0	0	673	0	0	0	0	-0.545	-0.325	0.297025	0.105625
628	0	0	692	0	0	0	0	-0.545	-0.325	0.297025	0.105625
640	0	0	693	0	0	0	0	-0.545	-0.325	0.297025	0.105625
643	0	0	697	0	0	0	0	-0.545	-0.325	0.297025	0.105625
663	0	0	699	0	0	0	0	-0.545	-0.325	0.297025	0.105625
666	0	0	700	0	0	0	0	-0.545	-0.325	0.297025	0.105625
673	0	0	702	0	0	0	0	-0.545	-0.325	0.297025	0.105625
692	0	0	707	0	0	0	0	-0.545	-0.325	0.297025	0.105625
693	0	0	712	0	0	0	0	-0.545	-0.325	0.297025	0.105625
697	0	0	715	0	0	0	0	-0.545	-0.325	0.297025	0.105625
699	0	0	722	0	0	0	0	-0.545	-0.325	0.297025	0.105625
700	0	0	725	0	0	0	0	-0.545	-0.325	0.297025	0.105625
702	0	0	732	0	0	0	0	-0.545	-0.325	0.297025	0.105625
707	0	0	736	0	0	0	0	-0.545	-0.325	0.297025	0.105625
712	0	0	737	1	0	0.071428571	0	-0.473571429	-0.325	0.224269898	0.105625
715	0	0	743	0	0	0	0	-0.545	-0.325	0.297025	0.105625
722	0	0	756	0	0	0	0	-0.545	-0.325	0.297025	0.105625
725	0	0	764	0	0	0	0	-0.545	-0.325	0.297025	0.105625
732	0	0	766	1	0	0.071428571	0	-0.473571429	-0.325	0.224269898	0.105625
732	0	0	773	0	0	0	0	-0.545	-0.325	0.297025	0.105625
736	0	0	782	30	0	2.142857143	0	1.597857143	-0.325	2.553147449	0.105625
737	1	0	794	0	1	0	0.071428571	-0.545	-0.253571429	0.297025	0.064298469
743	0	0	801	0	0	0	0	-0.545	-0.325	0.297025	0.105625
756	0	0	817	0	0	0	0	-0.545	-0.325	0.297025	0.105625
764	0	0	819	0	1	0	0.071428571	-0.545	-0.253571429	0.297025	0.064298469
766	1	0	829	0	0	0	0	-0.545	-0.325	0.297025	0.105625
773	0	0	831	0	0	0	0	-0.545	-0.325	0.297025	0.105625
782	30	0	841	0	0	0	0	-0.545	-0.325	0.297025	0.105625
794	0	1	853	0	1	0	0.071428571	-0.545	-0.253571429	0.297025	0.064298469
801	0	0	855	0	0	0	0	-0.545	-0.325	0.297025	0.105625
817	0	0	859	0	0	0	0	-0.545	-0.325	0.297025	0.105625
819	0	1	860	0	1	0	0.071428571	-0.545	-0.253571429	0.297025	0.064298469
829	0	0	866	0	3	0	0.214285714	-0.545	-0.110714286	0.297025	0.012257653
831	0	0	867	0	0	0	0	-0.545	-0.325	0.297025	0.105625
841	0	0	868	0	0	0	0	-0.545	-0.325	0.297025	0.105625
853	0	1	877	0	0	0	0	-0.545	-0.325	0.297025	0.105625
855	0	0	878	8	2	0.571428571	0.142857143	0.026428571	-0.182142857	0.000698469	0.03317602
859	0	0	890	0	0	0	0	-0.545	-0.325	0.297025	0.105625
860	0	1	892	0	0	0	0	-0.545	-0.325	0.297025	0.105625
866	0	3	900	0	0	0	0	-0.545	-0.325	0.297025	0.105625
867	0	0	906	8	3	0.571428571	0.214285714	0.026428571	-0.110714286	0.000698469	0.012257653
868	0	0	907	0	0	0	0	-0.545	-0.325	0.297025	0.105625
877	0	0	908	0	0	0	0	-0.545	-0.325	0.297025	0.105625
877	0	0	909	0	0	0	0	-0.545	-0.325	0.297025	0.105625
878	8	2	911	0	0	0	0	-0.545	-0.325	0.297025	0.105625
890	0	0	921	0	0	0	0	-0.545	-0.325	0.297025	0.105625
892	0	0	929	0	2	0	0.142857143	-0.545	-0.182142857	0.297025	0.03317602
900	0	0	939	0	0	0	0	-0.545	-0.325	0.297025	0.105625
906	8	3	949	0	0	0	0	-0.545	-0.325	0.297025	0.105625
907	0	0	963	0	0	0	0	-0.545	-0.325	0.297025	0.105625
908	0	0	969	3	0	0.214285714	0	-0.330714286	-0.325	0.109371939	0.105625
909	0	0	976	0	0	0	0	-0.545	-0.325	0.297025	0.105625
911	0	0	1000	0	0	0	0	-0.545	-0.325	0.297025	0.105625
921	0	0	1003	0	0	0	0	-0.545	-0.325	0.297025	0.105625
929	0	2	1015	0	0	0	0	-0.545	-0.325	0.297025	0.105625
939	0	0	1026	0	0	0	0	-0.545	-0.325	0.297025	0.105625
949	0	0	1028	0	0	0	0	-0.545	-0.325	0.297025	0.105625
963	0	0	1034	0	0	0	0	-0.545	-0.325	0.297025	0.105625
969	3	0	1035	0	0	0	0	-0.545	-0.325	0.297025	0.105625
976	0	0	1039	0	2	0	0.142857143	-0.545	-0.182142857	0.297025	0.03317602
1000	0	0	1041	0	0	0	0	-0.545	-0.325	0.297025	0.105625
1003	0	0	1044	0	0	0	0	-0.545	-0.325	0.297025	0.105625
1015	0	0	1051	0	0	0	0	-0.545	-0.325	0.297025	0.105625
1026	0	0	1063	0	0	0	0	-0.545	-0.325	0.297025	0.105625
1028	0	0	1077	0	0	0	0	-0.545	-0.325	0.297025	0.105625
1034	0	0	1098	0	0	0	0	-0.545	-0.325	0.297025	0.105625
1035	0	0	1113	0	0	0	0	-0.545	-0.325	0.297025	0.105625
1039	0	2	1118	0	0	0	0	-0.545	-0.325	0.297025	0.105625
1041	0	0	1119	0	0	0	0	-0.545	-0.325	0.297025	0.105625
1044	0	0	1136	0	0	0	0	-0.545	-0.325	0.297025	0.105625
1051	0	0	1152	2	0	0.142857143	0	-0.402142857	-0.325	0.161718878	0.105625
1063	0	0	1157	0	1	0	0.071428571	-0.545	-0.253571429	0.297025	0.064298469
1077	0	0	1159	0	0	0	0	-0.545	-0.325	0.297025	0.105625
1098	0	0	1171	0	0	0	0	-0.545	-0.325	0.297025	0.105625
1113	0	0	1184	0	0	0	0	-0.545	-0.325	0.297025	0.105625
1118	0	0	1185	0	0	0	0	-0.545	-0.325	0.297025	0.105625
1119	0	0	1194	0	0	0	0	-0.545	-0.325	0.297025	0.105625
1136	0	0	1197	0	0	0	0	-0.545	-0.325	0.297025	0.105625
1152	2	0	1199	0	0	0	0	-0.545	-0.325	0.297025	0.105625
1157	0	1	1200	1	0	0.071428571	0	-0.473571429	-0.325	0.224269898	0.105625
1159	0	0	1212	0	0	0	0	-0.545	-0.325	0.297025	0.105625
1171	0	0	1214	0	0	0	0	-0.545	-0.325	0.297025	0.105625
1184	0	0	1219	0	2	0	0.142857143	-0.545	-0.182142857	0.297025	0.03317602
1185	0	0	1221	0	0	0	0	-0.545	-0.325	0.297025	0.105625
1194	0	0	1228	0	0	0	0	-0.545	-0.325	0.297025	0.105625
1197	0	0	1232	0	1	0	0.071428571	-0.545	-0.253571429	0.297025	0.064298469
1199	0	0	1233	0	0	0	0	-0.545	-0.325	0.297025	0.105625
1200	1	0	1243	0	0	0	0	-0.545	-0.325	0.297025	0.105625
1200	0	0	1251	0	0	0	0	-0.545	-0.325	0.297025	0.105625
1212	0	0	1252	0	1	0	0.071428571	-0.545	-0.253571429	0.297025	0.064298469
1214	0	0	1258	0	0	0	0	-0.545	-0.325	0.297025	0.105625
1219	0	2	1260	0	5	0	0.357142857	-0.545	0.032142857	0.297025	0.001033163
1221	0	0	1261	0	0	0	0	-0.545	-0.325	0.297025	0.105625
1221	0	0	1264	0	0	0	0	-0.545	-0.325	0.297025	0.105625
1228	0	0	1266	0	0	0	0	-0.545	-0.325	0.297025	0.105625
1232	0	1	1277	0	0	0	0	-0.545	-0.325	0.297025	0.105625
1233	0	0	1280	0	0	0	0	-0.545	-0.325	0.297025	0.105625
1243	0	0	1292	0	0	0	0	-0.545	-0.325	0.297025	0.105625
1251	0	0	1296	0	0	0	0	-0.545	-0.325	0.297025	0.105625
1252	0	1	1297	0	0	0	0	-0.545	-0.325	0.297025	0.105625
1258	0	0	1304	0	0	0	0	-0.545	-0.325	0.297025	0.105625
1260	0	5	1313	0	0	0	0	-0.545	-0.325	0.297025	0.105625
1261	0	0	1314	0	0	0	0	-0.545	-0.325	0.297025	0.105625
1264	0	0	1317	0	0	0	0	-0.545	-0.325	0.297025	0.105625
1266	0	0	1320	0	0	0	0	-0.545	-0.325	0.297025	0.105625
1277	0	0	1325	0	0	0	0	-0.545	-0.325	0.297025	0.105625
1280	0	0	1331	0	2	0	0.142857143	-0.545	-0.182142857	0.297025	0.03317602
1292	0	0	1346	0	0	0	0	-0.545	-0.325	0.297025	0.105625
1296	0	0	1353	0	0	0	0	-0.545	-0.325	0.297025	0.105625
1297	0	0	1359	0	0	0	0	-0.545	-0.325	0.297025	0.105625
1304	0	0	1361	0	0	0	0	-0.545	-0.325	0.297025	0.105625
1313	0	0	1368	0	0	0	0	-0.545	-0.325	0.297025	0.105625
1314	0	0	1387	0	0	0	0	-0.545	-0.325	0.297025	0.105625
1317	0	0									
1320	0	0									
1325	0	0									
1331	0	2									
1346	0	0									
1353	0	0									
1359	0	0									
1361	0	0									
1361	0	0									
1368	0	0									
1387	0	0									

11.4.13 Bad Köstritz – C6

11.4.13.1 Bad Köstritz – C6 – Phase 1

O.R.C.U.S. 02.00 - Simulation Summary

UA Parameters

MTOW [kg]	Wingspan [m]	Length [m]	L/D
90	5	4	8

v [km/h]	Alt [m]	CCF [m]
100	100	8626.2888

P_CumCat [1/Fh]	Engine [%]	ESys [%]	FCS [%]	NavSys [%]	Struct [%]
0.01	20	20	20	20	20

General map parameters

	Name	Area [km2]	PPL	PPL/km2
City	Bad Koestritz, Stadt	16.93	3571	211
County	Greiz	845.98	99275	117
FS	TH	16202.41	2151205	133

Mission specific map parameters

	Area [km2]	PPL	Tourists	Total PPL
City-SMP	13.5387	3571	0	3571
SurM	53.3168	6239	0	6239
Map total	66.8555	9810	0	9810

PPL MOD NA

Sim FH [Fh]	19600	Ev/Fh [1/Fh]	0.0096939
Events total	190		

Hits due to UA impacts		Hits/Fh [1/Fh]
City-SMP ATB	148	0.007551
SurM ATB	0	0
Total ATB	148	0.007551
City-SMP OTW	32	0.0016327
SurM OTW	1	5.102E-05
Total OTW	33	0.0016837
Total	181	0.0092347

