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MAN Nutzfahrzeuge AG

Agenda



Motivation

Active safety

- by support in the transverse guidance control
 - by support in the longitudinal guidance control
 - by support when turning off
- VDA joint initiative – “SafetyTruck“
-

Summary



Motivation

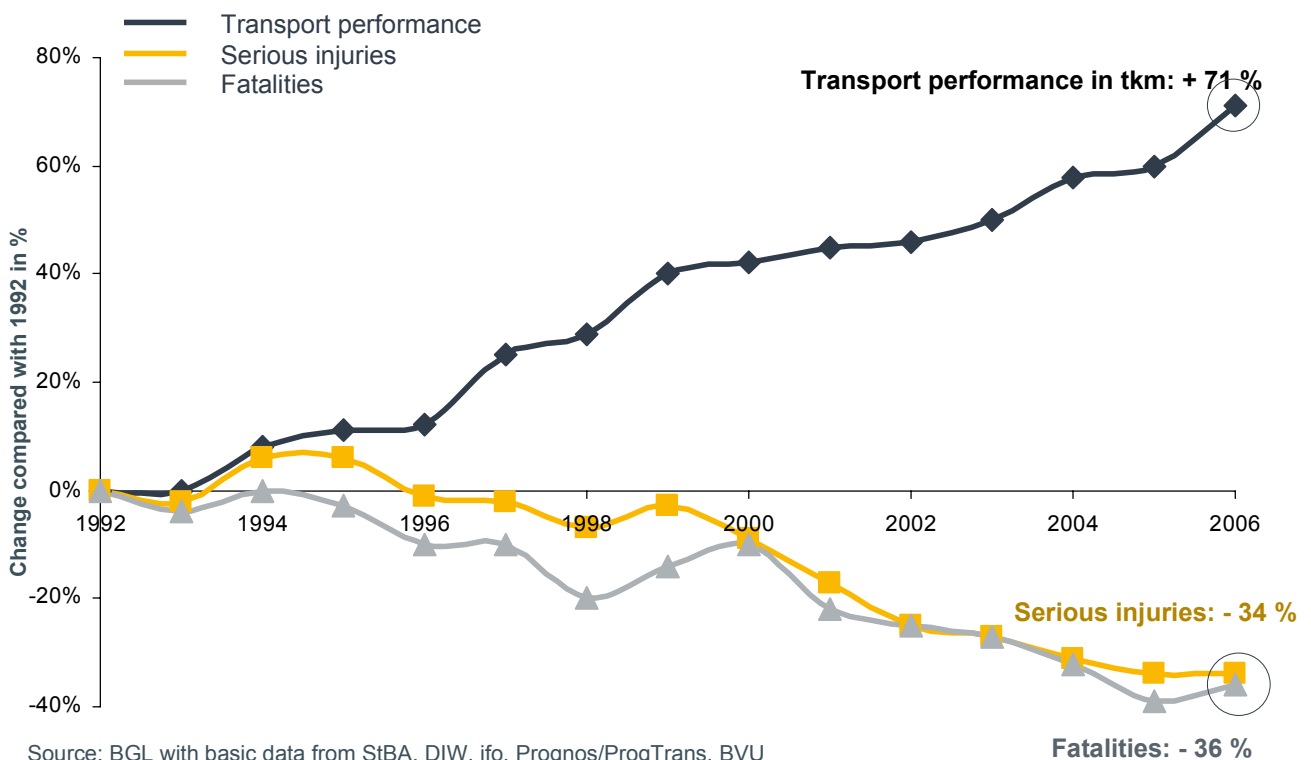