Prot	cyc	k_UA	Day	Time of impact	UA X Pos	UA Y Pos	Travelled Distance [km]	PPL_TD_CITY_ATB	PPL_CITY_ATB_COUNT	HIT_CITY_ATB_COUNT	PPL_TD_CITY_OTW	PPL_CITY_OTW_COUNT	HIT_CITY_OTW_COUNT	PPL_TD_SURM_ATB	PPL_SURM_ATB_COUNT	HIT_SURM_ATB_COUNT	PPL_TD_SURM_OTW	PPL_SURM_OTW_COUNT	HIT_SURM_OTW_COUNT	PPL_ALL_ATB_COUNT	PPL_ALL_OTW_COUNT	E	Case	Outcome
1002	29	2234	Monday	08:28:08	4243	3673	246.89	3035	3035	0	536	536	2	5303	5303	0	936	936	0	8338	1472	21	Engine Fire	UA structural desintegration - Debris Impact
1021	14	2097	Saturday	07:10:17	3980	3832	117.17	3392	3392	0	179	179	0	5864	5864	0	375	375	0	9256	554	69	Degradation of lateral and horizontal navigation data accuracy.	Central UA ground impact point below flight path
1025	46	1176	Wednesday	09:54:36	4961	4153	391.00	3035	3035	0	536	536	0	5178	5178	0	1061	1061	0	8213	1597	72	Degradation of altitude	UA approaches Emergency landing site
1027	95	3508	Friday	14:11:33	7759	2897	819.28	2767	2767	0	804	804	0	4523	4523	0	1716	1716	0	7290	2520	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
1038	146	461	Tuesday	18:31:08	7272	3420	1251.92	2678	2678	0	893	893	0	4648	4648	0	1591	1591	0	7326	2484	27	Generator Failure	UA ground impact tangential to trajectory
1040	21	2934	Thursday	07:47:44	6480	2932	179.56	3071	3071	0	500	500	0	5271	5271	0	968	968	0	8342	1468	40	Short Circuit / Overload	Central UA ground impact point below flight path
1048	50	2425	Friday	10:17:05	4753	3440	428.50	2821	2821	0	750	750	0	5053	5053	0	1186	1186	0	7874	1936	9	Engine Out	UA ground impact tangential to trajectory
107	65	1774	Tuesday	11:33:48	3781	4124	556.33	2928	2928	0	643	643	0	4897	4897	0	1342	1342	0	7825	1985	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1074	143	2265	Wednesday	18:18:12	4316	3635	1230.36	2642	2642	0	929	929	0	4523	4523	0	1716	1716	0	7165	2645	28	Generator Failure	UA ground impact tangential to trajectory
1077	16	3105	Saturday	07:22:06	7008	2850	136.83	3392	3392	0	179	179	0	5864	5864	0	375	375	0	9256	554	1	Engine Out	No Ground Effect
1081	136	2831	Wednesday	17:42:47	6130	3008	1171.33	2642	2642	34	929	929	3	4523	4523	0	1716	1716	0	7165	2645	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1083	25	184	Friday	08:04:28	7739	3110	207.47	3071	3071	0	500	500	0	5459	5459	0	780	780	0	8530	1280	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1093	98	1229	Monday	14:23:49	4794	4181	839.69	2767	2767	0	804	804	1	4991	4991	0	1248	1248	0	7758	2052	21	Engine Fire	UA structural desintegration - Debris Impact
1094	147	1000	Tuesday	18:37:06	5556	4026	1261.83	2678	2678	0	893	893	1	4648	4648	0	1591	1591	0	7326	2484	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1098	15	3493	Saturday	07:17:28	7747	2889	129.14	3392	3392	0	179	179	0	5864	5864	0	375	375	0	9256	554	74	Degradation of altitude	Central UA ground impact point below flight path
1100	36	1726	Monday	09:03:38	3806	4154	306.06	3035	3035	0	536	536	0	5303	5303	0	936	936	0	8338	1472	77	Degradation of altitude	Central UA ground impact point below flight path
1106	117	2662	Sunday	16:04:13	5537	3167	1007.03	2606	2606	0	965	965	0	4429	4429	0	1810	1810	0	7035	2775	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1106	51	2002	Sunday	10:21:40	3857	3932	436.11	2624	2624	0	947	947	0	4679	4679	0	1560	1560	0	7303	2507	13	Engine Anomaly	UA approaches Emergency landing site
1119	116	1254	Saturday	15:57:01	4718	4192	995.03	2838	2838	0	733	733	0	4897	4897	0	1342	1342	0	7735	2075	72	Degradation of altitude	UA approaches Emergency landing site
1119	135	1644	Saturday	17:35:55	3880	4193	1159.86	2838	2838	0	733	733	0	4897	4897	0	1342	1342	0	7735	2075	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1124	44	3205	Thursday	09:47:09	7269	2829	378.61	3035	3035	0	536	536	0	5490	5490	0	749	749	1	8525	1285	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
114	94	176	Tuesday	14:01:35	7746	3102	802.67	2838	2838	0	733	733	1	4585	4585	0	1654	1654	0	7423	2387	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1158	143	1686	Wednesday	18:17:23	3837	4175	1228.97	2642	2642	0	929	929	0	4523	4523	0	1716	1716	0	7165	2645	43	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
116	33	3229	Thursday	08:50:16	7325	2828	283.78	3035	3035	0	536	536	0	5490	5490	0	749	749	0	8525	1285	38	Short Circuit / Overload	Central UA ground impact point below flight path
1161	19	373	Saturday	07:33:42	7464	3315	156.17	3392	3392	0	179	179	0	5864	5864	0	375	375	0	9256	554	78	Degradation of altitude	Central UA ground impact point below flight path
1184	103	3492	Monday	14:52:56	7746	2888	888.25	2767	2767	0	804	804	0	4991	4991	0	1248	1248	0	7758	2052	55	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
119	60	1029	Sunday	11:06:51	5455	4051	511.42	2624	2624	0	947	947	0	4679	4679	0	1560	1560	0	7303	2507	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1195	92	3110	Friday	13:55:28	7022	2848	792.44	2767	2767	0	804	804	0	4523	4523	0	1716	1716	0	7290	2520	76	Degradation of altitude	Central UA ground impact point below flight path
1202	40	124	Friday	09:22:02	7783	3053	336.72	3071	3071	0	500	500	0	5459	5459	0	780	780	0	8530	1280	37	Short Circuit / Overload	Central UA ground impact point below flight path
1207	138	2506	Wednesday	17:52:41	5008	3342	1187.81	2642	2642	0	929	929	0	4523	4523	0	1716	1716	0	7165	2645	49	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
1222	57	2822	Thursday	10:53:54	6099	3015	489.83	2856	2856	0	715	715	0	4960	4960	0	1279	1279	0	7816	1994	1	Engine Out	No Ground Effect
1223	5	833	Friday	06:21:54	6142	3862	36.50	3088	3088	0	483	483	0	5334	5334	0	905	905	0	8422	1388	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1228	124	2606	Wednesday	16:40:22	5343	3227	1067.28	2642	2642	0	929	929	0	4523	4523	0	1716	1716	0	7165	2645	69	Degradation of lateral and horizontal navigation data accuracy.	Central UA ground impact point below flight path
1232	126	1643	Sunday	16:49:20	3881	4194	1082.22	2606	2606	0	965	965	0	4429	4429	0	1810	1810	0	7035	2775	8	Engine Out	UA ground impact tangential to trajectory
124	115	1341	Friday	15:51:57	4472	4220	986.61	2767	2767	0	804	804	2	4523	4523	0	1716	1716	0	7290	2520	18	Engine Fire	UA structural desintegration - Debris Impact
1247	62	1665	Monday	11:18:06	3857	4184	530.19	2892	2892	0	679	679	0	4835	4835	0	1404	1404	0	7727	2083	73	Degradation of altitude	Central UA ground impact point below flight path
1257	132	2567	Thursday	17:21:43	5210	3271	1136.19	2660	2660	1	911	911	0	4648	4648	0	1591	1591	0	7308	2502	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1259	58	3302	Saturday	10:59:45	7479	2830	499.61	2606	2606	0	965	965	0	4648	4648	0	1591	1591	0	7254	2556	71	Degradation of lateral and horizontal navigation data accuracy.	Central UA ground impact point on a random Map coordinate
1261	124	2629	Monday	16:40:23	5422	3202	1067.33	2642	2642	0	929	929	0	4648	4648	0	1591	1591	0	7290	2520	70	Degradation of lateral and horizontal navigation data accuracy.	Central UA ground impact point on a random Map coordinate
128	107	1856	Tuesday	15:11:18	3772	4065	918.83	2838	2838	0	733	733	0	4585	4585	0	1654	1654	0	7423	2387	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1289	147	2147	Monday	18:38:44	4065	3775	1264.58	2642	2642	0	929	929	0	4648	4648	0	1591	1591	0	7290	2520	1	Engine Out	No Ground Effect
1295	128	2105	Sunday	17:00:20	3992	3823	1100.58	2606	2606	0	965	965	0	4429	4429	0	1810	1810	0	7035	2775	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
1298	123	2902	Wednesday	16:35:36	6373	2954	1059.36	2642	2642	0	929	929	0	4523	4523	0	1716	1716	0	7165	2645	10	Engine Anomaly	UA approaches Emergency landing site
1301	13	191	Saturday	07:02:23	7732	3117	103.97	3392	3392	0	179	179	0	5864	5864	0	375	375	0	9256	554	72	Degradation of altitude	UA approaches Emergency landing site
1303	45	1217	Monday	09:49:29	4831	4175	382.47	3035	3035	0	536	536	0	5303	5303	0	936	936	0	8338	1472	65	Degradation of lateral and horizontal navigation data accuracy.	UA approaches Emergency landing site
131	88	2753	Friday	13:34:15	5857	3076	757.08	2767	2767	0	804	804	0	4523	4523	0	1716	1716	0	7290	2520	1	Engine Out	No Ground Effect
1311	13	828	Tuesday	07:03:17	6159	3857	105.50	3017	3017	0	554	554	0	5365	5365	0	874	874	0	8382	1428	5	Engine Out	No Ground Effect
1312	160	801	Wednesday	19:44:05	6252	3827	1373.50	3285	3285	0	286	286	0	5739	5739	0	500	500	0	9024	786	69	Degradation of lateral and horizontal navigation data accuracy.	Central UA ground impact point below flight path
1317	77	771	Monday	12:34:28	6355	3793	657.45	2892	2892	0	679	679	0	4835	4835	0	1404	1404	0	7727	2083	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1333	47	346	Wednesday	09:58:34	7515	3284	397.64	2856	2856	0	715	715	0	4928	4928	0	1311	1311	0	7784	2026	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
1345	6	919	Monday	06:27:12	5841	3951	45.33	3035	3035	0	536	536	0	5303	5303	0	936	936	0	8338	1472	22	Generator Failure	UA approaches Emergency landing site
1349	118	2713	Friday	16:09:27	5716	3115	1015.78	2803	2803	24	768	768	0	4772	4772	0	1467	1467	0	7575	2235	18	Engine Fire	UA structural desintegration - Debris Impact
1350	140	1357	Saturday	18:01:23	4430	4223	1202.31	2838	2838	0	733	733	0	4897	4897	0	1342	1342	0	7735	2075	65	Degradation of lateral and horizontal navigation data accuracy.	Central UA ground impact point below flight path
1358	59	2681	Sunday	11:04:02	5604	3147	506.75	2624	2624	0	947	947	0	4679	4679	0	1560	1560	0	7303	2507	22	Generator Failure	UA approaches Emergency landing site
1370	37	2183	Friday	09:09:27	4134	3733	315.78	3071	3071	0	500	500	0	5459	5459	0	780	780	0	8530	1280	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
1372	142	2028	Sunday	18:12:41	3885	3906	1221.17	2606	2606	0	965	965	0	4429	4429	0	1810	1810	0	7035	2775	49	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
138	20	1688	Friday	07:40:45	3835	4174	167.94	3088	3088	0	483	483	0	5334	5334	0	905	905	0	8422	1388	41	Partial Lock of Flight Control Surfaces	Central UA ground impact point below flight path
1382	3	729	Wednesday	06:11:23	6495	3745	19.00	3053	3053	0	518	518	0	5209	5209	0	1030	1030	0	8262	1548	13	Engine Anomaly	UA approaches Emergency landing site
1386	107	2424	Sunday	15:12:07	4750	3441	920.19	2553	2553	0	1018	1018	0	4180	4180	0	2059	2059	0	6733	3077	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1390	138	1856	Thursday	17:51:44	3772	4065	1186.25	2660	2660	0	911	911	0	4648	4648	0	1591	1591	0	7308	2502	78	Degradation of altitude	Central UA ground impact point below flight path
149	106	2511	Tuesday	15:07:03	5024	3336	911.78	2838	2838	0	733	733	0	4585	4585	0	1654	1654	0	7423	2387	37	Short Circuit / Overload	Central UA ground impact point below flight path
164	17	861	Wednesday	07:24:03	6044	3892	140.08	3053	3053	0	518	518	0	5209	5209	0	1030	1030	0	8262	1548	55	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
175	99	631	Sunday	14:28:07	6807	3628	846.89	2553	2553	0	1018	1018	0	4180	4180	0	2059	2059	0	6733	3077	21	Engine Fire	UA structural desintegration - Debris Impact
207	63	3421	Thursday	11:25:48	7670	2858	543.03	2856	2856	0	715	715	0	4960	4960	0	1279	1279	0	7816	1994	67	Degradation of lateral and horizontal navigation data accuracy.	Central UA ground impact point on a random Map coordinate
211	96	1496	Monday	14:13:50	4111	4231	823.08	2767	2767	0	804	804	0	4991	4991	0	1248	1248	0	7758	2052	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
234	142	2422	Wednesday	18:13:15	4744	3443	1222.11	2642	2642	0	929	929	1	4523	4523	0	1716	1716	0	7165	2645	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
252	75	922	Sunday	12:24:19	5830	3954	640.55	2624	2624	0	947	947	1	4679	4679	0	1560	1560	0	7303	2507	18	Engine Fire	UA structural desintegration - Debris Impact
254	158	3	Tuesday	19:32:36	7805	2956	1354.33	3267	3267	0	304	304	0	5864	5864	0	375	375	0	9131	679	40	Short Circuit / Overload	Central UA ground impact point below flight path
255	54	4453	Wednesday	10:34:58	7291	3410	458.28	2856	2856	1	715	715	0	4928	4928	0	1311	1311	0	7784	2026	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
256	16	1250	Thursday	07:19:26	4730	4190	132.39	3071	3071	0	500	500	0	5271	5271	0	968	968	0	8342	1468	51	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
264	144	1053	Friday	18:21:38	5372	4070	1236.08	2803	2803	0	768	768	0	4772	4772	0	1467	1467	0	7575	2235	32	Connection Failure	UA approaches Emergency landing site
275	21	3479	Tuesday	07:48:31	7735	2882	180.86	3017	3017	0	554	554	0	5365	5365	0	874	874	0	8382	1428	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
276	75	1873	Wednesday	12:25:42	3775	4051	642.83	2856	2856	0	715	715	0	4928	4928	0	1311	1311	0	7784	2026	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
278	119	2000	Friday	16:13:37	3855	3934	1022.69	2803	2803	0	768	768	0	4772	4772	0	1467	1467	0	7575	2235	44	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
289	84	1804	Tuesday	13:12:10	3773	4104	720.30	2838	2838	0	733	733	0	4585	4585	0	1654	1654	0	7423	2387	68	Degradation of lateral and horizontal navigation data accuracy.	Central UA ground impact point below flight path
30	41	36	Tuesday	09:27:04	7808	2980	345.14	3071	3071	0	500	500	0	5427	5427	0	812	812	0	8498	1312	38	Short Circuit / Overload	Central UA ground impact point below flight path
319	133	2537	Thursday	17:26:50	5109	3306	1144.75	2660	2660	0	911	911	0	4648	4648	0	1591	1591	0	7308	2502	13	Engine Anomaly	UA approaches Emergency landing site
319	29	3474	Thursday	08:29:54	7730	2880	249.86	3035	3035	0	536	536	0	5490	5490	0	749	749	0	8525	1285	36	Short Circuit / Overload	Central UA ground impact point below flight path
325	21	233	Wednesday	07:43:51	7687	3160	173.08	3053	3053	0	518	518	0	5209	5209	0	1030	1030	0	8262	1548	35	Connection Failure	UA ground impact tangential to trajectory
326	94	686	Thursday	14:02:19	6635	3694	803.89	2785	2785	0	786	786	0	4835	4835	0	1404	1404	0	7620	2190	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
328	28	2298	Saturday	08:23:02	4398	3595	238.42	2928	2928	0	643	643	0	5178	5178	0	1061	1061	0	8106	1704	10	Engine Anomaly	UA approaches Emergency landing site
330	121	3309	Monday	16:25:51	7492	2831	1043.08	2642	2642	0	929	929	0	4648	4648	0	1591	1591	0	7290	2520	1	Engine Out	No Ground Effect
337	95	3369	Monday	14:11:21	7596	2842	818.94	2767	2767	0	804	804	0	4991	4991	0	1248	1248	0	7758	2052	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
338	81	3435	Tuesday	12:59:00	7688	2863	698.33	2928	2928	0	643	643	0	4897	4897	0	1342	1342	0	7825	1985	45	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
353	84	622	Wednesday	13:10:29	6834	3617	717.47	2785	2785	0	786	786	0	4741	4741	0	1498	1498	0	7526	2284	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
357	98	2863	Sunday	14:26:09	6241	2982	843.61	2553	2553	0	1018	1018	0	4180	4180	0	2059	2059	0	6733	3077	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
358	148	1318	Monday	18:42:44	4534	4214	1271.22	2642	2642	0	929	929	0	4648	4648	0	1591	1591	0	7290	2520	28	Generator Failure	UA ground impact tangential to trajectory
372	121	3297	Monday	16:25:49	7469	2829	1043.05	2642	2642	0	929	929	0	4648	4648	0	1591	1591	0	7290	2520	37	Short Circuit / Overload	Central UA ground impact point below flight path
374	157	3255	Wednesday	19:32:06	7383	2827	1353.50	3285	3285	0	286	286	0	5739	5739	0	500	500	0	9024	786	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
38	103	2009	Wednesday	14:50:49	3864	3925	884.70	2785	2785	0	786	786	0	4741	4741	0	1498	1498	0	7526	2284	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
384	56	753	Saturday	10:45:45	6415	3773	476.25	2606	2606	0	965	965	0	4648	4648	0	1591	1591	0	7254	2556	28	Generator Failure	UA ground impact tangential to trajectory
393	118	812	Monday	16:06:43	6215	3839	1011.22	2642	2642	0	929	929	0	4648	4648	0	1591	1591	0	7290	2520	38	Short Circuit / Overload	Central UA ground impact point below flight path
399	162	1020	Sunday	19:54:45	5486	4043	1391.28	3160	3160	0	411	411	0	5771	5771	0	468	468	0	8931	879	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
402	25	1772	Wednesday	08:06:45	3782	4126	211.28	3035	3035	0	536	536	0	5178	5178	0	1061	1061	0	8213	1597	31	Connection Failure	UA ground impact tangential to trajectory
407	121	967	Monday	16:22:28	5672	3997	1037.47	2642	2642	0	929	929	0	4648	4648	0	1591	1591	0	7290	2520	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
433	85	1056	Tuesday	13:16:16	5361	4072	727.14	2821	2821	0	750	750	0	4897	4897	0	1342	1342	0	7718	2092	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
434	53	215	Sunday	10:29:26	7708	3141	449.08	2624	2624	0	947	947	0	4679	4679	0	1560	1560	0	7303	2507	28	Generator Failure	UA ground impact tangential to trajectory
440	100	718	Saturday	14:33:26	6531	3732	855.72	2821	2821	0	750	750	0	4897	4897	0	1342	1342	0	7718	2092	81	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
443	156	2763	Saturday	19:26:13	5892	3067	1343.70	3249	3249	21	322	322	0	5615	5615	0	624	624	0	8864	946	18	Engine Fire	UA structural desintegration - Debris Impact
443	154	631	Tuesday	19:12:48	6807	3628	1321.33	3267	3267	0	304	304	0	5864	5864	0	375	375	0	9131	679	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
469	39	374	Sunday	09:17:13	7462	3316	328.70	3196	3196	0	375	375	0	5708	5708	0	531	531	0	8904	906	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
478	63	2250	Tuesday	11:24:07	4280	3653	540.22	2928	2928	0	643	643	0	4897	4897	0	1342	1342	0	7825	1985	69	Degradation of lateral and horizontal navigation data accuracy.	Central UA ground impact point below flight path
484	115	2466	Monday	15:53:35	4880	3390	989.31	2767	2767	0	804	804	0	4991	4991	0	1248	1248	0	7758	2052	55	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
487	26	2786	Thursday	08:13:23	5973	3046	222.33	3035	3035	0	536	536	0	5490	5490	0	749	749	0	8525	1285	28	Generator Failure	UA ground impact tangential to trajectory
49	113	2363	Sunday	15:43:05	4572	3515	971.81	2553	2553	0	1018	1018	0	4180	4180	0	2059	2059	0	6733	3077	66	Degradation of lateral and horizontal navigation data accuracy.	Central UA ground impact point below flight path
494	91	10	Thursday	13:45:50	7806	2961	776.39	2785	2785	0	786	786	3	4835	4835	0	1404	1404	0	7620	2190	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
5	147	3399	Friday	18:40:32	7641	2850	1267.58	2803	2803	0	768	768	0	4772	4772	0	1467	1467	0	7575	2235	6	Engine Out	UA approaches Emergency landing site
500	133	172	Wednesday	17:23:26	7749	3098	1139.08	2642	2642	0	929	929	0	4523	4523	0	1716	1716	0	7165	2645	10	Engine Anomaly	UA approaches Emergency landing site
503	127	976	Saturday	16:53:33	5640	4005	1089.25	2838	2838	0	733	733	0	4897	4897	0	1342	1342	0	7735	2075	75	Degradation of altitude	UA approaches Emergency landing site
513	66	2811	Tuesday	11:40:28	6061	3024	567.44	2928	2928	0	643	643	0	4897	4897	0	1342	1342	0	7825	1985	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
52	160	1961	Wednesday	19:45:46	3820	3972	1376.28	3285	3285	2	286	286	0	5739	5739	0	500	500	0	9024	786	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
529	130	2464	Thursday	17:11:13	4873	3392	1118.70	2660	2660	0	911	911	0	4648	4648	0	1591	1591	0	7308	2502	30	Connection Failure	UA ground impact tangential to trajectory
543	85	2204	Thursday	13:17:56	4177	3708	729.89	2785	2785	0	786	786	4	4835	4835	0	1404	1404	0	7620	2190	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
559	127	2703	Saturday	16:56:02	5681	3125	1093.39	2838	2838	0	733	733	0	4897	4897	0	1342	1342	0	7735	2075	35	Connection Failure	UA ground impact tangential to trajectory
564	129	2690	Thursday	17:06:21	5635	3138	1110.61	2660	2660	17	911	911	1	4648	4648	0	1591	1591	0	7308	2502	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
573	124	2096	Saturday	16:39:38	3978	3833	1066.06	2838	2838	0	733	733	0	4897	4897	0	1342	1342	0	7735	2075	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
577	55	875	Wednesday	10:40:44	5995	3907	467.92	2856	2856	0	715	715	0	4928	4928	0	1311	1311	0	7784	2026	19	Engine Fire	UA structural desintegration - Debris Impact
578	8	2877	Thursday	06:40:22	6289	2972	67.28	3071	3071	12	500	500	1	5271	5271	0	968	968	0	8342	1468	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
595	145	676	Sunday	18:26:16	6667	3682	1243.81	2606	2606	0	965	965	0	4429	4429	0	1810	1810	0	7035	2775	2	Engine Out	UA ground impact tangential to trajectory
60	28	1927	Thursday	08:22:30	3797	4004	237.53	3035	3035	0	536	536	0	5490	5490	0	749	749	0	8525	1285	65	Degradation of lateral and horizontal navigation data accuracy.	Central UA ground impact point below flight path
635	38	1052	Friday	09:13:00	5375	4069	321.69	3071	3071	0	500	500	0	5459	5459	0	780	780	0	8530	1280	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
636	92	154	Saturday	13:51:13	7763	3081	785.36	2821	2821	0	750	750	0	4897	4897	0	1342	1342	0	7718	2092	22	Generator Failure	UA approaches Emergency landing site
64	84	274	Monday	13:09:58	7633	3203	716.64	2767	2767	0	804	804	0	4991	4991	0	1248	1248	0	7758	2052	20	Engine Fire	UA structural desintegration - Debris Impact
640	115	1330	Wednesday	15:51:57	4501	4217	986.58	2785	2785	0	786	786	0	4741	4741	0	1498	1498	0	7526	2284	28	Generator Failure	UA ground impact tangential to trajectory
641	162	3600	Thursday	19:58:28	7804	2953	1397.46	3231	3231	0	340	340	0	5802	5802	0	437	437	0	9033	777	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
643	80	1853	Saturday	12:51:33	3771	4067	685.92	2606	2606	0	965	965	0	4648	4648	0	1591	1591	0	7254	2556	13	Engine Anomaly	UA approaches Emergency landing site
647	136	2298	Wednesday	17:42:01	4398	3595	1170.06	2642	2642	0	929	929	0	4523	4523	0	1716	1716	0	7165	2645	47	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
65	87	2237	Tuesday	13:28:19	4250	3669	747.22	2838	2838	0	733	733	0	4585	4585	0	1654	1654	0	7423	2387	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
652	12	440	Monday	06:57:33	7321	3395	95.94	3035	3035	0	536	536	0	5303	5303	0	936	936	0	8338	1472	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
659	162	2307	Monday	19:56:36	4421	3584	1394.36	3231	3231	0	340	340	0	5802	5802	0	437	437	0	9033	777	6	Engine Out	UA approaches Emergency landing site
659	79	2648	Monday	12:47:31	5488	3182	679.20	2892	2892	1	679	679	0	4835	4835	0	1404	1404	0	7727	2083	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
661	102	2525	Wednesday	14:46:23	5070	3320	877.31	2785	2785	0	786	786	0	4741	4741	0	1498	1498	0	7526	2284	78	Degradation of altitude	Central UA ground impact point below flight path
664	58	1088	Saturday	10:56:34	5252	4096	494.31	2606	2606	0	965	965	0	4648	4648	0	1591	1591	0	7254	2556	31	Connection Failure	UA ground impact tangential to trajectory
674	16	2560	Tuesday	07:21:19	5186	3279	135.53	3017	3017	0	554	554	0	5365	5365	0	874	874	0	8382	1428	11	Engine Anomaly	UA approaches Emergency landing site
694	160	303	Monday	19:43:23	7589	3235	1372.31	3231	3231	0	340	340	2	5802	5802	0	437	437	0	9033	777	63	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
700	162	928	Sunday	19:54:38	5809	3960	1391.06	3160	3160	0	411	411	1	5771	5771	0	468	468	0	8931	879	31	Connection Failure	UA ground impact tangential to trajectory
705	109	1495	Friday	15:21:07	4113	4231	935.22	2767	2767	0	804	804	0	4523	4523	0	1716	1716	0	7290	2520	1	Engine Out	No Ground Effect
707	3	2248	Sunday	06:13:35	4275	3656	22.64	3446	3446	0	125	125	0	6145	6145	0	94	94	0	9591	219	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
714	94	2981	Sunday	14:05:37	6634	2904	809.39	2553	2553	0	1018	1018	0	4180	4180	0	2059	2059	0	6733	3077	78	Degradation of altitude	Central UA ground impact point below flight path
723	15	2427	Tuesday	07:15:57	4759	3437	126.58	3017	3017	0	554	554	0	5365	5365	0	874	874	0	8382	1428	69	Degradation of lateral and horizontal navigation data accuracy.	Central UA ground impact point below flight path
731	134	2705	Wednesday	17:32:16	5688	3123	1153.78	2642	2642	0	929	929	0	4523	4523	0	1716	1716	0	7165	2645	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
738	110	2242	Wednesday	15:27:22	4261	3663	945.64	2785	2785	0	786	786	0	4741	4741	0	1498	1498	0	7526	2284	19	Engine Fire	UA structural desintegration - Debris Impact
742	29	205	Sunday	08:25:12	7718	3131	242.03	3196	3196	0	375	375	0	5708	5708	0	531	531	0	8904	906	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
745	115	669	Wednesday	15:50:59	6689	3674	985.00	2785	2785	0	786	786	0	4741	4741	0	1498	1498	0	7526	2284	20	Engine Fire	UA structural desintegration - Debris Impact
752	18	1086	Wednesday	07:29:32	5259	4095	149.25	3053	3053	0	518	518	0	5209	5209	0	1030	1030	0	8262	1548	35	Connection Failure	UA ground impact tangential to trajectory
753	99	608	Thursday	14:28:05	6876	3600	846.83	2785	2785	0	786	786	0	4835	4835	0	1404	1404	0	7620	2190	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
759	145	1163	Wednesday	18:26:59	5002	4146	1244.97	2642	2642	0	929	929	0	4523	4523	0	1716	1716	0	7165	2645	78	Degradation of altitude	Central UA ground impact point below flight path
762	93	2373	Saturday	13:59:34	4600	3503	799.30	2821	2821	0	750	750	0	4897	4897	0	1342	1342	0	7718	2092	18	Engine Fire	UA structural desintegration - Debris Impact
763	9	158	Sunday	06:41:38	7760	3085	69.39	3446	3446	0	125	125	0	6145	6145	0	94	94	0	9591	219	9	Engine Out	UA ground impact tangential to trajectory
764	151	2052	Monday	18:59:16	3915	3880	1298.86	3231	3231	0	340	340	0	5802	5802	0	437	437	0	9033	777	49	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
764	90	1140	Monday	13:42:16	5078	4132	770.47	2767	2767	0	804	804	0	4991	4991	0	1248	1248	0	7758	2052	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
765	40	1747	Tuesday	09:24:22	3793	4141	340.61	3071	3071	0	500	500	0	5427	5427	0	812	812	0	8498	1312	22	Generator Failure	UA approaches Emergency landing site
769	82	1852	Saturday	13:01:54	3771	4068	703.17	2821	2821	0	750	750	0	4897	4897	0	1342	1342	0	7718	2092	57	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
770	107	2820	Sunday	18:39:43	6092	3017	1266.20	2606	2606	0	965	965	0	4429	4429	0	1810	1810	0	7035	2775	72	Degradation of altitude	Central UA ground impact point below flight path
775	36	1424	Friday	09:03:11	4265	4232	305.33	3071	3071	0	500	500	0	5459	5459	0	780	780	0	8530	1280	25	Generator Failure	UA ground impact tangential to trajectory
776	29	1735	Saturday	08:27:24	3800	4148	245.69	2928	2928	0	643	643	0	5178	5178	0	1061	1061	0	8106	1704	24	Engine Fire	UA structural desintegration - Debris Impact
779	130	2081	Tuesday	17:10:39	3955	3849	1117.78	2678	2678	0	893	893	0	4648	4648	0	1591	1591	0	7326	2484	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
78	14	961	Monday	07:08:40	5693	3991	114.44	3035	3035	0	536	536	0	5303	5303	0	936	936	0	8338	1472	20	Engine Fire	UA structural desintegration - Debris Impact
792	72	1857	Monday	12:10:08	3772	4064	616.92	2892	2892	0	679	679	0	4835	4835	0	1404	1404	0	7727	2083	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
795	42	3299	Thursday	09:36:56	7473	2830	361.58	3035	3035	0	536	536	0	5490	5490	0	749	749	0	8525	1285	73	Degradation of altitude	Central UA ground impact point below flight path
803	141	667	Friday	18:05:34	6695	3671	1209.28	2803	2803	0	768	768	0	4772	4772	0	1467	1467	0	7575	2235	11	Engine Anomaly	UA approaches Emergency landing site
811	48	2763	Saturday	10:07:14	5892	3067	412.06	2606	2606	0	965	965	0	4648	4648	0	1591	1591	0	7254	2556	65	Degradation of lateral and horizontal navigation data accuracy.	Central UA ground impact point below flight path
814	63	1346	Tuesday	11:22:49	4458	4221	538.06	2928	2928	0	643	643	0	4897	4897	0	1342	1342	0	7825	1985	67	Degradation of lateral and horizontal navigation data accuracy.	Central UA ground impact point below flight path
817	42	2059	Friday	09:35:10	3924	3873	358.61	3071	3071	0	500	500	0	5459	5459	0	780	780	0	8530	1280	47	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
819	35	608	Sunday	08:56:51	6876	3600	294.75	3196	3196	0	375	375	0	5708	5708	0	531	531	0	8904	906	3	Engine Out	UA ground impact tangential to trajectory
823	155	1969	Thursday	19:19:53	3826	3965	1333.17	3231	3231	0	340	340	0	5802	5802	0	437	437	0	9033	777	31	Connection Failure	UA ground impact tangential to trajectory
835	153	2074	Tuesday	19:09:41	3945	3857	1316.17	3267	3267	0	304	304	0	5864	5864	0	375	375	0	9131	679	78	Degradation of altitude	Central UA ground impact point below flight path
841	144	1876	Monday	18:22:49	3776	4048	1238.05	2642	2642	0	929	929	0	4648	4648	0	1591	1591	0	7290	2520	78	Degradation of altitude	Central UA ground impact point below flight path
842	15	2960	Tuesday	07:16:42	6566	2916	127.86	3017	3017	0	554	554	0	5365	5365	0	874	874	0	8382	1428	21	Engine Fire	UA structural desintegration - Debris Impact
843	8	1926	Wednesday	06:38:59	3796	4005	65.00	3053	3053	0	518	518	0	5209	5209	0	1030	1030	0	8262	1548	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
844	135	1725	Thursday	17:36:02	3806	4154	1160.06	2660	2660	0	911	911	0	4648	4648	0	1591	1591	0	7308	2502	36	Short Circuit / Overload	Central UA ground impact point below flight path
86	160	535	Tuesday	19:43:43	7083	3510	1372.86	3267	3267	0	304	304	0	5864	5864	0	375	375	0	9131	679	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
862	25	1123	Monday	08:05:49	5134	4121	209.72	3035	3035	0	536	536	0	5303	5303	0	936	936	0	8338	1472	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
868	18	1608	Sunday	07:30:17	3925	4207	150.50	3446	3446	0	125	125	0	6145	6145	0	94	94	0	9591	219	22	Generator Failure	UA approaches Emergency landing site
868	21	986	Sunday	07:44:55	5605	4014	174.89	3446	3446	0	125	125	0	6145	6145	0	94	94	0	9591	219	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
870	161	1085	Tuesday	19:49:41	5262	4094	1382.81	3267	3267	0	304	304	0	5864	5864	0	375	375	0	9131	679	67	Degradation of lateral and horizontal navigation data accuracy.	Central UA ground impact point on a random Map coordinate
870	57	1106	Tuesday	10:51:26	5191	4109	485.72	2928	2928	0	643	643	0	4897	4897	0	1342	1342	0	7825	1985	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
894	162	1067	Friday	19:54:50	5324	4081	1391.39	3321	3321	0	250	250	0	5739	5739	0	500	500	0	9060	750	44	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
897	84	552	Monday	13:10:22	7037	3531	717.30	2767	2767	0	804	804	0	4991	4991	0	1248	1248	0	7758	2052	47	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
908	129	3026	Friday	17:06:50	6775	2881	1111.42	2803	2803	0	768	768	0	4772	4772	0	1467	1467	0	7575	2235	40	Short Circuit / Overload	Central UA ground impact point below flight path
924	22	1177	Sunday	07:50:23	4957	4154	183.97	3446	3446	0	125	125	0	6145	6145	0	94	94	0	9591	219	70	Degradation of lateral and horizontal navigation data accuracy.	Central UA ground impact point on a random Map coordinate
926	73	2013	Thursday	12:15:32	3868	3921	625.92	2928	2928	0	643	643	0	4897	4897	0	1342	1342	0	7825	1985	75	Degradation of altitude	UA approaches Emergency landing site
951	145	2206	Saturday	18:28:28	4182	3706	1247.47	2838	2838	0	733	733	0	4897	4897	0	1342	1342	0	7735	2075	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site

960	136	1556	Monday	17:40:57	4003	4221	1168.28	2642	2642	0	929	929	0	4648	4648	0	1591	1591	0	7290	2520	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
964	56	1773	Friday	10:47:12	3782	4125	478.69	2821	2821	0	750	750	0	5053	5053	0	1186	1186	0	7874	1936	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
966	144	3581	Sunday	18:25:17	7799	2940	1242.14	2606	2606	0	965	965	0	4429	4429	0	1810	1810	0	7035	2775	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
968	127	1926	Tuesday	16:54:54	3796	4005	1091.53	2678	2678	0	893	893	0	4648	4648	0	1591	1591	0	7326	2484	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
970	158	2785	Thursday	19:36:36	5969	3047	1361.00	3231	3231	21	340	340	0	5802	5802	0	437	437	0	9033	777	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
970	83	1544	Thursday	13:06:37	4023	4224	711.06	2785	2785	0	786	786	1	4835	4835	0	1404	1404	0	7620	2190	21	Engine Fire	UA structural desintegration - Debris Impact
997	132	1512	Wednesday	17:20:12	4080	4229	1133.67	2642	2642	0	929	929	2	4523	4523	0	1716	1716	0	7165	2645	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact

O.R.C.U.S. 02.00 - tTest of the Simulation

nProbes	1400
nEvents	190
nEvents_cor	181
tMission	14
x_cross_ATB	0.1057143
x_cross_OTW	0.0235714
x_cross_TOT	0.1292857
s2ATB	0.021008
sATB	0.1449414
tATB	24.708611
s2OTW	0.0007136
sOTW	0.0267138
tOTW	19.008737
s2TOT	0.027178
sTOT	0.1648576
tTOT	27.07345

UADay/Prot	HIT_TOT_ATB	HIT_TOT_OTW	UADay/Prot cor	HIT_TOT_mean_ATB	HIT_TOT_mean_OTW	HIT_TOT_mean_ATB/Fh	HIT_TOT_mean_OTW/Fh	x_i-x_cross ATB	x_i-x_cross OTW	(x_i-x_cross ATB)^2	(x_i-x_cross OTW)^2
5	0	0	5	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
30	0	0	30	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
38	0	0	38	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
49	0	0	49	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
52	0	2	52	0	2	0	0.142857143	-0.105714286	0.119285714	0.01117551	0.014229082
60	0	0	60	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
64	0	0	64	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
65	0	0	65	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
78	0	0	78	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
86	0	0	86	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
107	0	0	107	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
114	0	1	114	0	1	0	0.071428571	-0.105714286	0.047857143	0.01117551	0.002290306
116	0	0	116	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
119	0	0	119	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
124	0	2	124	0	2	0	0.142857143	-0.105714286	0.119285714	0.01117551	0.014229082
128	0	0	128	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
131	0	0	131	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
138	0	0	138	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
149	0	0	149	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
164	0	0	164	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
175	0	0	175	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
207	0	0	207	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
211	0	0	211	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
234	2	1	234	2	1	0.142857143	0.071428571	0.037142857	0.047857143	0.001379592	0.002290306
252	0	1	252	0	1	0	0.071428571	-0.105714286	0.047857143	0.01117551	0.002290306
254	0	0	254	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
255	1	0	255	1	0	0.071428571	0	-0.034285714	-0.023571429	0.00117551	0.000555612
256	0	0	256	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
264	0	0	264	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
275	0	0	275	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
276	0	0	276	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
278	0	0	278	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
289	0	0	289	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
319	0	0	319	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
319	0	0	325	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
325	0	0	326	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
326	0	0	328	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
328	0	0	330	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
330	0	0	337	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
337	0	0	338	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
338	0	0	353	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
353	0	0	357	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
357	0	0	358	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
358	0	0	372	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
372	0	0	374	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
374	0	0	384	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
384	0	0	393	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
393	0	0	399	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
399	0	0	402	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
402	0	0	407	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
407	0	0	433	0	1	0	0.071428571	-0.105714286	0.047857143	0.01117551	0.002290306
433	0	1	434	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
434	0	0	440	21	0	1.5	0	1.394285714	-0.023571429	1.944032653	0.000555612
440	0	0	443	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
440	21	0	469	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
443	0	0	478	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
469	0	0	484	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
478	0	0	487	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
484	0	0	494	0	3	0	0.214285714	-0.105714286	0.190714286	0.01117551	0.036371939
487	0	0	500	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
494	0	3	503	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
500	0	0	513	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
503	0	0	529	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
513	0	0	543	0	4	0	0.285714286	-0.105714286	0.262142857	0.01117551	0.068718878
529	0	0	559	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
543	0	4	564	17	1	1.214285714	0.071428571	1.108571429	0.047857143	1.228930612	0.002290306
559	0	0	573	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
564	17	1	577	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
573	0	0	578	12	1	0.857142857	0.071428571	0.751428571	0.047857143	0.564644898	0.002290306
577	0	0	595	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
578	12	1	635	0	1	0	0.071428571	-0.105714286	0.047857143	0.01117551	0.002290306
595	0	0	636	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
635	0	1	640	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
636	0	0	641	0	1	0	0.071428571	-0.105714286	0.047857143	0.01117551	0.002290306
640	0	0	643	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
641	0	1	647	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
643	0	0	652	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
647	0	0	659	1	1	0.071428571	0.071428571	-0.034285714	0.047857143	0.00117551	0.002290306
652	0	0	661	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
659	0	0	664	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
659	1	1	674	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
661	0	0	694	2	1	0.142857143	0.071428571	0.037142857	0.047857143	0.001379592	0.002290306
664	0	0	700	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
674	0	0	705	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
694	2	1	707	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
700	0	0	714	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
705	0	0	723	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
707	0	0	731	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
714	0	0	738	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
723	0	0	742	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
731	0	0	745	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
738	0	0	752	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
742	0	0	753	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
745	0	0	759	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
752	0	0	762	7	0	0.5	0	0.394285714	-0.023571429	0.155461224	0.000555612
753	0	0	763	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
759	0	0	764	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
762	7	0	765	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
763	0	0	769	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
764	0	0	770	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
764	0	0	775	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
765	0	0	776	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
769	0	0	779	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
770	0	0	792	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
775	0	0	795	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
776	0	0	803	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
779	0	0	811	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
792	0	0	814	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
795	0	0	817	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
803	0	0	819	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
811	0	0	823	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
814	0	0	835	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
817	0	0	841	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
819	0	0	842	5	1	0.357142857	0.071428571	0.251428571	0.047857143	0.063216327	0.002290306
823	0	0	843	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
835	0	0	844	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
841	0	0	862	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
842	5	1	868	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
843	0	0	870	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
844	0	0	894	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
862	0	0	897	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
868	0	0	908	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
868	0	0	924	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
870	0	0	926	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
870	0	0	951	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
894	0	0	960	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
897	0	0	964	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
908	0	0	966	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
924	0	0	968	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
926	0	0	970	21	1	1.5	0.071428571	1.394285714	0.047857143	1.944032653	0.002290306
951	0	0	997	0	2	0	0.142857143	-0.105714286	0.119285714	0.01117551	0.014229082
960	0	0	1002	0	2	0	0.142857143	-0.105714286	0.119285714	0.01117551	0.014229082
964	0	0	1021	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
966	0	0	1025	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
968	0	0	1027	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
970	21	0	1038	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
970	0	1	1040	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
997	0	2	1048	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
1002	0	2	1074	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
1021	0	0	1077	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
1025	0	0	1081	34	3	2.428571429	0.214285714	2.322857143	0.190714286	5.395665306	0.036371939
1027	0	0	1083	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
1038	0	0	1093	0	1	0	0.071428571	-0.105714286	0.047857143	0.01117551	0.002290306
1040	0	0	1094	0	1	0	0.071428571	-0.105714286	0.047857143	0.01117551	0.002290306
1048	0	0	1098	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
1074	0	0	1100	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
1077	0	0	1106	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
1081	34	3	1119	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
1083	0	0	1124	0	1	0	0.071428571	-0.105714286	0.047857143	0.01117551	0.002290306
1093	0	1	1158	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
1094	0	1	1161	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
1098	0	0	1184	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
1100	0	0	1195	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
1106	0	0	1202	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
1106	0	0	1207	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
1119	0	0	1222	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
1119	0	0	1223	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
1124	0	1	1228	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
1158	0	0	1232	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
1161	0	0	1247	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
1184	0	0	1257	1	0	0.071428571	0	-0.034285714	-0.023571429	0.00117551	0.000555612
1195	0	0	1259	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
1202	0	0	1261	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
1207	0	0	1289	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
1222	0	0	1295	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
1223	0	0	1298	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
1228	0	0	1301	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
1232	0	0	1303	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
1247	0	0	1311	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
1257	1	0	1312	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
1259	0	0	1317	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
1261	0	0	1333	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
1289	0	0	1345	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
1295	0	0	1349	24	0	1.714285714	0	1.608571429	-0.023571429	2.587502041	0.000555612
1298	0	0	1350	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
1301	0	0	1358	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
1303	0	0	1370	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
1311	0	0	1372	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
1312	0	0	1382	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
1317	0	0	1386	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
1333	0	0	1390	0	0	0	0	-0.105714286	-0.023571429	0.01117551	0.000555612
1345	0	0									
1349	24	0									
1350	0	0									
1358	0	0									
1370	0	0									
1372	0	0									
1382	0	0									
1386	0	0									
1390	0	0									

11.4.13.2 Bad Köstritz – C6 – Phase 2

O.R.C.U.S. 02.00 - Simulation Summary

UA Parameters

MTOW [kg]	Wingspan [m]	Length [m]	L/D
90	5	4	8

v [km/h]	Alt [m]	CCF [m]
100	100	8626.2888

P_CumCat [1/Fh]	Engine [%]	ESys [%]	FCS [%]	NavSys [%]	Struct [%]
0.01	20	20	20	20	20

General map parameters

	Name	Area [km2]	PPL	PPL/km2
City	Bad Koestritz, Stadt	16.93	3571	211
County	Greiz	845.98	99275	117
FS	TH	16202.41	2151205	133

Mission specific map parameters

	Area [km2]	PPL	Tourists	Total PPL
City-SMP	13.5387	3571	0	3571
SurM	53.3168	6239	0	6239
Map total	66.8555	9810	0	9810

PPL MOD NA

Sim FH [Fh]	19600	Ev/Fh [1/Fh]	0.0098469
Events total	193		

Hits due to UA impacts		Hits/Fh [1/Fh]
City-SMP ATB	207	0.0105612
SurM ATB	0	0
Total ATB	207	0.0105612
City-SMP OTW	23	0.0011735
SurM OTW	1	5.102E-05
Total OTW	24	0.0012245
Total	231	0.0117857

Prot	cyc	k_UA	Day	Time of impact	UA X Pos	UA Y Pos	Travelled Distance [km]	PPL_TD_CITY_ATB	PPL_CITY_ATB_COUNT	HIT_CITY_ATB_COUNT	PPL_TD_CITY_OTW	PPL_CITY_OTW_COUNT	HIT_CITY_OTW_COUNT	PPL_TD_SURM_ATB	PPL_SURM_ATB_COUNT	HIT_SURM_ATB_COUNT	PPL_TD_SURM_OTW	PPL_SURM_OTW_COUNT	HIT_SURM_OTW_COUNT	PPL_ALL_ATB_COUNT	PPL_ALL_OTW_COUNT	E	Case	Outcome
1009	149	3537	Monday	18:51:05	7779	2913	1285.17	2642	2642	0	929	929	0	4648	4648	0	1591	1591	0	7290	2520	72	Degradation of altitude	UA approaches Emergency landing site
1022	148	1666	Sunday	18:43:14	3856	4184	1272.06	2606	2606	0	965	965	0	4429	4429	0	1810	1810	0	7035	2775	28	Generator Failure	UA ground impact tangential to trajectory
1027	153	1761	Friday	19:09:14	3786	4133	1315.42	3321	3321	0	250	250	0	5739	5739	0	500	500	0	9060	750	2	Engine Out	UA approaches Emergency landing site
1032	71	2374	Wednesday	12:05:43	4603	3502	609.53	2856	2856	12	715	715	3	4928	4928	0	1311	1311	0	7784	2026	18	Engine Fire	UA structural desintegration - Debris Impact
1033	7	2025	Thursday	06:33:57	3882	3909	56.61	3071	3071	0	500	500	0	5271	5271	0	968	968	0	8342	1468	17	Engine Fire	Central UA ground impact point below flight path
1035	73	31	Saturday	12:12:42	7808	2976	621.17	2606	2606	0	965	965	1	4648	4648	0	1591	1591	0	7254	2556	9	Engine Out	UA ground impact tangential to trajectory
1040	23	11	Thursday	07:53:52	7806	2961	189.80	3071	3071	0	500	500	0	5271	5271	0	968	968	0	8342	1468	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
1042	149	2250	Saturday	18:49:14	4280	3653	1282.08	2838	2838	0	733	733	0	4897	4897	0	1342	1342	0	7735	2075	32	Connection Failure	UA approaches Emergency landing site
1042	2	2324	Saturday	06:08:31	4465	3563	14.20	3392	3392	0	179	179	0	5864	5864	0	375	375	0	9256	554	22	Generator Failure	UA approaches Emergency landing site
1062	93	1944	Friday	13:58:57	3808	3988	798.28	2767	2767	0	804	804	0	4523	4523	0	1716	1716	0	7290	2520	9	Engine Out	UA ground impact tangential to trajectory
1072	102	3279	Monday	14:47:28	7433	2828	879.11	2767	2767	0	804	804	0	4991	4991	0	1248	1248	0	7758	2052	29	Connection Failure	UA approaches Emergency landing site
1072	152	3356	Monday	19:06:22	7575	2839	1310.61	3231	3231	0	340	340	0	5802	5802	0	437	437	0	9033	777	68	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
1074	119	110	Wednesday	16:10:53	7790	3041	1018.17	2642	2642	0	929	929	0	4523	4523	0	1716	1716	0	7165	2645	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
1084	150	2719	Saturday	18:55:05	5737	3109	1291.83	2838	2838	0	733	733	0	4897	4897	0	1342	1342	0	7735	2075	22	Generator Failure	UA approaches Emergency landing site
1089	105	1984	Thursday	15:01:07	3839	3950	901.89	2785	2785	0	786	786	0	4835	4835	0	1404	1404	0	7620	2190	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
1099	12	1808	Sunday	06:59:31	3772	4101	99.22	3446	3446	0	125	125	0	6145	6145	0	94	94	0	9591	219	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
11	17	270	Thursday	07:23:12	7639	3199	138.67	3071	3071	0	500	500	0	5271	5271	0	968	968	0	8342	1468	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
110	123	2322	Friday	16:34:46	4460	3566	1057.97	2803	2803	0	768	768	0	4772	4772	0	1467	1467	0	7575	2235	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
1101	138	1984	Tuesday	17:51:56	3839	3950	1186.56	2678	2678	0	893	893	0	4648	4648	0	1591	1591	0	7326	2484	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
1116	95	3485	Wednesday	14:11:31	7740	2885	819.22	2785	2785	0	786	786	0	4741	4741	0	1498	1498	0	7526	2284	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
1122	43	24	Tuesday	09:37:25	7807	2971	362.36	3071	3071	0	500	500	0	5427	5427	0	812	812	0	8498	1312	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
1124	102	1041	Thursday	14:44:14	5413	4060	873.75	2785	2785	0	786	786	0	4835	4835	0	1404	1404	0	7620	2190	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
1128	147	976	Monday	18:37:03	5640	4005	1261.78	2642	2642	0	929	929	0	4648	4648	0	1591	1591	0	7290	2520	73	Degradation of altitude	Central UA ground impact point below flight path
1131	161	1166	Thursday	19:49:48	4993	4148	1383.00	3231	3231	0	340	340	0	5802	5802	0	437	437	0	9033	777	14	Engine Anomaly	Central UA ground impact point below flight path
1163	88	2822	Monday	13:34:20	6099	3015	757.25	2767	2767	0	804	804	0	4991	4991	0	1248	1248	0	7758	2052	75	Degradation of altitude	UA approaches Emergency landing site

91	5	3348	Sunday	06:25:30	7562	2837	42.53	3446	3446	0	125	125	0	6145	6145	0	94	94	0	9591	219	26	Generator Failure	Central UA ground impact point below flight path
911	105	1671	Monday	15:00:40	3851	4182	901.14	2767	2767	0	804	804	0	4991	4991	0	1248	1248	0	7758	2052	46	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
919	35	3100	Tuesday	09:00:25	6993	2851	300.72	3071	3071	0	500	500	0	5427	5427	0	812	812	0	8498	1312	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
923	83	2101	Saturday	13:07:26	3986	3827	712.39	2821	2821	0	750	750	0	4897	4897	0	1342	1342	0	7718	2092	77	Degradation of altitude	Central UA ground impact point below flight path
930	53	2522	Saturday	10:32:45	5060	3323	454.61	2606	2606	2	965	965	0	4648	4648	0	1591	1591	0	7254	2556	35	Connection Failure	UA ground impact tangential to trajectory
943	157	2397	Friday	19:30:52	4670	3474	1351.44	3321	3321	0	250	250	0	5739	5739	0	500	500	0	9060	750	42	Partial Lock of Flight Control Surfaces	Central UA ground impact point below flight path
945	3	2526	Sunday	06:13:58	5073	3319	23.31	3446	3446	0	125	125	0	6145	6145	0	94	94	0	9591	219	30	Connection Failure	Central UA ground impact point below flight path
950	74	337	Friday	12:18:18	7531	3273	630.53	2821	2821	0	750	750	0	5053	5053	0	1186	1186	0	7874	1936	35	Connection Failure	UA ground impact tangential to trajectory
954	161	1166	Tuesday	19:49:48	4993	4148	1383.00	3267	3267	0	304	304	0	5864	5864	0	375	375	0	9131	679	39	Short Circuit / Overload	Central UA ground impact point below flight path
969	132	2590	Wednesday	17:21:44	5288	3245	1136.25	2642	2642	1	929	929	0	4523	4523	0	1716	1716	0	7165	2645	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.