Active safety

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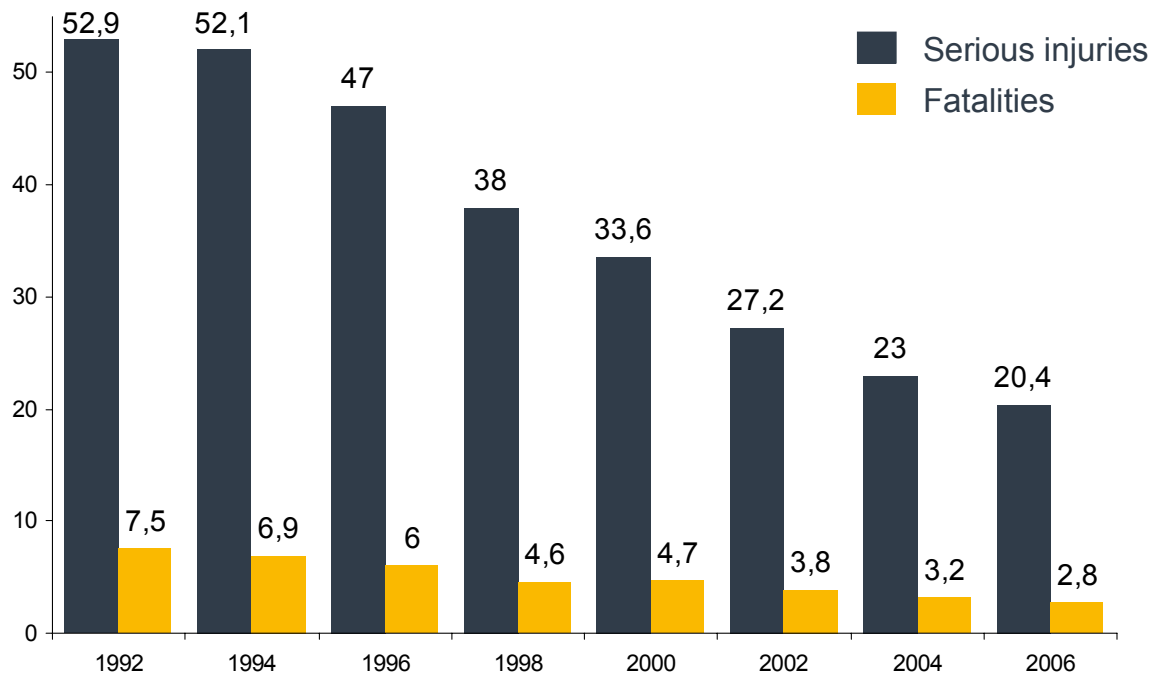
Truck accident occurrence in Germany

Change compared with 1992 in %



Truck accident occurrence in Germany

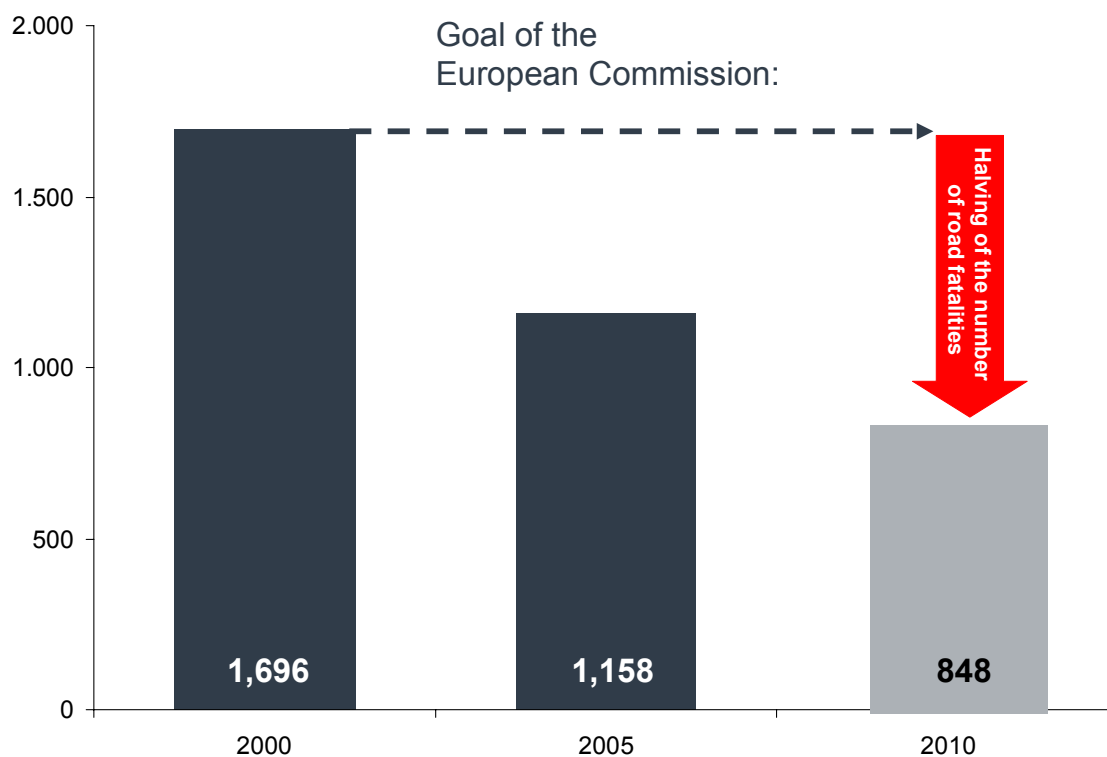
Accident victims per 1 billion tonne kilometres