O.R.C.U.S. 02.00 - tTest of the Simulation

nProbes	200
nEvents	193
nEvents_cor	178
tMission	14
x_cross_ATB	1.035
x_cross_OTW	0.12
x_cross_TOT	1.155
s2ATB	1.1038396
sATB	1.0506377
tATB	13.797039
s2OTW	0.0137894
sOTW	0.1174281
tOTW	13.247554
s2TOT	1.3368434
sTOT	1.1562194
tTOT	14.004907

UADay/Prot	HIT_TOT_ATB	HIT_TOT_OTW	UADay/Prot cor	HIT_TOT_mean_ATB	HIT_TOT_mean_OTW	HIT_TOT_mean_ATB/Fh	HIT_TOT_mean_OTW/Fh	x_i-x_cross ATB	x_i-x_cross OTW	(x_i-x_cross ATB)^2	(x_i-x_cross OTW)^2
9	0	0	9	0	0	0	0	-1.035	-0.12	1.071225	0.0144
11	0	0	11	0	0	0	0	-1.035	-0.12	1.071225	0.0144
21	0	0	21	0	0	0	0	-1.035	-0.12	1.071225	0.0144
25	2	3	25	2	3	0.142857143	0.214285714	-0.892142857	0.094285714	0.795918878	0.008889796
43	0	0	43	0	0	0	0	-1.035	-0.12	1.071225	0.0144
48	0	0	48	0	0	0	0	-1.035	-0.12	1.071225	0.0144
48	0	0	50	0	1	0	0.071428571	-1.035	-0.048571429	1.071225	0.002359184
50	0	1	54	0	0	0	0	-1.035	-0.12	1.071225	0.0144
54	0	0	69	0	0	0	0	-1.035	-0.12	1.071225	0.0144
69	0	0	78	0	0	0	0	-1.035	-0.12	1.071225	0.0144
78	0	0	83	31	1	2.214285714	0.071428571	1.179285714	-0.048571429	1.390714796	0.002359184
83	31	1	87	0	0	0	0	-1.035	-0.12	1.071225	0.0144
87	0	0	91	0	0	0	0	-1.035	-0.12	1.071225	0.0144
91	0	0	110	0	0	0	0	-1.035	-0.12	1.071225	0.0144
110	0	0	123	0	0	0	0	-1.035	-0.12	1.071225	0.0144
123	0	0	132	32	0	2.285714286	0	1.250714286	-0.12	1.564286224	0.0144
132	32	0	134	0	0	0	0	-1.035	-0.12	1.071225	0.0144
134	0	0	136	0	0	0	0	-1.035	-0.12	1.071225	0.0144
136	0	0	143	17	1	1.214285714	0.071428571	0.179285714	-0.048571429	0.032143367	0.002359184
143	17	1	148	0	0	0	0	-1.035	-0.12	1.071225	0.0144
148	0	0	153	0	0	0	0	-1.035	-0.12	1.071225	0.0144
153	0	0	182	0	0	0	0	-1.035	-0.12	1.071225	0.0144
153	0	0	183	0	0	0	0	-1.035	-0.12	1.071225	0.0144
182	0	0	195	0	0	0	0	-1.035	-0.12	1.071225	0.0144
183	0	0	202	0	0	0	0	-1.035	-0.12	1.071225	0.0144
195	0	0	203	1	0	0.071428571	0	-0.963571429	-0.12	0.928469898	0.0144
202	0	0	208	0	0	0	0	-1.035	-0.12	1.071225	0.0144
203	1	0	211	0	0	0	0	-1.035	-0.12	1.071225	0.0144
208	0	0	222	0	0	0	0	-1.035	-0.12	1.071225	0.0144
211	0	0	234	0	0	0	0	-1.035	-0.12	1.071225	0.0144
222	0	0	243	0	0	0	0	-1.035	-0.12	1.071225	0.0144
234	0	0	244	0	0	0	0	-1.035	-0.12	1.071225	0.0144
243	0	0	250	0	0	0	0	-1.035	-0.12	1.071225	0.0144
243	0	0	256	0	0	0	0	-1.035	-0.12	1.071225	0.0144
244	0	0	289	0	0	0	0	-1.035	-0.12	1.071225	0.0144
250	0	0	292	0	0	0	0	-1.035	-0.12	1.071225	0.0144
256	0	0	296	0	0	0	0	-1.035	-0.12	1.071225	0.0144
289	0	0	311	0	0	0	0	-1.035	-0.12	1.071225	0.0144
292	0	0	319	0	0	0	0	-1.035	-0.12	1.071225	0.0144
292	0	0	330	0	0	0	0	-1.035	-0.12	1.071225	0.0144
296	0	0	337	0	0	0	0	-1.035	-0.12	1.071225	0.0144
311	0	0	352	0	0	0	0	-1.035	-0.12	1.071225	0.0144
319	0	0	369	0	0	0	0	-1.035	-0.12	1.071225	0.0144
330	0	0	376	0	0	0	0	-1.035	-0.12	1.071225	0.0144
337	0	0	377	0	0	0	0	-1.035	-0.12	1.071225	0.0144
352	0	0	379	0	0	0	0	-1.035	-0.12	1.071225	0.0144
369	0	0	380	0	0	0	0	-1.035	-0.12	1.071225	0.0144
376	0	0	383	3	0	0.214285714	0	-0.820714286	-0.12	0.673571939	0.0144
377	0	0	386	0	0	0	0	-1.035	-0.12	1.071225	0.0144
379	0	0	397	0	2	0	0.142857143	-1.035	0.022857143	1.071225	0.000522449
380	0	0	399	0	0	0	0	-1.035	-0.12	1.071225	0.0144
383	3	0	413	0	0	0	0	-1.035	-0.12	1.071225	0.0144
386	0	0	425	0	2	0	0.142857143	-1.035	0.022857143	1.071225	0.000522449
397	0	2	429	2	0	0.142857143	0	-0.892142857	-0.12	0.795918878	0.0144
399	0	0	432	0	0	0	0	-1.035	-0.12	1.071225	0.0144
413	0	0	440	0	0	0	0	-1.035	-0.12	1.071225	0.0144
425	0	2	442	0	0	0	0	-1.035	-0.12	1.071225	0.0144
429	2	0	456	0	0	0	0	-1.035	-0.12	1.071225	0.0144
432	0	0	461	0	0	0	0	-1.035	-0.12	1.071225	0.0144
440	0	0	477	0	0	0	0	-1.035	-0.12	1.071225	0.0144
442	0	0	478	0	0	0	0	-1.035	-0.12	1.071225	0.0144
456	0	0	480	0	0	0	0	-1.035	-0.12	1.071225	0.0144
461	0	0	496	0	0	0	0	-1.035	-0.12	1.071225	0.0144
477	0	0	500	0	0	0	0	-1.035	-0.12	1.071225	0.0144
478	0	0	501	0	0	0	0	-1.035	-0.12	1.071225	0.0144
480	0	0	502	29	0	2.071428571	0	1.036428571	-0.12	1.074184184	0.0144
496	0	0	505	0	0	0	0	-1.035	-0.12	1.071225	0.0144
496	0	0	507	0	0	0	0	-1.035	-0.12	1.071225	0.0144
500	0	0	508	2	0	0.142857143	0	-0.892142857	-0.12	0.795918878	0.0144
500	0	0	513	0	0	0	0	-1.035	-0.12	1.071225	0.0144
501	0	0	523	0	0	0	0	-1.035	-0.12	1.071225	0.0144
502	29	0	525	6	2	0.428571429	0.142857143	-0.606428571	0.022857143	0.367755612	0.000522449
505	0	0	535	0	0	0	0	-1.035	-0.12	1.071225	0.0144
507	0	0	542	0	0	0	0	-1.035	-0.12	1.071225	0.0144
508	2	0	543	0	0	0	0	-1.035	-0.12	1.071225	0.0144
513	0	0	547	0	0	0	0	-1.035	-0.12	1.071225	0.0144
523	0	0	549	0	0	0	0	-1.035	-0.12	1.071225	0.0144
525	6	2	551	4	0	0.285714286	0	-0.749285714	-0.12	0.561429082	0.0144
535	0	0	554	0	0	0	0	-1.035	-0.12	1.071225	0.0144
542	0	0	565	0	0	0	0	-1.035	-0.12	1.071225	0.0144
542	0	0	568	1	0	0.071428571	0	-0.963571429	-0.12	0.928469898	0.0144
543	0	0	575	0	0	0	0	-1.035	-0.12	1.071225	0.0144
547	0	0	581	0	0	0	0	-1.035	-0.12	1.071225	0.0144
549	0	0	582	0	0	0	0	-1.035	-0.12	1.071225	0.0144
551	0	0	585	0	0	0	0	-1.035	-0.12	1.071225	0.0144
551	4	0	589	0	0	0	0	-1.035	-0.12	1.071225	0.0144
554	0	0	591	0	0	0	0	-1.035	-0.12	1.071225	0.0144
565	0	0	610	0	0	0	0	-1.035	-0.12	1.071225	0.0144
568	1	0	615	0	0	0	0	-1.035	-0.12	1.071225	0.0144
575	0	0	634	0	0	0	0	-1.035	-0.12	1.071225	0.0144
581	0	0	643	0	0	0	0	-1.035	-0.12	1.071225	0.0144
582	0	0	646	0	0	0	0	-1.035	-0.12	1.071225	0.0144
585	0	0	650	0	0	0	0	-1.035	-0.12	1.071225	0.0144
589	0	0	693	0	0	0	0	-1.035	-0.12	1.071225	0.0144
591	0	0	706	0	0	0	0	-1.035	-0.12	1.071225	0.0144
610	0	0	727	0	0	0	0	-1.035	-0.12	1.071225	0.0144
615	0	0	730	0	0	0	0	-1.035	-0.12	1.071225	0.0144
634	0	0	735	0	0	0	0	-1.035	-0.12	1.071225	0.0144
643	0	0	743	0	0	0	0	-1.035	-0.12	1.071225	0.0144
646	0	0	747	0	0	0	0	-1.035	-0.12	1.071225	0.0144
650	0	0	753	0	0	0	0	-1.035	-0.12	1.071225	0.0144
693	0	0	764	0	0	0	0	-1.035	-0.12	1.071225	0.0144
706	0	0	767	0	0	0	0	-1.035	-0.12	1.071225	0.0144
727	0	0	776	0	0	0	0	-1.035	-0.12	1.071225	0.0144
730	0	0	778	0	0	0	0	-1.035	-0.12	1.071225	0.0144
735	0	0	781	0	0	0	0	-1.035	-0.12	1.071225	0.0144
743	0	0	787	0	0	0	0	-1.035	-0.12	1.071225	0.0144
747	0	0	803	0	0	0	0	-1.035	-0.12	1.071225	0.0144
753	0	0	805	0	0	0	0	-1.035	-0.12	1.071225	0.0144
764	0	0	823	61	0	4.357142857	0	3.322142857	-0.12	11.03663316	0.0144
767	0	0	838	0	0	0	0	-1.035	-0.12	1.071225	0.0144
776	0	0	853	0	3	0	0.214285714	-1.035	0.094285714	1.071225	0.008889796
778	0	0	858	0	0	0	0	-1.035	-0.12	1.071225	0.0144
781	0	0	889	0	0	0	0	-1.035	-0.12	1.071225	0.0144
787	0	0	893	0	1	0	0.071428571	-1.035	-0.048571429	1.071225	0.002359184
803	0	0	905	0	0	0	0	-1.035	-0.12	1.071225	0.0144
805	0	0	911	0	0	0	0	-1.035	-0.12	1.071225	0.0144
823	61	0	919	0	0	0	0	-1.035	-0.12	1.071225	0.0144
838	0	0	923	0	0	0	0	-1.035	-0.12	1.071225	0.0144
853	0	3	930	2	0	0.142857143	0	-0.892142857	-0.12	0.795918878	0.0144
858	0	0	943	0	0	0	0	-1.035	-0.12	1.071225	0.0144
858	0	0	945	0	0	0	0	-1.035	-0.12	1.071225	0.0144
889	0	0	950	0	0	0	0	-1.035	-0.12	1.071225	0.0144
893	0	1	954	0	0	0	0	-1.035	-0.12	1.071225	0.0144
905	0	0	969	1	0	0.071428571	0	-0.963571429	-0.12	0.928469898	0.0144
911	0	0	1009	0	0	0	0	-1.035	-0.12	1.071225	0.0144
919	0	0	1022	0	0	0	0	-1.035	-0.12	1.071225	0.0144
923	0	0	1027	0	0	0	0	-1.035	-0.12	1.071225	0.0144
930	2	0	1032	12	3	0.857142857	0.214285714	-0.177857143	0.094285714	0.031633163	0.008889796
943	0	0	1033	0	0	0	0	-1.035	-0.12	1.071225	0.0144
945	0	0	1035	0	1	0	0.071428571	-1.035	-0.048571429	1.071225	0.002359184
950	0	0	1040	0	0	0	0	-1.035	-0.12	1.071225	0.0144
954	0	0	1042	0	0	0	0	-1.035	-0.12	1.071225	0.0144
969	1	0	1062	0	0	0	0	-1.035	-0.12	1.071225	0.0144
1009	0	0	1072	0	0	0	0	-1.035	-0.12	1.071225	0.0144
1022	0	0	1074	0	0	0	0	-1.035	-0.12	1.071225	0.0144
1027	0	0	1084	0	0	0	0	-1.035	-0.12	1.071225	0.0144
1032	12	3	1089	0	0	0	0	-1.035	-0.12	1.071225	0.0144
1033	0	0	1099	0	0	0	0	-1.035	-0.12	1.071225	0.0144
1035	0	1	1101	0	0	0	0	-1.035	-0.12	1.071225	0.0144
1040	0	0	1116	0	0	0	0	-1.035	-0.12	1.071225	0.0144
1042	0	0	1122	0	0	0	0	-1.035	-0.12	1.071225	0.0144
1042	0	0	1124	0	0	0	0	-1.035	-0.12	1.071225	0.0144
1062	0	0	1128	0	0	0	0	-1.035	-0.12	1.071225	0.0144
1072	0	0	1131	0	0	0	0	-1.035	-0.12	1.071225	0.0144
1072	0	0	1163	0	0	0	0	-1.035	-0.12	1.071225	0.0144
1074	0	0	1166	0	0	0	0	-1.035	-0.12	1.071225	0.0144
1084	0	0	1169	0	0	0	0	-1.035	-0.12	1.071225	0.0144
1089	0	0	1180	0	0	0	0	-1.035	-0.12	1.071225	0.0144
1099	0	0	1185	0	0	0	0	-1.035	-0.12	1.071225	0.0144
1101	0	0	1193	0	1	0	0.071428571	-1.035	-0.048571429	1.071225	0.002359184
1116	0	0	1203	0	0	0	0	-1.035	-0.12	1.071225	0.0144
1122	0	0	1208	0	0	0	0	-1.035	-0.12	1.071225	0.0144
1124	0	0	1232	0	0	0	0	-1.035	-0.12	1.071225	0.0144
1128	0	0	1238	0	0	0	0	-1.035	-0.12	1.071225	0.0144
1131	0	0	1243	0	3	0	0.214285714	-1.035	0.094285714	1.071225	0.008889796
1163	0	0	1253	0	0	0	0	-1.035	-0.12	1.071225	0.0144
1166	0	0	1257	0	0	0	0	-1.035	-0.12	1.071225	0.0144
1169	0	0	1261	0	0	0	0	-1.035	-0.12	1.071225	0.0144
1180	0	0	1288	0	0	0	0	-1.035	-0.12	1.071225	0.0144
1185	0	0	1293	0	0	0	0	-1.035	-0.12	1.071225	0.0144
1193	0	0	1300	0	0	0	0	-1.035	-0.12	1.071225	0.0144
1193	0	1	1303	0	0	0	0	-1.035	-0.12	1.071225	0.0144
1203	0	0	1304	0	0	0	0	-1.035	-0.12	1.071225	0.0144
1208	0	0	1306	0	0	0	0	-1.035	-0.12	1.071225	0.0144
1208	0	0	1309	0	0	0	0	-1.035	-0.12	1.071225	0.0144
1232	0	0	1313	1	0	0.071428571	0	-0.963571429	-0.12	0.928469898	0.0144
1238	0	0	1314	0	0	0	0	-1.035	-0.12	1.071225	0.0144
1243	0	3	1324	0	0	0	0	-1.035	-0.12	1.071225	0.0144
1253	0	0	1325	0	0	0	0	-1.035	-0.12	1.071225	0.0144
1257	0	0	1331	0	0	0	0	-1.035	-0.12	1.071225	0.0144
1261	0	0	1335	0	0	0	0	-1.035	-0.12	1.071225	0.0144
1288	0	0	1365	0	0	0	0	-1.035	-0.12	1.071225	0.0144
1293	0	0	1379	0	0	0	0	-1.035	-0.12	1.071225	0.0144
1300	0	0	1384	0	0	0	0	-1.035	-0.12	1.071225	0.0144
1303	0	0	1385	0	0	0	0	-1.035	-0.12	1.071225	0.0144
1303	0	0	1386	0	0	0	0	-1.035	-0.12	1.071225	0.0144
1304	0	0	1395	0	0	0	0	-1.035	-0.12	1.071225	0.0144
1304	0	0									
1306	0	0									
1309	0	0									
1313	1	0									
1314	0	0									
1324	0	0									
1325	0	0									
1331	0	0									
1335	0	0									
1365	0	0									
1379	0	0									
1384	0	0									
1385	0	0									
1386	0	0									
1395	0	0									

11.4.14 Kroppenstedt – C7

11.4.14.1 Kroppenstedt – C7 – Phase 1

O.R.C.U.S. 02.00 - Simulation Summary

UA Parameters

MTOW [kg]	Wingspan [m]	Length [m]	L/D
90	5	4	8

v [km/h]	Alt [m]	CCF [m]
100	100	10246.382

P_CumCat [1/Fh]	Engine [%]	ESys [%]	FCS [%]	NavSys [%]	Struct [%]
0.01	20	20	20	20	20

General map parameters

	Name	Area [km2]	PPL	PPL/km2
City	Kroppenstedt, Stadt	38.65	1440	37
County	Boerde	2366.84	172619	73
FS	ST	20453.79	2223081	109

Mission specific map parameters

	Area [km2]	PPL	Tourists	Total PPL
City-SMP	11.7983	1440	0	1440
SurM	55.0572	4020	0	4020
Map total	66.8555	5460	0	5460

PPL MOD NA

Sim FH [Fh] 19600 Ev/Fh [1/Fh] 0.0112245
Events total 220

Hits due to UA impacts		Hits/Fh [1/Fh]
City-SMP ATB	16	0.0008163
SurM ATB	0	0
Total ATB	16	0.0008163
City-SMP OTW	8	0.0004082
SurM OTW	21	0.0010714
Total OTW	29	0.0014796
Total	45	0.0022959

Prot	cyc	k_UA	Day	Time of impact	UA X Pos	UA Y Pos	Travelled Distance [km]	PPL_TD_CITY_ATB	PPL_CITY_ATB_COUNT	HIT_CITY_ATB_COUNT	PPL_TD_CITY_OTW	PPL_CITY_OTW_COUNT	HIT_CITY_OTW_COUNT
10	49	666	Wednesday	10:56:13	6940	4235	493.72	1195	1195	0	245	245	0
1006	5	542	Friday	06:25:31	7405	4200	42.53	1216	1216	0	224	224	0
1007	76	1081	Saturday	13:42:55	5202	4141	771.56	1137	1137	0	303	303	0
101	118	2764	Wednesday	18:04:00	6308	3016	1206.69	1065	1065	0	375	375	0
1013	107	808	Friday	16:53:02	6356	4239	1088.42	1101	1101	0	339	339	0
1017	24	2811	Tuesday	08:26:12	6507	3037	243.67	1224	1224	0	216	216	1
1026	77	1512	Thursday	13:49:49	3832	3763	783.25	1144	1144	0	296	296	0
1028	27	511	Saturday	08:40:42	7511	4187	267.86	1224	1224	0	216	216	0
1031	38	1179	Tuesday	09:49:28	4819	4075	382.47	1224	1224	0	216	216	0
1032	57	2091	Wednesday	11:47:50	3873	3169	579.75	1195	1195	0	245	245	0
1039	105	1001	Wednesday	16:41:05	5533	4184	1068.47	1065	1065	0	375	375	0
1042	57	2560	Saturday	11:48:39	5441	2974	581.08	1051	1051	5	389	389	0
1046	88	2716	Wednesday	14:59:29	6104	2999	899.17	1152	1152	0	288	288	0
1047	33	3466	Thursday	09:22:38	8394	3622	337.75	1224	1224	0	216	216	0
1048	120	1635	Friday	18:14:23	3636	3628	1223.97	1101	1101	0	339	339	0
1048	96	560	Friday	15:45:00	7341	4207	975.00	1101	1101	0	339	339	0
1057	91	1120	Sunday	15:15:13	5046	4117	925.36	1015	1015	0	425	425	0
1066	44	494	Tuesday	10:25:12	7568	4179	442.00	1152	1152	0	288	288	0
1067	88	2814	Wednesday	14:59:40	6519	3038	899.44	1152	1152	0	288	288	0
1068	21	2651	Thursday	08:07:29	5826	2983	212.47	1224	1224	0	216	216	0
1076	61	203	Friday	12:09:12	8287	3972	615.36	1152	1152	0	288	288	0
1083	106	700	Friday	16:46:43	6804	4240	1077.86	1101	1101	0	339	339	0
1085	105	503	Sunday	16:40:13	7538	4183	1067.06	1087	1087	0	353	353	0
1086	46	643	Monday	10:37:45	7030	4231	462.92	1137	1137	0	303	303	0
1088	25	1787	Wednesday	08:30:35	3545	3461	251.00	1252	1252	0	188	188	0
1094	128	1791	Tuesday	19:03:49	3545	3457	1306.39	1303	1303	0	137	137	0
1096	105	44	Thursday	16:39:26	8442	3815	1065.75	1072	1072	0	368	368	0
1131	88	3585	Thursday	15:00:59	8453	3753	901.64	1144	1144	0	296	296	0
1134	110	2100	Sunday	17:13:41	3892	3162	1122.83	1087	1087	0	353	353	0
1137	136	933	Wednesday	19:51:33	5822	4211	1385.92	1303	1303	0	137	137	0
1138	48	3505	Thursday	10:54:56	8425	3665	491.56	1195	1195	0	245	245	0
1148	5	552	Sunday	06:25:32	7369	4204	42.56	1404	1404	1	36	36	0
1152	126	1379	Thursday	18:50:50	4154	3900	1284.72	1072	1072	0	368	368	0
1157	47	1991	Tuesday	10:46:12	3692	3255	477.00	1152	1152	0	288	288	0
1185	61	291	Tuesday	12:09:22	8125	4047	615.61	1152	1152	0	288	288	0
1187	21	1909	Thursday	08:06:12	3597	3334	210.36	1224	1224	0	216	216	0
1193	121	1148	Wednesday	18:19:41	4937	4098	1232.83	1065	1065	0	375	375	0
12	113	3158	Friday	17:33:56	7783	3296	1156.58	1101	1101	0	339	339	0
120	39	1463	Monday	09:56:06	3938	3815	393.53	1224	1224	0	216	216	0
1203	22	1217	Saturday	08:11:10	4679	4046	218.64	1224	1224	0	216	216	0
1205	3	2413	Monday	06:16:24	4853	2993	27.36	1216	1216	0	224	224	0
1209	108	2908	Friday	17:02:47	6904	3092	1104.64	1101	1101	0	339	339	0
1209	80	2228	Friday	14:09:29	4223	3073	815.81	1101	1101	0	339	339	0
1210	116	1835	Saturday	17:50:08	3552	3410	1183.56	1130	1130	0	310	310	0
1219	14	1012	Monday	07:21:39	5487	4179	136.08	1216	1216	0	224	224	0
1228	38	2916	Wednesday	09:52:26	6936	3097	387.42	1252	1252	0	188	188	0
1230	21	3207	Friday	08:08:25	7920	3344	214.06	1238	1238	0	202	202	0
1237	95	881	Friday	15:39:24	6044	4227	965.67	1101	1101	0	339	339	0
1242	76	2145	Wednesday	13:44:45	3998	3128	774.58	1152	1152	0	288	288	0
1259	69	1472	Saturday	13:00:33	3917	3805	700.94	1137	1137	0	303	303	0
1260	122	827	Sunday	18:25:17	6275	4237	1242.17	1087	1087	0	353	353	0
1264	71	69	Thursday	13:10:27	8430	3841	717.44	1144	1144	0	296	296	0
1268	70	1639	Monday	13:06:59	3632	3624	711.67	1137	1137	0	303	303	0
1271	131	3552	Thursday	19:25:17	8447	3717	1342.14	1317	1317	0	123	123	0
1281	107	994	Sunday	16:53:22	5563	4187	1088.95	1087	1087	0	353	353	0
1281	21	2641	Sunday	08:07:28	5783	2981	212.44	1267	1267	0	173	173	0
1282	88	267	Monday	14:55:19	8175	4027	892.20	1137	1137	0	303	303	0
1283	124	3309	Tuesday	18:41:50	8160	3450	1269.72	1080	1080	0	360	360	0
1286	128	1235	Friday	19:02:53	4615	4031	1304.81	1317	1317	0	123	123	0
1293	132	2899	Friday	19:30:18	6868	3086	1350.53	1317	1317	0	123	123	0
13	31	2654	Saturday	09:08:58	5838	2983	314.95	1224	1224	0	216	216	0
1300	89	912	Friday	15:02:33	5911	4218	904.28	1101	1101	0	339	339	0
1305	70	3260	Wednesday	13:09:46	8053	3398	716.28	1152	1152	0	288	288	0
1309	88	716	Sunday	14:56:05	6739	4241	893.47	1015	1015	0	425	425	0
1311	89	3450	Tuesday	15:06:54	8378	3605	911.50	1130	1130	0	310	310	0
1324	20	3391	Monday	08:02:35	8304	3539	204.33	1224	1224	0	216	216	0
1327	51	15	Thursday	11:07:25	8451	3785	512.36	1195	1195	0	245	245	0
1330	135	2356	Sunday	19:47:49	4643	3011	1379.72	1310	1310	0	130	130	0
1333	118	2520	Wednesday	18:03:35	5275	2975	1206.00	1065	1065	0	375	375	0
1334	23	3219	Thursday	08:20:44	7952	3356	234.58	1224	1224	0	216	216	0
1344	69	1189	Sunday	13:00:04	4782	4067	700.14	1015	1015	0	425	425	0
1345	135	3137	Monday	19:49:09	7720	3276	1381.94	1317	1317	0	123	123	0
1348	61	2887	Thursday	12:13:47	6820	3078	623.00	1195	1195	0	245	245	0
1350	23	1492	Saturday	08:17:48	3873	3784	229.67	1224	1224	0	216	216	0
1358	135	2991	Sunday	19:48:55	7224	3150	1381.53	1310	1310	0	130	130	0
136	123	126	Wednesday	18:30:15	8385	3899	1250.42	1065	1065	0	375	375	0
1368	113	2358	Wednesday	17:32:35	4650	3010	1154.31	1065	1065	0	375	375	0
1369	3	627	Thursday	06:13:21	7092	4227	22.28	1231	1231	0	209	209	0
14	128	1625	Sunday	19:03:32	3648	3639	1305.92	1310	1310	0	130	130	0
145	21	845	Friday	08:04:23	6198	4234	207.33	1238	1238	0	202	202	0
160	75	328	Saturday	13:35:29	8042	4076	759.17	1137	1137	0	303	303	0
17	110	1261	Wednesday	17:12:16	4524	4009	1120.44	1065	1065	0	375	375	0
171	76	1130	Wednesday	13:43:01	5007	4110	771.69	1152	1152	0	288	288	0
18	13	650	Thursday	07:14:53	7003	4232	124.81	1231	1231	0	209	209	1
182	85	2010	Sunday	14:39:51	3722	3238	866.42	1015	1015	0	425	425	0
192	121	689	Wednesday	18:18:54	6848	4238	1231.53	1065	1065	0	375	375	0
193	111	1848	Thursday	17:19:25	3557	3396	1132.36	1072	1072	0	368	368	0
209	129	1402	Saturday	19:09:18	4091	3877	1315.53	1317	1317	0	123	123	0
215	128	513	Friday	19:01:39	7505	4187	1302.75	1317	1317	0	123	123	0
219	95	2403	Tuesday	15:41:59	4815	2995	970.00	1130	1130	0	310	310	0
222	82	1733	Friday	14:20:56	3558	3520	834.89	1101	1101	0	339	339	0
227	79	558	Wednesday	14:00:29	7348	4206	800.81	1152	1152	0	288	288	0
240	128	552	Tuesday	19:01:43	7369	4204	1302.86	1303	1303	0	137	137	0
242	109	3377	Thursday	17:09:43	8283	3524	1116.22	1072	1072	0	368	368	0
242	118	2755	Thursday	18:04:00	6270	3013	1206.67	1072	1072	0	368	368	0
252	11	862	Sunday	07:02:57	6125	4231	104.92	1404	1404	0	36	36	0
256	4	892	Thursday	06:19:58	5997	4224	33.28	1231	1231	0	209	209	0
262	135	3069	Wednesday	19:49:03	7501	3214	1381.75	1303	1303	0	137	137	0
278	73	1673	Friday	13:25:30	3598	3586	742.50	1101	1101	0	339	339	0
279	86	3368	Saturday	14:48:19	8268	3514	880.53	1137	1137	0	303	303	0
284	45	2955	Thursday	10:35:33	7088	3123	459.25	1195	1195	0	245	245	0
285	16	3552	Friday	07:38:16	8447	3717	163.81	1216	1216	0	224	224	0
292	134	1106	Friday	19:39:33	5102	4126	1365.92	1317	1317	0	123	123	0
300	6	2066	Saturday	06:34:16	3821	3189	57.11	1368	1368	0	72	72	0
311	7	3033	Wednesday	06:42:03	7376	3183	70.11	1202	1202	0	238	238	0
317	48	548	Tuesday	10:49:53	7384	4202	483.14	1152	1152	0	288	288	0
320	11	1867	Friday	07:04:39	3567	3377	107.78	1216	1216	0	224	224	0
322	95	3213	Sunday	15:43:22	7936	3350	972.30	1015	1015	0	425	425	0
328	17	2938	Saturday	07:43:22	7022	3111	172.30	1368	1368	0	72	72	0
335	51	805	Saturday	11:08:45	6368	4240	514.61	1051	1051	0	389	389	0
342	83	3130	Saturday	14:29:28	7699	3269	849.11	1137	1137	0	303	303	0
347	42	1370	Thursday	10:14:24	4180	3909	424.00	1195	1195	0	245	245	0
351	73	648	Monday	13:23:45	7011	4232	739.58	1137	1137	0	303	303	0
362	85	1297	Friday	14:38:37	4404	3977	864.39	1101	1101	0	339	339	0
366	26	12	Tuesday	08:33:42	8451	3782	256.19	1224	1224	0	216	216	0
367	55	2079	Wednesday	11:35:31	3848	3179	559.22	1195	1195	0	245	245	0
37	103	2940	Tuesday	16:32:05	7030	3113	1053.50	1080	1080	0	360	360	0
379	14	983	Monday	07:21:36	5609	4192	136.00	1216	1216	0	224	224	0
379	93	1981	Monday	15:28:58	3678	3264	948.31	1137	1137	0	303	303	0
383	42	1223	Friday	10:14:08	4657	4041	423.58	1152	1152	0	288	288	0
386	5	727	Monday	06:25:49	6694	4242	43.05	1216	1216	0	224	224	0
41	84	2887	Saturday	14:35:12	6820	3078	858.67	1137	1137	0	303	303	0
413	113	3285	Sunday	17:34:10	8110	3425	1156.94	1087	1087	0	353	353	0
420	54	9	Sunday	11:25:51	8452	3779	543.08	1065	1065	0	375	375	0
425	64	1915	Friday	12:30:35	3602	3328	650.97	1152	1152	0	288	288	0
430	82	210	Wednesday	14:18:19	8276	3978	830.55	1152	1152	0	288	288	0
433	135	2025	Saturday	19:47:16	3746	3225	1378.78	1317	1317	0	123	123	0
438	107	847	Thursday	16:53:06	6190	4234	1088.53	1072	1072	0	368	368	0
445	67	1440	Thursday	12:48:12	3993	3839	680.36	1195	1195	0	245	245	0
45	17	2626	Wednesday	07:42:50	5719	2979	171.42	1202	1202	5	238	238	0
450	105	2709	Tuesday	16:44:00	6074	2997	1073.33	1080	1080	0	360	360	0
451	117	1397	Wednesday	17:55:32	4104	3882	1192.56	1065	1065	0	375	375	0
457	28	1401	Tuesday	08:48:23	4094	3878	280.64	1224	1224	0	216	216	0
461	122	1803	Saturday	18:26:57	3546	3444	1244.94	1130	1130	0	310	310	0
48	8	624	Saturday	06:44:06	7104	4226	73.50	1368	1368	0	72	72	0
484	92	1082	Monday	15:21:18	5198	4141	935.50	1137	1137	0	303	303	0
489	63	2646	Saturday	12:25:41	5804	2982	642.81	1051	1051	0	389	389	0
491	106	3501	Monday	16:51:30	8422	3661	1085.83	1051	1051	0	389	389	1
495	4	2639	Friday	06:22:57	5774	2981	38.25	1216	1216	0	224	224	0
5	21	3207	Friday	08:08:25	7920	3344	214.06	1238	1238	0	202	202	0
509	102	3046	Friday	16:26:07	7422	3194	1043.55	1101	1101	0	339	339	0
510	91	2291	Saturday	15:17:13	4420	3039	928.70	1137	1137	0	303	303	0
511	8	2390	Sunday	06:47:06	4766	2999	78.53	1404	1404	0	36	36	0
531	125	812	Saturday	18:43:43	6339	4239	1272.86	1130	1130	0	310	310	0
531	76	1852	Saturday	13:44:14	3559	3392	773.75	1137	1137	0	303	303	0
548	2	3193	Tuesday	06:11:36	7883	3330	19.33	1209	1209	0	231	231	0
552	7	2731	Saturday	06:41:33	6168	3004	69.25	1368	1368	0	72	72	0
560	55	947	Sunday	11:33:36	5762	4206	556.00	1065	1065	0	375	375	0
561	102	2041	Monday	16:24:24	3774	3211	1040.69	1051	1051	0	389	389	0
566	41	646	Saturday	10:07:00	7019	4231	411.69	1051	1051	0	389	389	0
574	115	643	Sunday	17:41:57	7030	4231	1169.92	1087	1087	0	353	353	0
580	24	3338	Saturday	08:27:06	8216	3481	245.17	1224	1224	0	216	216	0
590	35	1917	Tuesday	09:32:17	3604	3326	353.83	1224	1224	0	216	216	0
591	73	2814	Wednesday	13:27:26	6519	3038	745.75	1152	1152	3	288	288	3
598	58	3078	Wednesday	11:55:40	7531	3222	592.80	1195	1195	0	245	245	0
6	12	2034	Saturday	07:11:05	3762	3217	118.50	1368	1368	0	72	72	0
600	52	582	Friday	11:14:31	7261	4214	524.22	1152	1152	0	288	288	0
621	57	1350	Friday	11:46:35	4239	3928	577.64	1152	1152	0	288	288	0
623	17	479	Sunday	07:39:10	7617	4171	165.31	1404	1404	0	36	36	0
628	122	2808	Friday	18:28:40	6494	3035	1247.80	1101	1101	0	339	339	0
629	133	2647	Saturday	19:36:02	5808	2982	1360.06	1317	1317	0	123	123	0
63	15	1911	Sunday	07:29:19	3598	3332	148.89	1404	1404	0	36	36	0
632	131	2000	Tuesday	19:22:37	3706	3247	1337.72	1303	1303	0	137	137	0
633	17	108	Wednesday	07:38:32	8402	3881	164.25	1202	1202	0	238	238	0
636	124	3436	Saturday	18:42:03	8363	3589	1270.08	1130	1130	0	310	310	0
654	63	1523	Wednesday	12:23:45	3810	3751	639.61	1195	1195	0	245	245	0
655	122	1110	Thursday	18:25:46	5086	4123	1242.97	1072	1072	0	368	368	0
660	101	1542	Tuesday	16:17:24	3774	3730	1029.03	1080	1080	0	360	360	0
663	5	1098	Friday	06:26:27	5134	4131	44.11	1216	1216	0	224	224	0
67	17	3251	Thursday	07:43:55	8032	3389	173.20	1231	1231	0	209	209	0
671	104	2590	Saturday	16:37:38	5566	2975	1062.75	1130	1130	0	310	310	0
68	104	2434	Friday	16:37:22	4933	2987	1062.31	1101	1101	0	339	339	0
7	91	427	Sunday	15:14:02	7778	4142	923.39	1015	1015	0	425	425	0
706	93	3074	Saturday	15:30:50	7518	3218	951.42	1137	1137	0	303	303	0
708	82	2611	Monday	14:22:25	5655	2977	837.39	1137	1137	0	303	303	0
711	127	3342	Thursday	19:00:20	8224	3486	1300.56	1317	1317	0	123	123	0
714	55	49	Sunday	11:32:03	8440	3821	553.44	1065	1065	0	375	375	0
72	134	1760	Tuesday	19:40:40	3549	3490	1367.78	1303	1303	0	137	137	0
724	13	2338	Wednesday	07:17:45	4579	3018	129.61	1202	1202	0	238	238	0
73	124	293	Wednesday	18:36:41	8121	4049	1261.14	1065	1065	0	375	375	1
734	125	1563	Saturday	18:45:00	3738	3707	1275.00	1130	1130	0	310	310	0
742	131	1971	Sunday	19:22:35	3665	3274	1337.64	1310	1310	0	130	130	0
751	101	3348	Tuesday	16:20:30	8234	3492	1034.17	1080	1080	0	360	360	0

756	132	2460	Sunday	19:29:33	5034	2982	1349.28	1310	1310	1	130	130	0	3678	3676	0	342	342	0	4986	472	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
76	17	2304	Saturday	07:42:17	4463	3033	170.50	1368	1368	0	72	72	0	3778	3776	0	242	242	0	5144	314	51	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
767	4	2834	Thursday	06:23:16	6603	3048	38.81	1231	1231	1	209	209	1	3296	3296	0	724	724	0	4527	933	18	Engine Fire	UA structural desintegration - Debris Impact
773	53	2945	Wednesday	11:24:42	7049	3116	541.19	1195	1195	0	245	245	0	3075	3075	0	945	945	0	4270	1190	47	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
780	11	2599	Wednesday	07:05:55	5604	2976	109.86	1202	1202	0	238	238	0	3356	3356	0	664	664	0	4558	902	28	Generator Failure	UA ground impact tangential to trajectory
785	115	2702	Monday	17:45:28	6044	2995	1175.78	1051	1051	0	389	389	0	2834	2834	0	1186	1186	0	3885	1575	37	Short Circuit / Overload	Central UA ground impact point below flight path
785	85	1219	Monday	14:38:29	4672	4044	864.17	1137	1137	0	303	303	0	3175	3175	0	845	845	0	4312	1148	9	Engine Out	UA ground impact tangential to trajectory
793	104	1058	Tuesday	16:35:01	5296	4155	1058.39	1080	1080	0	360	360	0	3095	3095	0	925	925	0	4175	1285	71	Degradation of lateral and horizontal navigation data accuracy.	Central UA ground impact point on a random Map coordinate
795	21	2944	Thursday	08:07:59	7045	3116	213.31	1224	1224	0	216	216	0	3417	3416	0	603	603	0	4640	819	5	Engine Out	No Ground Effect
798	70	2518	Sunday	13:08:30	5267	2975	714.17	1015	1015	0	425	425	0	3115	3115	0	905	905	0	4130	1330	9	Engine Out	UA ground impact tangential to trajectory
80	31	2322	Wednesday	09:08:24	4524	3025	314.00	1252	1252	0	188	188	0	3356	3355	0	664	664	0	4607	852	11	Engine Anomaly	Central UA ground impact point below flight path
81	108	2449	Thursday	17:01:59	4991	2984	1103.33	1072	1072	0	368	368	0	2954	2952	0	1066	1066	0	4024	1434	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
814	40	1152	Tuesday	10:01:43	4922	4095	402.89	1152	1152	0	288	288	0	3236	3236	0	784	784	0	4388	1072	21	Engine Fire	UA structural desintegration - Debris Impact
820	106	3257	Monday	16:51:05	8046	3395	1085.14	1051	1051	0	389	389	0	2834	2834	0	1186	1186	0	3885	1575	42	Partial Lock of Flight Control Surfaces	Central UA ground impact point below flight path
834	54	3376	Monday	11:31:36	8281	3523	552.67	1137	1137	0	303	303	0	3276	3274	0	744	744	0	4411	1047	21	Engine Fire	UA structural desintegration - Debris Impact
835	86	2411	Tuesday	14:46:40	4845	2993	877.80	1130	1130	0	310	310	0	3236	3235	0	784	784	0	4365	1094	29	Connection Failure	UA approaches Emergency landing site
837	110	3515	Thursday	17:16:06	8431	3676	1126.86	1072	1072	0	368	368	0	2954	2954	0	1066	1066	0	4026	1434	75	Degradation of altitude	UA approaches Emergency landing site
845	87	2822	Friday	14:53:31	6553	3042	889.22	1101	1101	0	339	339	0	3195	3195	0	825	825	0	4296	1164	66	Degradation of lateral and horizontal navigation data accuracy.	Central UA ground impact point below flight path
847	79	685	Sunday	14:00:42	6864	4238	801.17	1015	1015	0	425	425	0	3115	3114	0	905	905	0	4129	1330	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
853	30	1091	Saturday	09:00:09	5162	4135	300.25	1224	1224	0	216	216	0	3155	3154	0	865	865	0	4378	1081	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
857	43	2269	Wednesday	10:22:05	4349	3050	436.81	1195	1195	0	245	245	0	3075	3075	0	945	945	0	4270	1190	5	Engine Out	No Ground Effect
89	93	1161	Friday	15:27:34	4887	4088	945.97	1101	1101	0	339	339	0	3195	3195	0	825	825	0	4296	1164	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
891	59	1811	Tuesday	11:59:40	3547	3435	599.44	1152	1152	0	288	288	0	3236	3234	0	784	784	0	4386	1072	40	Short Circuit / Overload	Central UA ground impact point below flight path
892	36	3490	Wednesday	09:41:08	8414	3649	368.56	1252	1252	0	188	188	0	3356	3356	0	664	664	0	4608	852	37	Short Circuit / Overload	Central UA ground impact point below flight path
896	114	2096	Sunday	17:38:17	3884	3165	1163.81	1087	1087	0	353	353	0	2974	2974	0	1046	1046	0	4061	1399	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
906	76	2174	Wednesday	13:44:47	4072	3107	774.67	1152	1152	0	288	288	0	2934	2934	0	1086	1086	0	4086	1374	74	Degradation of altitude	Central UA ground impact point below flight path
913	31	2556	Wednesday	09:08:47	5424	2974	314.67	1252	1252	0	188	188	0	3356	3354	0	664	664	0	4606	852	66	Degradation of lateral and horizontal navigation data accuracy.	Central UA ground impact point below flight path
917	104	3225	Sunday	16:38:44	7967	3362	1064.56	1087	1087	0	353	353	0	2974	2974	0	1046	1046	0	4061	1399	1	Engine Out	No Ground Effect
93	11	872	Tuesday	07:02:58	6083	4229	104.95	1209	1209	0	231	231	0	3356	3355	0	664	664	0	4564	895	40	Short Circuit / Overload	Central UA ground impact point below flight path
935	100	3532	Thursday	16:14:40	8439	3695	1024.44	1072	1072	0	368	368	0	2954	2953	0	1066	1066	0	4025	1434	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
942	5	2640	Thursday	06:29:05	5779	2981	48.50	1231	1231	0	209	209	0	3296	3293	0	724	724	0	4524	933	36	Short Circuit / Overload	Central UA ground impact point below flight path
942	97	1430	Thursday	15:52:38	4018	3849	987.72	1144	1144	0	296	296	0	3256	3254	0	764	764	0	4398	1060	77	Degradation of altitude	Central UA ground impact point below flight path
943	89	2874	Friday	15:05:55	6767	3071	909.86	1101	1101	0	339	339	0	3195	3195	0	825	825	0	4296	1164	1	Engine Out	No Ground Effect
949	48	440	Thursday	10:49:41	7739	4150	482.83	1195	1195	0	245	245	0	3236	3235	0	784	784	0	4430	1029	5	Engine Out	No Ground Effect
963	12	2015	Thursday	07:11:04	3730	3233	118.45	1231	1231	0	209	209	0	3296	3293	0	724	724	0	4524	933	37	Short Circuit / Overload	Central UA ground impact point below flight path
968	49	2667	Tuesday	10:59:39	5894	2986	499.42	1152	1152	0	288	288	0	3236	3236	0	784	784	0	4388	1072	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
994	92	2946	Sunday	15:24:29	7053	3117	940.81	1015	1015	0	425	425	0	3115	3113	0	905	905	0	4128	1330	9	Engine Out	UA ground impact tangential to trajectory

O.R.C.U.S. 02.00 - tTest of the Simulation

nProbes	1400
nEvents	220
nEvents_cor	212
tMission	14
x_cross_ATB	0.0114286
x_cross_OTW	0.0207143
x_cross_TOT	0.0321429
s2ATB	0.0003381
sATB	0.0183886
tATB	2.9068067
s2OTW	0.0011813
sOTW	0.0343702
tOTW	11.663939
s2TOT	0.0019985
sTOT	0.0447047
tTOT	18.532939

UADay/Prot	HIT_TOT_ATB	HIT_TOT_OTW	UADay/Prot cor	HIT_TOT_mean_ATB	HIT_TOT_mean_OTW	HIT_TOT_mean_ATB/Fh	HIT_TOT_mean_OTW/Fh	x_i-x_cross ATB	x_i-x_cross OTW	(x_i-x_cross ATB)^2	(x_i-x_cross OTW)^2
5	0	0	5	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
6	0	0	6	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
7	0	0	7	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
10	0	0	10	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
12	0	0	12	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
13	0	0	13	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
14	0	0	14	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
17	0	0	17	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
18	0	1	18	0	1	0	0.071428571	-0.011428571	0.050714286	0.000130612	0.002571939
37	0	0	37	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
41	0	0	41	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
45	5	0	45	5	0	0.357142857	0	0.345714286	-0.020714286	0.119518367	0.000429082
48	0	0	48	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
63	0	1	63	0	1	0	0.071428571	-0.011428571	0.050714286	0.000130612	0.002571939
67	0	0	67	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
68	0	0	68	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
72	0	0	72	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
73	0	1	73	0	1	0	0.071428571	-0.011428571	0.050714286	0.000130612	0.002571939
76	0	0	76	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
80	0	0	80	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
81	0	0	81	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
89	0	0	89	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
93	0	0	93	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
101	0	0	101	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
120	0	0	120	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
136	0	0	136	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
145	0	0	145	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
160	0	0	160	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
171	0	0	171	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
182	0	0	182	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
192	0	0	192	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
193	0	0	193	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
209	0	0	209	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
215	0	0	215	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
219	0	0	219	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
222	0	0	222	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
227	0	0	227	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
240	0	0	240	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
242	0	0	242	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
242	0	0	252	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
252	0	0	256	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
256	0	0	262	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
262	0	0	278	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
278	0	0	279	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
279	0	0	284	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
284	0	0	285	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
285	0	0	292	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
292	0	0	300	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
300	0	0	311	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
311	0	0	317	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
317	0	0	320	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
320	0	0	322	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
322	0	0	328	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
328	0	0	335	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
335	0	0	342	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
342	0	0	347	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
347	0	0	351	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
351	0	0	362	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
362	0	0	366	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
366	0	0	367	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
367	0	0	379	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
379	0	0	383	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
379	0	0	386	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
383	0	0	413	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
386	0	0	420	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
413	0	0	425	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
420	0	0	430	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
425	0	0	433	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
430	0	0	438	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
433	0	0	445	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
438	0	0	450	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
445	0	0	451	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
450	0	0	457	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
451	0	0	461	0	8	0	0.571428571	-0.011428571	0.550714286	0.000130612	0.303286224
457	0	0	484	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
461	0	8	489	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
484	0	0	491	0	1	0	0.071428571	-0.011428571	0.050714286	0.000130612	0.002571939
489	0	0	495	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
491	0	1	509	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
495	0	0	510	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
509	0	0	511	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
510	0	0	531	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
511	0	0	548	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
531	0	0	552	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
531	0	0	560	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
548	0	0	561	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
552	0	0	566	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
560	0	0	574	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
561	0	0	580	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
566	0	0	590	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
574	0	0	591	3	3	0.214285714	0.214285714	0.202857143	0.193571429	0.04115102	0.037469898
580	0	0	598	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
590	0	0	600	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
591	3	3	621	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
598	0	0	623	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
600	0	0	628	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
621	0	0	629	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
623	0	0	632	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
628	0	0	633	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
629	0	0	636	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
632	0	0	654	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
633	0	0	655	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
636	0	0	660	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
654	0	0	663	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
655	0	0	671	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
660	0	0	706	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
663	0	0	708	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
671	0	0	711	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
706	0	0	714	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
708	0	0	724	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
711	0	0	734	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
714	0	0	742	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
724	0	0	751	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
734	0	0	756	1	0	0.071428571	0	0.06	-0.020714286	0.0036	0.000429082
742	0	0	767	1	1	0.071428571	0.071428571	0.06	0.050714286	0.0036	0.002571939
751	0	0	773	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
756	1	0	780	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
767	1	1	785	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
773	0	0	793	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
780	0	0	795	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
785	0	0	798	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
785	0	0	814	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
793	0	0	820	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
795	0	0	834	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
798	0	0	835	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
814	0	0	837	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
820	0	0	845	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
834	0	0	847	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
835	0	0	853	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
837	0	0	857	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
845	0	0	891	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
847	0	0	892	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
853	0	0	896	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
857	0	0	906	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
891	0	0	913	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
892	0	0	917	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
896	0	0	935	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
906	0	0	942	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
913	0	0	943	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
917	0	0	949	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
935	0	0	963	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
942	0	0	968	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
942	0	0	994	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
943	0	0	1006	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
949	0	0	1007	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
963	0	0	1013	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
968	0	0	1017	0	1	0	0.071428571	-0.011428571	0.050714286	0.000130612	0.002571939
994	0	0	1026	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1006	0	0	1028	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1007	0	0	1031	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1013	0	0	1032	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1017	0	1	1039	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1026	0	0	1042	5	0	0.357142857	0	0.345714286	-0.020714286	0.119518367	0.000429082
1028	0	0	1046	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1031	0	0	1047	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1032	0	0	1048	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1039	0	0	1057	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1042	5	0	1066	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1046	0	0	1067	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1047	0	0	1068	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1048	0	0	1076	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1048	0	0	1083	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1057	0	0	1085	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1066	0	0	1086	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1067	0	0	1088	0	12	0	0.857142857	-0.011428571	0.836428571	0.000130612	0.699612755
1068	0	0	1094	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1076	0	0	1096	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1083	0	0	1131	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1085	0	0	1134	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1086	0	0	1137	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1088	0	12	1138	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1094	0	0	1148	1	0	0.071428571	0	0.06	-0.020714286	0.0036	0.000429082
1096	0	0	1152	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1131	0	0	1157	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1134	0	0	1185	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1137	0	0	1187	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1138	0	0	1193	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1148	1	0	1203	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1152	0	0	1205	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1157	0	0	1209	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1185	0	0	1210	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1187	0	0	1219	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1193	0	0	1228	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1203	0	0	1230	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1205	0	0	1237	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1209	0	0	1242	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1209	0	0	1259	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1210	0	0	1260	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1219	0	0	1264	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1228	0	0	1268	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1230	0	0	1271	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1237	0	0	1281	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1242	0	0	1282	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1259	0	0	1283	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1260	0	0	1286	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1264	0	0	1293	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1268	0	0	1300	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1271	0	0	1305	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1281	0	0	1309	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1281	0	0	1311	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1282	0	0	1324	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1283	0	0	1327	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1286	0	0	1330	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1293	0	0	1333	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1300	0	0	1334	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1305	0	0	1344	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1309	0	0	1345	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1311	0	0	1348	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1324	0	0	1350	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1327	0	0	1358	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1330	0	0	1368	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1333	0	0	1369	0	0	0	0	-0.011428571	-0.020714286	0.000130612	0.000429082
1334	0	0									
1344	0	0									
1345	0	0									
1348	0	0									
1350	0	0									
1358	0	0									
1368	0	0									
1369	0	0									

11.4.14.2 Kroppenstedt – C7 – Phase 2

O.R.C.U.S. 02.00 - Simulation Summary

UA Parameters

MTOW [kg]	Wingspan [m]	Length [m]	L/D
90	5	4	8

v [km/h]	Alt [m]	CCF [m]
100	100	10246.382

P_CumCat [1/Fh]	Engine [%]	ESys [%]	FCS [%]	NavSys [%]	Struct [%]
0.01	20	20	20	20	20

General map parameters

	Name	Area [km2]	PPL	PPL/km2
City	Kroppenstedt, Stadt	38.65	1440	37
County	Boerde	2366.84	172619	73
FS	ST	20453.79	2223081	109

Mission specific map parameters

	Area [km2]	PPL	Tourists	Total PPL
City-SMP	11.7983	1440	0	1440
SurM	55.0572	4020	0	4020
Map total	66.8555	5460	0	5460

PPL MOD NA

Sim FH [Fh]	19600	Ev/Fh [1/Fh]	0.0097959
Events total	192		

Hits due to UA impacts		Hits/Fh [1/Fh]
City-SMP ATB	17	0.0008673
SurM ATB	0	0
Total ATB	17	0.0008673
City-SMP OTW	12	0.0006122
SurM OTW	6	0.0003061
Total OTW	18	0.0009184
Total	35	0.0017857

Prot	cyc	k_UA	Day	Time of impact	UA X Pos	UA Y Pos	Travelled Distance [km]	PPL_TD_CITY_ATB	PPL_CITY_ATB_COUNT	HIT_CITY_ATB_COUNT	PPL_TD_CITY_OTW	PPL_CITY_OTW_COUNT	HIT_CITY_OTW_COUNT	PPL_TD_SURM_ATB	PPL_SURM_ATB_COUNT	HIT_SURM_ATB_COUNT	PPL_TD_SURM_OTW	PPL_SURM_OTW_COUNT	HIT_SURM_OTW_COUNT	PPL_ALL_ATB_COUNT	PPL_ALL_OTW_COUNT	E	Case	Outcome
1001	2	2773	Sunday	06:10:53	6347	3020	18.14	1404	1404	0	36	36	0	3718	3718	0	302	302	0	5122	338	29	Connection Failure	UA approaches Emergency landing site
1007	84	828	Saturday	14:31:41	6271	4237	852.81	1137	1137	0	303	303	0	3095	3094	0	925	925	0	4231	1228	17	Engine Fire	Central UA ground impact point below flight path
1018	114	2896	Wednesday	17:39:39	6856	3084	1166.08	1065	1065	0	375	375	0	3236	3233	0	784	784	0	4298	1159	32	Connection Failure	UA approaches Emergency landing site
102	87	539	Thursday	14:49:38	7415	4199	882.72	1144	1144	0	296	296	0	3256	3254	0	764	764	0	4398	1060	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1023	79	743	Monday	14:00:47	6628	4242	801.33	1137	1137	0	303	303	0	3175	3174	0	845	845	0	4311	1148	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
1024	41	754	Tuesday	10:07:12	6582	4242	412.00	1152	1152	0	288	288	0	3236	3235	0	784	784	0	4387	1072	6	Engine Out	UA approaches Emergency landing site
1032	79	1817	Wednesday	14:02:38	3548	3429	804.39	1152	1152	0	288	288	0	2934	2933	0	1086	1086	0	4085	1374	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
1036	41	1525	Sunday	10:08:31	3806	3749	414.20	1065	1065	0	375	375	0	2954	2954	0	1066	1066	0	4019	1441	15	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
1044	43	317	Monday	10:18:45	8067	4067	431.25	1137	1137	0	303	303	0	3276	3275	0	744	744	0	4412	1047	9	Engine Out	UA ground impact tangential to trajectory
1049	43	873	Saturday	10:19:41	6078	4229	432.83	1051	1051	0	389	389	0	2874	2873	0	1146	1146	0	3924	1535	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1060	121	436	Wednesday	18:18:29	7751	4148	1230.81	1065	1065	0	375	375	0	3236	3236	0	784	784	0	4301	1159	24	Generator Failure	UA ground impact tangential to trajectory
1067	26	2140	Wednesday	08:37:21	3985	3131	262.25	1252	1252	0	188	188	0	3356	3356	0	664	664	0	4608	852	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
1068	123	1629	Thursday	18:32:49	3643	3635	1254.70	1072	1072	0	368	368	0	2954	2951	0	1066	1066	0	4023	1434	1	Engine Out	No Ground Effect
107	44	709	Tuesday	10:25:34	6768	4240	442.61	1152	1152	0	288	288	0	3236	3236	0	784	784	0	4388	1072	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
107	68	3530	Tuesday	12:57:55	8439	3693	696.55	1152	1152	0	288	288	0	3236	3236	0	784	784	0	4388	1072	47	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
1075	64	1583	Thursday	12:30:00	3706	3685	650.03	1195	1195	0	245	245	0	3236	3235	0	784	784	0	4430	1029	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
1086	95	334	Monday	15:38:27	8027	4080	964.11	1137	1137	0	303	303	0	3175	3174	0	845	845	0	4311	1148	22	Generator Failure	UA approaches Emergency landing site
1096	88	1623	Thursday	14:57:37	3651	3641	896.05	1144	1144	0	296	296	0	3256	3255	0	764	764	0	4399	1060	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
1098	68	2564	Saturday	12:56:16	5457	2974	693.81	1051	1051	0	389	389	0	2874	2874	0	1146	1146	0	3925	1535	28	Generator Failure	UA ground impact tangential to trajectory
11	107	2858	Thursday	16:56:33	6702	3061	1094.25	1072	1072	0	368	368	0	2954	2954	0	1066	1066	0	4026	1434	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1100	111	159	Monday	17:16:31	8349	3931	1127.55	1051	1051	0	389	389	0	2834	2834	0	1186	1186	0	3885	1575	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
1108	37	1500	Tuesday	09:43:53	3856	3775	373.14	1224	1224	0	216	216	0	3376	3375	0	644	644	0	4599	860	67	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
1119	21	670	Saturday	08:04:06	6924	4236	206.83	1224	1224	0	216	216	0	3155	3154	0	865	865	0	4378	1081	67	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
1120	53	779	Sunday	11:21:01	6478	4242	535.03	1065	1065	0	375	375	0	2954	2953	0	1066	1066	0	4018	1441	55	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point below flight path
1126	48	1670	Saturday	10:51:47	3600	3589	486.33	1051	1051	0	389	389	0	2874	2873	0	1146	1146	0	3924	1535	73	Degradation of altitude	Central UA ground impact point below flight path
1127	102	2881	Sunday	16:25:51	6796	3075	1043.08	1087	1087	0	353	353	0	2974	2973	0	1046	1046	0	4060	1399	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1128	7	3316	Monday	06:42:32	8174	3458	70.92	1216	1216	0	224	224	0	3477	3477	0	543	543	0	4693	767	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1129	6	446	Tuesday	06:31:30	7720	4153	52.50	1209	1209	0	231	231	0	3356	3355	0	664	664	0	4564	895	50	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
1142	78	166	Monday	13:53:39	8340	3937	789.44	1137	1137	0	303	303	0	3175	3175	0	845	845	0	4312	1148	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
1151	86	2099	Wednesday	14:46:09	3890	3163	876.92	1152	1152	0	288	288	0	2934	2933	0	1086	1086	0	4085	1374	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
1155	41	2725	Sunday	10:10:34	6142	3002	417.61	1065	1065	0	375	375	0	2954	2953	0	1066	1066	0	4018	1441	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
1162	31	887	Sunday	09:05:56	6018	4225	309.92	1267	1267	0	173	173	0	3577	3576	0	443	443	0	4843	616	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1162	81	2161	Sunday	14:15:31	4038	3116	825.86	1015	1015	0	425	425	0	3115	3114	0	905	905	0	4129	1330	28	Generator Failure	UA ground impact tangential to trajectory
1167	32	625	Friday	09:11:39	7100	4227	319.42	1238	1238	0	202	202	0	3376	3376	0	644	644	0	4614	846	37	Short Circuit / Overload	Central UA ground impact point below flight path
1173	21	631	Thursday	08:04:02	7077	4228	206.72	1224	1224	0	216	216	0	3417	3416	0	603	603	0	4640	819	59	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
1177	125	1231	Monday	18:44:25	4629	4034	1274.06	1051	1051	0	389	389	0	2834	2834	0	1186	1186	0	3885	1575	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1190	13	1030	Sunday	07:15:31	5412	4170	125.89	1404	1404	0	36	36	0	3718	3715	0	302	302	0	5119	338	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1198	49	2140	Monday	10:58:45	3985	3131	497.92	1137	1137	0	303	303	0	3276	3274	0	744	744	0	4411	1047	50	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
1199	94	323	Tuesday	15:32:17	8053	4072	953.83	1130	1130	0	310	310	0	3236	3235	0	784	784	0	4365	1094	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1206	101	1084	Tuesday	16:16:38	5190	4139	1027.72	1080	1080	0	360	360	0	3095	3094	0	925	925	0	4174	1285	18	Engine Fire	Central UA ground impact point below flight path
1217	39	292	Saturday	09:54:06	8123	4048	390.19	1224	1224	0	216	216	0	3155	3154	0	865	865	0	4378	1081	30	Connection Failure	Central UA ground impact point below flight path
1221	104	3030	Wednesday	16:38:24	7366	3181	1064.00	1065	1065	0	375	375	0	3236	3233	0	784	784	0	4298	1159	42	Partial Lock of Flight Control Surfaces	Central UA ground impact point below flight path
123	24	117	Thursday	08:21:35	8394	3890	236.00	1224	1224	0	216	216	0	3417	3416	0	603	603	0	4640	819	40	Short Circuit / Overload	Central UA ground impact point below flight path
1230	121	1519	Friday	18:20:20	3818	3755	1233.89	1101	1101	0	339	339	0	3216	3216	0	804	804	0	4317	1143	49	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
1234	76	427	Tuesday	13:41:48	7778	4142	769.69	1130	1130	0	310	310	0	3236	3236	0	784	784	0	4366	1094	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
1237	40	225	Friday	10:00:08	8252	3991	400.25	1152	1152	0	288	288	0	3135	3135	0	885	885	0	4287	1173	47	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
1266	98	3588	Saturday	16:02:28	8453	3756	1004.11	1130	1130	0	310	310	0	3155	3155	0	865	865	0	4285	1175	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1270	63	3553	Wednesday	12:27:13	8447	3718	645.39	1195	1195	0	245	245	0	3075	3075	0	945	945	0	4270	1190	14	Engine Anomaly	Central UA ground impact point below flight path
1284	49	295	Wednesday	10:55:35	8117	4050	492.67	1195	1195	0	245	245	0	3075	3074	0	945	945	0	4269	1190	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
1299	125	929	Thursday	18:43:55	5839	4213	1273.20	1072	1072	0	368	368	0	2954	2953	0	1066	1066	0	4025	1434	75	Degradation of altitude	UA approaches Emergency landing site
1316	45	1003	Sunday	10:32:13	5525	4183	453.70	1065	1065	0	375	375	0	2954	2953	0	1066	1066	0	4018	1441	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1320	70	1757	Thursday	13:07:12	3550	3494	712.00	1144	1144	0	296	296	0	3256	3254	0	764	764	0	4398	1060	67	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
1325	101	430	Tuesday	16:15:31	7769	4144	1025.86	1080	1080	7	360	360	2	3095	3094	0	925	925	0	4174	1285	80	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
1325	111	1516	Tuesday	17:18:51	3824	3758	1131.42	1080	1080	0	360	360	0	3095	3094	0	925	925	0	4174	1285	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
1345	115	1131	Monday	17:42:47	5003	4109	1171.31	1051	1051	0	389	389	0	2834	2834	0	1186	1186	0	3885	1575	79	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
1347	118	685	Wednesday	18:00:27	6864	4238	1200.78	1065	1065	0	375	375	0	3236	3236	0	784	784	0	4301	1159	25	Generator Failure	UA approaches Emergency landing site
1347	90	1401	Wednesday	15:09:32	4094	3878	915.92	1152	1152	0	288	288	0	2934	2933	0	1086	1086	0	4085	1374	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
1348	115	916	Thursday	17:42:25	5894	4217	1170.69	1072	1072	0	368	368	0	2954	2954	0	1066	1066	0	4026	1434	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
1348	30	730	Thursday	08:59:32	6682	4242	299.22	1224	1224	0	216	216	0	3417	3414	0	603	603	0	4638	819	19	Engine Fire	Central UA ground impact point below flight path
135	125	2471	Tuesday	18:46:33	5078	2980	1277.58	1080	1080	0	360	360	0	3095	3095	0	925	925	0	4175	1285	73	Degradation of altitude	Central UA ground impact point below flight path
1367	85	634	Tuesday	14:37:30	7065	4229	862.50	1130	1130	0	310	310	0	3236	3235	0	784	784	0	4365	1094	76	Degradation of altitude	Central UA ground impact point below flight path
1372	38	2097	Sunday	09:51:03	3886	3164	385.08	1267	1267	0	173	173	0	3577	3577	0	443	443	0	4844	616	29	Connection Failure	UA approaches Emergency landing site
138	3	647	Friday	06:13:24	7015	4232	22.33	1216	1216	0	224	224	0	3437	3435	0	583	583	0	4651	807	20	Engine Fire	Central UA ground impact point below flight path
1384	67	45	Friday	12:45:50	8442	3817	676.39	1152	1152	0	288	288	0	3135	3135	0	885	885	0	4287	1173	78	Degradation of altitude	Central UA ground impact point below flight path
139	123	2956	Saturday	18:35:04	7092	3124	1258.47	1130	1130	0	310	310	0	3155	3153	0	865	865	0	4283	1175	66	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
1392	16	1717	Saturday	07:35:08	3566	3537	158.58	1368	1368	0	72	72	0	3778	3775	0	242	242	0	5143	314	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
145	102	1153	Friday	16:22:53	4918	4094	1038.17	1101	1101	0	339	339	0	3216	3215	0	804	804	0	4316	1143	73	Degradation of altitude	Central UA ground impact point below flight path
147	67	2875	Sunday	12:50:39	6771	3071	684.44	1065	1065	0	375	375	0	2954	2953	0	1066	1066	0	4018	1441	57	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
156	23	2321	Tuesday	08:19:12	4520	3025	232.03	1224	1224	0	216	216	0	3376	3376	0	644	644	0	4600	860	36	Short Circuit / Overload	Central UA ground impact point below flight path
173	83	260	Friday	14:24:33	8188	4022	840.94	1101	1101	0	339	339	0	3195	3194	0	825	825	0	4295	1164	39	Short Circuit / Overload	Central UA ground impact point below flight path
196	3	1603	Sunday	06:15:01	3677	3663	25.06	1404	1404	0	36	36	0	3718	3718	0	302	302	0	5122	338	40	Short Circuit / Overload	Central UA ground impact point below flight path
197	39	234	Monday	09:54:01	8236	3999	390.03	1224	1224	0	216	216	0	3417	3415	0	603	603	0	4639	819	72	Degradation of altitude	UA approaches Emergency landing site
198	100	2673	Tuesday	16:13:11	5920	2987	1022.00	1080	1080	0	360	360	0	3095	3094	0	925	925	0	4174	1285	18	Engine Fire	Central UA ground impact point below flight path
198	77	1131	Tuesday	13:49:09	5003	4109	781.94	1130	1130	0	310	310	0	3236	3235	0	784	784	0	4365	1094	81	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
205	97	3284	Tuesday	15:55:47	8108	3424	993.00	1130	1130	0	310	310	0	3236	3236	0	784	784	0	4366	1094	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
220	134	2355	Wednesday	19:41:40	4639	3011	1369.47	1303	1303	0	137	137	0	3778	3776	0	242	242	0	5081	379	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
222	122	1969	Friday	18:27:14	3662	3276	1245.42	1101	1101	0	339	339	0	3216	3216	0	804	804	0	4316	1143	23	Generator Failure	UA ground impact tangential to trajectory
224	120	2152	Sunday	18:15:16	4015	3123	1225.44	1087	1087	0	353	353	0	2974	2974	0	1046	1046	0	4061	1399	58	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
237	40	2441	Saturday	10:03:56	4960	2986	406.56	1051	1051	0	389	389	0	2874	2872	0	1146	1146	0	3923	1535	27	Generator Failure	UA ground impact tangential to trajectory
248	55	3475	Wednesday	11:37:55	8402	3632	563.20	1195	1195	0	245	245	0	3075	3075	0	945	945	0	4270	1190	73	Degradation of altitude	Central UA ground impact point below flight path
248	58	1019	Wednesday	11:52:09	5458	4175	586.94	1195	1195	0	245	245	0	3075	3075	0	945	945	0	4270	1190	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
27	85	829	Saturday	14:37:50	6266	4237	863.06	1137	1137	0	303	303	0	3095	3094	0	925	925	0	4231	1228	50	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
275	42	2355	Tuesday	10:16:04	4639	3011	426.80	1152	1152	0	288	288	0	3236	3235	0	784	784	0	4387	1072	44	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
280	115	47	Sunday	17:40:55	8441	3819	1168.22	1087	1087	0	353	353	0	2974	2971	0	1046	1046	0	4058	1399	13	Engine Anomaly	UA approaches Emergency landing site
286	101	244	Saturday	16:15:11	8218	4008	1025.33	1130	1130	0	310	310	0	3155	3155	0	865	865	0	4285	1175	13	Engine Anomaly	UA approaches Emergency landing site
298	87	80	Thursday	14:48:50	8424	3853	881.42	1144	1144	0	296	296	0	3256	3256	0	764	764	0	4400	1060	40	Short Circuit / Overload	Central UA ground impact point below flight path
30	113	1021	Tuesday	17:30:18	5449	4174	1150.50	1080	1080	0	360	360	0	3095	3094	0	925	925	0	4174	1285	40	Short Circuit / Overload	Central UA ground impact point below flight path
30	117	2870	Tuesday	17:58:02	6751	3068	1196.75	1080	1080	0	360	360	0	3095	3094	0	925	925	0	4174	1285	77	Degradation of altitude	Central UA ground impact point below flight path
300	27	1536	Saturday	08:42:27	3785	3737	270.78	1224	1224	0	216	216	0	3155	3155	0	865	865	0	4379	1081	27	Generator Failure	UA ground impact tangential to trajectory
307	29	2495	Saturday	08:56:24	5174	2977	294.00	1224	1224	0	216	216	0	3155	3154	0	865	865	0	4378	1081	65	Degradation of lateral and horizontal navigation data accurarcy.	UA approaches Emergency landing site
309	100	1639	Monday	16:11:26	3632	3624	1019.06	1051	1051	0	389	389	0	2834	2834	0	1186	1186	0	3885	1575	26	Generator Failure	UA ground impact tangential to trajectory
309	80	950	Monday	14:07:18	5749	4205	812.17	1137	1137	0	303	303	2	3175	3174	0	845	845	0	4311	1148	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
310	32	1894	Tuesday	09:13:49	3584	3349	323.03	1224	1224	0	216	216	0	3376	3374	0	644	644	0	4598	860	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
315	120	844	Sunday	18:13:01	6202	4234	1221.72	1087	1087	0	353	353	0	2974	2973	0	1046	1046	0	4060	1399	44	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
324	105	3060	Tuesday	16:44:35	7470	3206	1074.33	1080	1080	0	360	360	0	3095	3093	0	925	925	0	4173	1285	9	Engine Out	UA ground impact tangential to trajectory
326	125	1983	Thursday	18:45:43	3681	3263	1276.20	1072	1072	0	368	368	0	2954	2954	0	1066	1066	0	4026	1434	33	Connection Failure	UA approaches Emergency landing site
334	94	3183	Friday	15:37:11	7855	3320	961.97	1101	1101	0	339	339	0	3195	3195	0	825	825	0	4296	1164	72	Degradation of altitude	Central UA ground impact point below flight path
341	43	2757	Friday	10:22:55	6279	3013	438.20	1152	1152	0	288	288	0	3135	3134	0	885	885	0	4286	1173	74	Degradation of altitude	Central UA ground impact point below flight path
345	104	33	Tuesday	16:33:16	8446	3804	1055.47	1080	1080	0	360	360	0	3095	3095	0	925	925	0	4175	1285	36	Short Circuit / Overload	Central UA ground impact point below flight path
345	42	540	Tuesday	10:12:58	7412	4199	421.64	1152	1152	0	288	288	0	3236	3234	0	784	784	0	4388	1072	56	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
353	20	2035	Wednesday	08:00:17	3763	3216	200.47	1252	1252	0	188	188	0	3356	3354	0	664	664	0	4606	852	67	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
354	39	3484	Thursday	09:59:34	8410	3642	399.28	1224	1224	0	216	216	0	3417	3415	0	603	603	0	4639	819	80	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
358	124	3318	Monday	18:41:50	8178	3460	1269.75	1051	1051	0	389	389	0	2834	2834	0	1186	1186	0	3885	1575	72	Degradation of altitude	UA approaches Emergency landing site
369	108	1776	Friday	17:00:51	3546	3473	1101.42	1101	1101	0	339	339	0	3216	3214	0	804	804	0	4315	1143	13	Engine Anomaly	UA approaches Emergency landing site
384	88	1165	Saturday	14:56:51	4872	4085	894.75	1137	1137	0	303	303	0	3095	3095	0	925	925	0	4232	1228	73	Degradation of altitude	Central UA ground impact point below flight path
389	6	1763	Thursday	06:33:44	3548	3487	56.25	1231	1231	0	209	209	0	3296	3296	0	724	724	0	4527	933	55	GCS Override Wrong commands to the flight control surfaces.	Central UA ground impact point on a random Map coordinate
404	136	1382	Friday	19:52:19	4146	3897	1387.20	1317	1317	0	123	123	0	3718	3718	0	302	302	0	5035	425	40	Short Circuit / Overload	Central UA ground impact point below flight path
407	110	1749	Monday	17:13:06	3552	3502	1121.83	1051	1051	0	389	389	0	2834	2834	0	1186	1186	0	3885	1575	17	Engine Fire	Central UA ground impact point below flight path
414	56	60	Monday	11:38:13	8435	3832	563.72	1137	1137	0	303	303	0	3276	3272	0	744	744	0	4409	1047	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
416	112	3147	Wednesday	17:27:46	7750	3285	1146.31	1065	1065	0	375	375	0	3236	3236	0	784	784	0	4301	1159	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
416	49	2901	Wednesday	11:00:02	6876	3087	500.08	1195	1195	0	245	245	0	3075	3075	0	945	945	0	4270	1190	31	Connection Failure	UA ground impact tangential to trajectory
426	50	1419	Saturday	11:03:40	4046	3860	506.11	1051	1051	0	389	389	0	2874	2874	0	1146	1146	0	3925	1535	52	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
438	47	1356	Thursday	10:45:06	4221	3922	475.19	1195	1195	0	245	245	0	3236	3235	0	784	784	0	4430	1029	80	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
464	54	38	Tuesday	11:25:53	8445	3809	543.17	1152	1152	0	288	288	0	3236	3235	0	784	784	0	4386	1072	19	Engine Fire	Central UA ground impact point below flight path
467	60	2798	Friday	12:07:30	6452	3031	612.50	1152	1152	0	288	288	0	3135	3135	0	885	885	0	4287	1173	72	Degradation of altitude	UA approaches Emergency landing site
469	17	567	Sunday	07:39:20	7316	4209	165.56	1404	1404	0	36	36	0	3718	3717	0	302	302	0	5121	338	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
48	56	2890	Saturday	11:43:03	6832	3080	571.78	1051	1051	0	389	389	0	2874	2874	0	1146	1146	0	3925	1535	32	Connection Failure	UA approaches Emergency landing site
485	107	2623	Tuesday	16:56:08	5706	2978	1093.58	1080	1080	1	360	360	2	3095	3094	0	925	925	0	4174	1285	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
487	127	2229	Thursday	18:58:25	4226	3072	1297.39	1317	1317	0	123	123	0	3798	3793	0	222	222	0	5110	345	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
499	73	2570	Tuesday	13:27:01	5482	2974	745.05	1130	1130	0	310	310	0	3236	3235	0	784	784	0	4365	1094	81	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
505	94	528	Monday	15:32:38	7454	4194	954.42	1137	1137	0	303	303	0	3175	3174	0	845	845	0	4311	1148	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
514	125	3359	Wednesday	18:48:04	8253	3504	1280.11	1065	1065	0	375	375	0	3236	3235	0	784	784	0	4300	1159	78	Degradation of altitude	Central UA ground impact point below flight path
521	119	2004	Wednesday	18:08:51	3712	3243	1214.78	1065	1065	0	375	375	0	3236	3235	0	784	784	0	4300	1159	22	Generator Failure	UA approaches Emergency landing site
522	78	713	Thursday	13:54:36	6751	4241	791.00	1144	1144	0	296	296	0	3256	3256	0	764	764	0	4400	1060	54	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
532	103	1574	Sunday	16:29:45	3720	3695	1049.61	1087	1087	0	353	353	0	2974	2973	0	1046	1046	0	4060	1399	27	Generator Failure	UA ground impact tangential to trajectory
536	96	1097	Thursday	15:45:55	5138	4131	976.53	1144	1144	0	296	296	0	3256	3256	0	764	764	0	4400	1060	61	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
546	96	404	Sunday	15:44:44	7844	4128	974.56	1015	1015	0	425	425	0	3115	3115	0	905	905	0	4130	1330	39	Short Circuit / Overload	Central UA ground impact point below flight path
552	61	535	Saturday	12:09:47	7429	4197	616.31	1051	1051	0	389	389	0	2874	2872	0	1146	1146	0	3923	1535	81	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
557	51	961	Thursday	11:09:01	5702	4201	515.05	1195	1195	0	245	245	0	3236	3236	0	784	784	0	4431	1029	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
561	116	2000	Monday	17:50:24	3706	3247	1184.03	1051	1051	0	389	389	0	2834	2833	0	1186	1186	0	3884	1575	78	Degradation of altitude	Central UA ground impact point below flight path
576	107	3160	Tuesday	16:57:03	7789	3297	1095.11	1080	1080	0	360	360	0	3095	3093	0	925	925	0	4173	1285	60	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
577	132	3280	Wednesday	19:30:58	8099	3419	1351.61	1303	1303	0	137	137	0	3778	3777	0	242	242	0	5080	379	25	Generator Failure	UA approaches Emergency landing site
578	99	1032	Thursday	16:04:14	5404	4169	1007.08	1072	1072	0	368	368	0	2954	2954	0	1066	1066	0	4026	1434	69	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
584	117	2099	Wednesday	17:56:43	3890	3163	1194.55	1065	1065	0	375	375	0	3236	3234	0	784	784	0	4300	1159	8	Engine Out	UA approaches Emergency landing site
586	101	820	Friday	16:16:10	6305	4238	1026.97	1101	1101	0	339	339	0	3216	3215	0	804	804	0	4316	1143	73	Degradation of altitude	Central UA ground impact point below flight path
59	45	3482	Wednesday	10:36:27	8408	3640	460.75	1195	1195	0	245	245	0	3075	3075	0	945	945	0	4270	1190	80	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
591	125	1114	Wednesday	18:44:13	5070	4121	1273.72	1065	1065	0	375	375	0	3236	3236	0	784	784	0	4301	1159	11	Engine Anomaly	Central UA ground impact point below flight path
592	103	940	Thursday	16:28:41	5792	4209	1047.81	1072	1072	0	368	368	2	2954	2954	0	1066	1066	0	4026	1434	63	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
592	83	348	Thursday	14:24:42	7993	4090	841.19	1144	1144	2	296	296	2	3256	3256	0	764	764	0	4399	1060	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
612	46	223	Wednesday	10:37:01	8255	3990	461.72	1195	1195	0	245	245	0	3075	3075	0	945	945	0	4270	1190	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
613	53	3472	Thursday	11:25:36	8399	3629	542.69	1195	1195	0	245	245	0	3236	3234	0	784	784	0	4429	1029	81	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
616	31	1931	Sunday	09:07:43	3618	3312	312.89	1267	1267	0	173	173	0	3577	3577	0	443	443	0	4842	616	41	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
630	93	2772	Sunday	15:30:20	6342	3019	950.56	1015	1015	0	425	425	0	3115	3113	0	905	905	0	4128	1330	19	Engine Fire	Central UA ground impact point below flight path
631	76	1637	Monday	13:43:52	3634	3626	773.14	1137	1137	0	303	303	0	3175	3173	0	845	845	0	4310	1148	53	Wrong commands to the flight control surfaces (Oscillations)	Central UA ground impact point below flight path
64	67	201	Monday	12:46:05	8291	3970	676.83	1137	1137	0	303	303	0	3276	3276	0	744	744	0	4413	1047	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
655	8	87	Thursday	06:43:11	8419	3860	71.97	1231	1231	0	209	209	0	3296	3293	0	724	724	0	4524	933	67	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
656	98	2553	Friday	16:00:41	5411	2974	1001.17	1101	1101	0	339	339	0	3216	3214	0	804	804	0	4315	1143	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
662	46	574	Thursday	10:37:37	7290	4212	462.72	1195	1195	0	245	245	0	3236	3234	0	784	784	0	4429	1029	64	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	UA structural desintegration - Debris Impact
684	85	48	Friday	14:36:29	8441	3820	860.83	1101	1101	0	339	339	0	3195	3195	0	825	825	0	4296	1164	43	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
687	80	1076	Monday	14:07:30	5223	4144	812.53	1137	1137	0	303	303	0	3175	3174	0	845	845	0	4311	1148	13	Engine Anomaly	UA approaches Emergency landing site
687	94	2461	Monday	15:35:57	5038	2982	959.92	1137	1137	0	303	303	0	3175	3174	0	845	845	0	4311	1148	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
690	126	2667	Thursday	18:53:01	5894	2986	1288.39	1072	1072	0	368	368	0	2954	2953	0	1066	1066	0	4025	1434	38	Short Circuit / Overload	Central UA ground impact point below flight path
693	126	2970	Sunday	18:53:33	7145	3134	1289.25	1087	1087	0	353	353	0	2974	2973	0	1046	1046	0	4060	1399	18	Engine Fire	Central UA ground impact point below flight path
698	86	3221	Friday	14:48:03	7957	3358	880.11	1101	1101	0	339	339	0	3195	3194	0	825	825	0	4295	1164	76	Degradation of altitude	Central UA ground impact point below flight path
710	120	1488	Wednesday	18:14:07	3882	3788	1223.55	1065	1065	0	375	375	0	3236	3235	0	784	784	0	4300	1159	81	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
710	84	2126	Wednesday	14:33:54	3952	3142	856.50	1152	1152	0	288	288	0	2934	2933	0	1086	1086	0	4085	1374	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
72	35	1654	Tuesday	09:31:51	3616	3607	353.08	1224	1224	0	216	216	0	3376	3376	0	644	644	0	4600	860	24	Generator Failure	UA ground impact tangential to trajectory
726	64	2110	Friday	12:30:54	3915	3154	651.53	1152	1152	0	288	288	0	3135	3135	0	885	885	0	4287	1173	71	Degradation of lateral and horizontal navigation data accurarcy.	Central UA ground impact point on a random Map coordinate
73	70	1600	Wednesday	13:06:55	3681	3667	711.55	1152	1152	0	288	288	0	2934	2934	0	1086	1086	0	4086	1374	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
730	95	3408	Tuesday	15:43:42	8328	3558	972.86	1130	1130	0	310	310	0	3236	3236	0	784	784	0	4366	1094	81	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
731	110	1105	Wednesday	17:12:00	5106	4126	1120.00	1065	1065	0	375	375	0	3236	3235	0	784	784	0	4300	1159	12	Engine Anomaly	UA approaches Emergency landing site
742	62	273	Sunday	12:15:29	8163	4032	625.81	1065	1065	0	375	375	0	2954	2954	0	1066	1066	0	4019	1441	7	Engine Out	UA approaches Emergency landing site
750	8	1483	Monday	06:45:34	3893	3794	75.95	1216	1216	0	224	224	0	3477	3476	0	543	543	0	4692	767	80	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
755	6	1665	Saturday	06:33:34	3605	3595	55.97	1368	1368	0	72	72	0	3778	3777	0	242	242	0	5145	314	35	Connection Failure	UA approaches Emergency landing site
777	125	3203	Sunday	18:47:48	7910	3340	1279.67	1087	1087	0	353	353	0	2974	2973	0	1046	1046	0	4060	1399	4	Engine Out	UA ground impact tangential to trajectory
794	58	2532	Wednesday	11:54:45	5325	2974	591.25	1195	1195	0	245	245	0	3075	3075	0	945	945	0	4270	1190	29	Connection Failure	UA approaches Emergency landing site
813	114	2925	Monday	17:39:41	6971	3103	1166.17	1051	1051	0	389	389	0	2834	2834	0	1186	1186	0	3885	1575	47	Partial Lock of Flight Control Surfaces	UA ground impact in flight direction with deviating trajectory.
822	119	1038	Wednesday	18:07:12	5379	4166	1212.03	1065	1065	0	375	375	0	3236	3236	0	784	784	0	4301	1159	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
823	9	449	Thursday	06:49:56	7711	4155	83.25	1231	1231	0	209	209	0	3296	3294	0	724	724	0	4525	933	21	Engine Fire	Central UA ground impact point below flight path
824	82	1421	Friday	14:20:24	4041	3858	834.00	1101	1101	0	339	339	0	3195	3194	0	825	825	0	4295	1164	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
830	74	356	Thursday	13:29:23	7973	4096	749.00	1144	1144	0	296	296	0	3256	3256	0	764	764	0	4399	1060	77	Degradation of altitude	Central UA ground impact point below flight path
836	43	2893	Wednesday	10:23:08	6844	3082	438.58	1195	1195	0	245	245	0	3075	3075	0	945	945	0	4270	1190	29	Connection Failure	UA approaches Emergency landing site
849	73	2951	Tuesday	13:27:40	7073	3121	746.14	1130	1130	0	310	310	0	3236	3236	0	784	784	0	4366	1094	26	Generator Failure	UA ground impact tangential to trajectory
859	21	465	Friday	08:03:45	7662	4164	206.25	1238	1238	0	202	202	0	3376	3374	0	644	644	0	4612	846	45	Partial Lock of Flight Control Surfaces	UA approaches Emergency landing site
863	99	1481	Tuesday	16:05:00	3897	3796	1008.36	1080	1080	0	360	360	0	3095	3094	0	925	925	0	4174	1285	33	Connection Failure	UA approaches Emergency landing site
87	19	2726	Wednesday	07:55:18	6146	3002	192.19	1202	1202	0	238	238	0	3356	3356	0	664	664	0	4558	902	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.
887	46	3463	Friday	10:42:33	8391	3619	470.94	1152	1152	0	288	288	0	3135	3134	0	885	885	0	4286	1173	75	Degradation of altitude	Central UA ground impact point below flight path
892	9	3367	Wednesday	06:54:55	8267	3513	91.55	1202	1202	0	238	238	0	3356	3355	0	664	664	0	4557	902	82	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
894	129	1305	Friday	19:09:09	4378	3970	1315.25	1317	1317	0	123	123	0	3718	3718	0	302	302	0	5035	425	4	Engine Out	Central ground impact point below flight path with B/G Ratio.
902	13	2719	Saturday	07:18:25	6117	3000	130.70	1368	1368	1	72	72	0	3778	3775	0	242	242	0	5143	314	80	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
907	77	2341	Thursday	13:51:13	4590	3017	785.39	1144	1144	0	296	296	0	3256	3256	0	764	764	0	4400	1060	83	Separation of essential UA parts (tail or main wing).	UA structural desintegration - Debris Impact
911	106	2837	Monday	16:50:22	6615	3050	1083.94	1051	1051	0	389	389	0	2834	2834	0	1186	1186	0	3885	1575	17	Engine Fire	Central UA ground impact point below flight path
924	136	982	Sunday	19:51:38	5613	4192	1386.06	1310	1310	0	130	130	0	3678	3678	0	342	342	0	4988	472	40	Short Circuit / Overload	Central UA ground impact point below flight path

93	74	1020	Tuesday	13:30:32	5453	4175	750.89	1130	1130	0	310	310	0	3236	3236	0	784	784	0	4366	1094	77	Degradation of altitude	Central UA ground impact point below flight path
933	114	1129	Tuesday	17:36:37	5011	4111	1161.05	1080	1080	0	360	360	0	3095	3094	0	925	925	0	4174	1285	37	Short Circuit / Overload	Central UA ground impact point below flight path
944	48	1709	Saturday	10:51:51	3571	3546	486.44	1051	1051	0	389	389	0	2874	2873	0	1146	1146	0	3924	1535	62	Wrong commands to the flight control surfaces and/or the engine movements beyond the limitations of the UA	Central UA ground impact point below flight path
972	77	585	Saturday	13:48:14	7250	4215	780.39	1137	1137	0	303	303	0	3095	3095	0	925	925	0	4232	1228	26	Generator Failure	Central UA ground impact point below flight path
985	93	566	Friday	15:26:34	7319	4209	944.28	1101	1101	0	339	339	0	3195	3194	0	825	825	0	4295	1164	72	Degradation of altitude	UA approaches Emergency landing site
987	95	1730	Sunday	15:40:51	3559	3523	968.08	1015	1015	0	425	425	0	3115	3115	0	905	905	0	4130	1330	19	Engine Fire	Central UA ground impact point below flight path
99	40	3114	Monday	10:05:04	7649	3254	408.47	1137	1137	0	303	303	0	3276	3276	0	744	744	0	4413	1047	48	Wrong commands to the flight control surfaces (Oscillations)	UA approaches Emergency landing site
996	45	1051	Tuesday	10:32:17	5325	4159	453.83	1152	1152	0	288	288	0	3236	3233	0	784	784	0	4385	1072	79	Separation of essential UA parts (tail or main wing).	Central UA ground impact point below flight path
998	105	2113	Thursday	16:42:58	3921	3152	1071.64	1072	1072	0	368	368	0	2954	2953	0	1066	1066	0	4025	1434	16	Engine Anomaly	Central ground impact point below flight path with B/G Ratio.

O.R.C.U.S. 02.00 - tTest of the Simulation

nProbes	200
nEvents	192
nEvents_cor	178
tMission	14
x_cross_ATB	0.085
x_cross_OTW	0.09
x_cross_TOT	0.175
s2ATB	0.0083007
sATB	0.0911081
tATB	11.641776
s2OTW	0.0086699
sOTW	0.0931122
tOTW	12.15062
s2TOT	0.0313814
sTOT	0.177148
tTOT	13.172336

UADay/Prot	HIT_TOT_ATB	HIT_TOT_OTW	UADay/Prot cor	HIT_TOT_mean_ATB	HIT_TOT_mean_OTW	HIT_TOT_mean_ATB/Fh	HIT_TOT_mean_OTW/Fh	x_i-x_cross ATB	x_i-x_cross OTW	(x_i-x_cross ATB)^2	(x_i-x_cross OTW)^2
11	0	0	11	0	0	0	0	-0.085	-0.09	0.007225	0.0081
27	0	0	27	0	0	0	0	-0.085	-0.09	0.007225	0.0081
30	0	0	30	0	0	0	0	-0.085	-0.09	0.007225	0.0081
30	0	0	48	0	0	0	0	-0.085	-0.09	0.007225	0.0081
48	0	0	59	0	0	0	0	-0.085	-0.09	0.007225	0.0081
59	0	0	64	0	0	0	0	-0.085	-0.09	0.007225	0.0081
64	0	0	72	0	0	0	0	-0.085	-0.09	0.007225	0.0081
72	0	0	73	0	0	0	0	-0.085	-0.09	0.007225	0.0081
73	0	0	87	0	0	0	0	-0.085	-0.09	0.007225	0.0081
87	0	0	93	0	0	0	0	-0.085	-0.09	0.007225	0.0081
93	0	0	99	0	0	0	0	-0.085	-0.09	0.007225	0.0081
99	0	0	102	0	0	0	0	-0.085	-0.09	0.007225	0.0081
102	0	0	107	0	0	0	0	-0.085	-0.09	0.007225	0.0081
107	0	0	123	0	0	0	0	-0.085	-0.09	0.007225	0.0081
107	0	0	135	0	0	0	0	-0.085	-0.09	0.007225	0.0081
123	0	0	138	0	0	0	0	-0.085	-0.09	0.007225	0.0081
135	0	0	139	0	0	0	0	-0.085	-0.09	0.007225	0.0081
138	0	0	145	0	0	0	0	-0.085	-0.09	0.007225	0.0081
139	0	0	147	0	0	0	0	-0.085	-0.09	0.007225	0.0081
145	0	0	156	0	0	0	0	-0.085	-0.09	0.007225	0.0081
147	0	0	173	0	0	0	0	-0.085	-0.09	0.007225	0.0081
156	0	0	196	0	0	0	0	-0.085	-0.09	0.007225	0.0081
173	0	0	197	0	0	0	0	-0.085	-0.09	0.007225	0.0081
196	0	0	198	0	0	0	0	-0.085	-0.09	0.007225	0.0081
197	0	0	205	0	0	0	0	-0.085	-0.09	0.007225	0.0081
198	0	0	220	0	0	0	0	-0.085	-0.09	0.007225	0.0081
198	0	0	222	0	0	0	0	-0.085	-0.09	0.007225	0.0081
205	0	0	224	0	0	0	0	-0.085	-0.09	0.007225	0.0081
220	0	0	237	0	0	0	0	-0.085	-0.09	0.007225	0.0081
222	0	0	248	0	0	0	0	-0.085	-0.09	0.007225	0.0081
224	0	0	275	0	0	0	0	-0.085	-0.09	0.007225	0.0081
237	0	0	280	0	0	0	0	-0.085	-0.09	0.007225	0.0081
248	0	0	286	0	0	0	0	-0.085	-0.09	0.007225	0.0081
248	0	0	298	0	0	0	0	-0.085	-0.09	0.007225	0.0081
275	0	0	300	0	0	0	0	-0.085	-0.09	0.007225	0.0081
280	0	0	307	0	0	0	0	-0.085	-0.09	0.007225	0.0081
286	0	0	309	0	2	0	0.142857143	-0.085	0.052857143	0.007225	0.002793878
298	0	0	310	0	6	0	0.428571429	-0.085	0.338571429	0.007225	0.114630612
300	0	0	315	0	0	0	0	-0.085	-0.09	0.007225	0.0081
307	0	0	324	0	0	0	0	-0.085	-0.09	0.007225	0.0081
309	0	0	326	0	0	0	0	-0.085	-0.09	0.007225	0.0081
309	0	2	334	0	0	0	0	-0.085	-0.09	0.007225	0.0081
310	0	6	341	0	0	0	0	-0.085	-0.09	0.007225	0.0081
315	0	0	345	0	0	0	0	-0.085	-0.09	0.007225	0.0081
324	0	0	353	0	0	0	0	-0.085	-0.09	0.007225	0.0081
326	0	0	354	0	0	0	0	-0.085	-0.09	0.007225	0.0081
334	0	0	358	0	0	0	0	-0.085	-0.09	0.007225	0.0081
341	0	0	369	0	0	0	0	-0.085	-0.09	0.007225	0.0081
345	0	0	384	0	0	0	0	-0.085	-0.09	0.007225	0.0081
345	0	0	389	0	0	0	0	-0.085	-0.09	0.007225	0.0081
353	0	0	404	0	0	0	0	-0.085	-0.09	0.007225	0.0081
354	0	0	407	0	0	0	0	-0.085	-0.09	0.007225	0.0081
358	0	0	414	0	0	0	0	-0.085	-0.09	0.007225	0.0081
369	0	0	416	0	0	0	0	-0.085	-0.09	0.007225	0.0081
384	0	0	426	0	0	0	0	-0.085	-0.09	0.007225	0.0081
389	0	0	438	0	0	0	0	-0.085	-0.09	0.007225	0.0081
404	0	0	464	0	0	0	0	-0.085	-0.09	0.007225	0.0081
407	0	0	467	0	0	0	0	-0.085	-0.09	0.007225	0.0081
414	0	0	469	0	0	0	0	-0.085	-0.09	0.007225	0.0081
416	0	0	485	1	2	0.071428571	0.142857143	-0.013571429	0.052857143	0.000184184	0.002793878
416	0	0	487	0	0	0	0	-0.085	-0.09	0.007225	0.0081
426	0	0	499	0	0	0	0	-0.085	-0.09	0.007225	0.0081
438	0	0	505	1	0	0.071428571	0	-0.013571429	-0.09	0.000184184	0.0081
464	0	0	514	0	0	0	0	-0.085	-0.09	0.007225	0.0081
467	0	0	521	0	0	0	0	-0.085	-0.09	0.007225	0.0081
469	0	0	522	0	0	0	0	-0.085	-0.09	0.007225	0.0081
485	1	2	532	0	0	0	0	-0.085	-0.09	0.007225	0.0081
487	0	0	536	0	0	0	0	-0.085	-0.09	0.007225	0.0081
499	0	0	546	0	0	0	0	-0.085	-0.09	0.007225	0.0081
505	1	0	552	0	0	0	0	-0.085	-0.09	0.007225	0.0081
514	0	0	557	0	0	0	0	-0.085	-0.09	0.007225	0.0081
521	0	0	561	0	0	0	0	-0.085	-0.09	0.007225	0.0081
522	0	0	576	0	0	0	0	-0.085	-0.09	0.007225	0.0081
532	0	0	577	0	0	0	0	-0.085	-0.09	0.007225	0.0081
536	0	0	578	0	0	0	0	-0.085	-0.09	0.007225	0.0081
546	0	0	584	0	0	0	0	-0.085	-0.09	0.007225	0.0081
552	0	0	586	0	0	0	0	-0.085	-0.09	0.007225	0.0081
557	0	0	591	0	0	0	0	-0.085	-0.09	0.007225	0.0081
561	0	0	592	2	4	0.142857143	0.285714286	0.057857143	0.195714286	0.003347449	0.038304082
576	0	0	612	0	0	0	0	-0.085	-0.09	0.007225	0.0081
577	0	0	613	0	0	0	0	-0.085	-0.09	0.007225	0.0081
578	0	0	616	0	0	0	0	-0.085	-0.09	0.007225	0.0081
584	0	0	630	0	0	0	0	-0.085	-0.09	0.007225	0.0081
586	0	0	631	0	0	0	0	-0.085	-0.09	0.007225	0.0081
591	0	0	655	0	0	0	0	-0.085	-0.09	0.007225	0.0081
592	0	2	656	5	0	0.357142857	0	0.272142857	-0.09	0.074061735	0.0081
592	2	2	662	0	1	0	0.071428571	-0.085	-0.018571429	0.007225	0.000344898
612	0	0	684	0	0	0	0	-0.085	-0.09	0.007225	0.0081
613	0	0	687	0	0	0	0	-0.085	-0.09	0.007225	0.0081
616	0	0	690	0	0	0	0	-0.085	-0.09	0.007225	0.0081
630	0	0	693	0	0	0	0	-0.085	-0.09	0.007225	0.0081
631	0	0	698	0	0	0	0	-0.085	-0.09	0.007225	0.0081
655	0	0	710	0	0	0	0	-0.085	-0.09	0.007225	0.0081
656	5	0	726	0	0	0	0	-0.085	-0.09	0.007225	0.0081
662	0	1	730	0	0	0	0	-0.085	-0.09	0.007225	0.0081
684	0	0	731	0	0	0	0	-0.085	-0.09	0.007225	0.0081
687	0	0	742	0	0	0	0	-0.085	-0.09	0.007225	0.0081
687	0	0	750	0	0	0	0	-0.085	-0.09	0.007225	0.0081
690	0	0	755	0	0	0	0	-0.085	-0.09	0.007225	0.0081
693	0	0	777	0	0	0	0	-0.085	-0.09	0.007225	0.0081
698	0	0	794	0	0	0	0	-0.085	-0.09	0.007225	0.0081
710	0	0	813	0	0	0	0	-0.085	-0.09	0.007225	0.0081
710	0	0	822	0	0	0	0	-0.085	-0.09	0.007225	0.0081
726	0	0	823	0	1	0	0.071428571	-0.085	-0.018571429	0.007225	0.000344898
730	0	0	824	0	0	0	0	-0.085	-0.09	0.007225	0.0081
731	0	0	830	0	0	0	0	-0.085	-0.09	0.007225	0.0081
742	0	0	836	0	0	0	0	-0.085	-0.09	0.007225	0.0081
750	0	0	849	0	0	0	0	-0.085	-0.09	0.007225	0.0081
755	0	0	859	0	0	0	0	-0.085	-0.09	0.007225	0.0081
777	0	0	863	0	0	0	0	-0.085	-0.09	0.007225	0.0081
794	0	0	887	0	0	0	0	-0.085	-0.09	0.007225	0.0081
813	0	0	892	0	0	0	0	-0.085	-0.09	0.007225	0.0081
822	0	0	894	0	0	0	0	-0.085	-0.09	0.007225	0.0081
823	0	1	902	1	0	0.071428571	0	-0.013571429	-0.09	0.000184184	0.0081
824	0	0	907	0	0	0	0	-0.085	-0.09	0.007225	0.0081
830	0	0	911	0	0	0	0	-0.085	-0.09	0.007225	0.0081
836	0	0	924	0	0	0	0	-0.085	-0.09	0.007225	0.0081
849	0	0	933	0	0	0	0	-0.085	-0.09	0.007225	0.0081
859	0	0	944	0	0	0	0	-0.085	-0.09	0.007225	0.0081
863	0	0	972	0	0	0	0	-0.085	-0.09	0.007225	0.0081
887	0	0	985	0	0	0	0	-0.085	-0.09	0.007225	0.0081
892	0	0	987	0	0	0	0	-0.085	-0.09	0.007225	0.0081
894	0	0	996	0	0	0	0	-0.085	-0.09	0.007225	0.0081
902	1	0	998	0	0	0	0	-0.085	-0.09	0.007225	0.0081
907	0	0	1001	0	0	0	0	-0.085	-0.09	0.007225	0.0081
911	0	0	1007	0	0	0	0	-0.085	-0.09	0.007225	0.0081
924	0	0	1018	0	0	0	0	-0.085	-0.09	0.007225	0.0081
933	0	0	1023	0	0	0	0	-0.085	-0.09	0.007225	0.0081
944	0	0	1024	0	0	0	0	-0.085	-0.09	0.007225	0.0081
972	0	0	1032	0	0	0	0	-0.085	-0.09	0.007225	0.0081
985	0	0	1036	0	0	0	0	-0.085	-0.09	0.007225	0.0081
987	0	0	1044	0	0	0	0	-0.085	-0.09	0.007225	0.0081
996	0	0	1049	0	0	0	0	-0.085	-0.09	0.007225	0.0081
998	0	0	1060	0	0	0	0	-0.085	-0.09	0.007225	0.0081
1001	0	0	1067	0	0	0	0	-0.085	-0.09	0.007225	0.0081
1007	0	0	1068	0	0	0	0	-0.085	-0.09	0.007225	0.0081
1018	0	0	1075	0	0	0	0	-0.085	-0.09	0.007225	0.0081
1023	0	0	1086	0	0	0	0	-0.085	-0.09	0.007225	0.0081
1024	0	0	1096	0	0	0	0	-0.085	-0.09	0.007225	0.0081
1032	0	0	1098	0	0	0	0	-0.085	-0.09	0.007225	0.0081
1036	0	0	1100	0	0	0	0	-0.085	-0.09	0.007225	0.0081
1044	0	0	1108	0	0	0	0	-0.085	-0.09	0.007225	0.0081
1049	0	0	1119	0	0	0	0	-0.085	-0.09	0.007225	0.0081
1060	0	0	1120	0	0	0	0	-0.085	-0.09	0.007225	0.0081
1067	0	0	1126	0	0	0	0	-0.085	-0.09	0.007225	0.0081
1068	0	0	1127	0	0	0	0	-0.085	-0.09	0.007225	0.0081
1075	0	0	1128	0	0	0	0	-0.085	-0.09	0.007225	0.0081
1086	0	0	1129	0	0	0	0	-0.085	-0.09	0.007225	0.0081
1096	0	0	1142	0	0	0	0	-0.085	-0.09	0.007225	0.0081
1098	0	0	1151	0	0	0	0	-0.085	-0.09	0.007225	0.0081
1100	0	0	1155	0	0	0	0	-0.085	-0.09	0.007225	0.0081
1108	0	0	1162	0	0	0	0	-0.085	-0.09	0.007225	0.0081
1119	0	0	1167	0	0	0	0	-0.085	-0.09	0.007225	0.0081
1120	0	0	1173	0	0	0	0	-0.085	-0.09	0.007225	0.0081
1126	0	0	1177	0	0	0	0	-0.085	-0.09	0.007225	0.0081
1127	0	0	1190	0	0	0	0	-0.085	-0.09	0.007225	0.0081
1128	0	0	1198	0	0	0	0	-0.085	-0.09	0.007225	0.0081
1129	0	0	1199	0	0	0	0	-0.085	-0.09	0.007225	0.0081
1142	0	0	1206	0	0	0	0	-0.085	-0.09	0.007225	0.0081
1151	0	0	1217	0	0	0	0	-0.085	-0.09	0.007225	0.0081
1155	0	0	1221	0	0	0	0	-0.085	-0.09	0.007225	0.0081
1162	0	0	1230	0	0	0	0	-0.085	-0.09	0.007225	0.0081
1162	0	0	1234	0	0	0	0	-0.085	-0.09	0.007225	0.0081
1167	0	0	1237	0	0	0	0	-0.085	-0.09	0.007225	0.0081
1173	0	0	1266	0	0	0	0	-0.085	-0.09	0.007225	0.0081
1177	0	0	1270	0	0	0	0	-0.085	-0.09	0.007225	0.0081
1190	0	0	1284	0	0	0	0	-0.085	-0.09	0.007225	0.0081
1198	0	0	1299	0	0	0	0	-0.085	-0.09	0.007225	0.0081
1199	0	0	1316	0	0	0	0	-0.085	-0.09	0.007225	0.0081
1206	0	0	1320	0	0	0	0	-0.085	-0.09	0.007225	0.0081
1217	0	0	1325	7	2	0.5	0.142857143	0.415	0.052857143	0.172225	0.002793878
1221	0	0	1345	0	0	0	0	-0.085	-0.09	0.007225	0.0081
1230	0	0	1347	0	0	0	0	-0.085	-0.09	0.007225	0.0081
1234	0	0	1348	0	0	0	0	-0.085	-0.09	0.007225	0.0081
1237	0	0	1367	0	0	0	0	-0.085	-0.09	0.007225	0.0081
1266	0	0	1372	0	0	0	0	-0.085	-0.09	0.007225	0.0081
1270	0	0	1384	0	0	0	0	-0.085	-0.09	0.007225	0.0081
1284	0	0	1392	0	0	0	0	-0.085	-0.09	0.007225	0.0081
1299	0	0									
1316	0	0									
1320	0	0									
1325	7	2									
1325	0	0									
1345	0	0									
1347	0	0									
1347	0	0									
1348	0	0									
1348	0	0									
1367	0	0									
1372	0	0									
1384	0	0									
1392	0	0									