Reduction of fatalities per 1 billion tkm by 61%
Reduction of serious injuries per 1 billion tkm by 63%

Truck accident occurrence in Germany

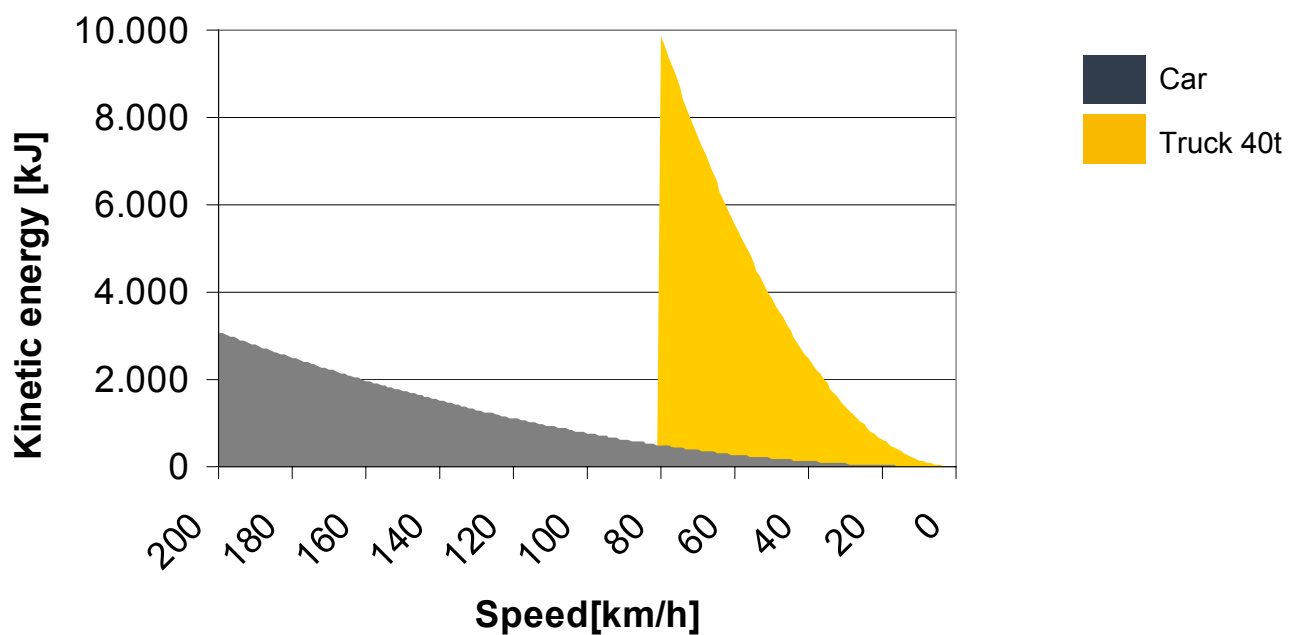
Number of fatalities



Compatibility problem between trucks and cars



Kinetic energy of cars and trucks



Extension of the passive safety systems in trucks is limited

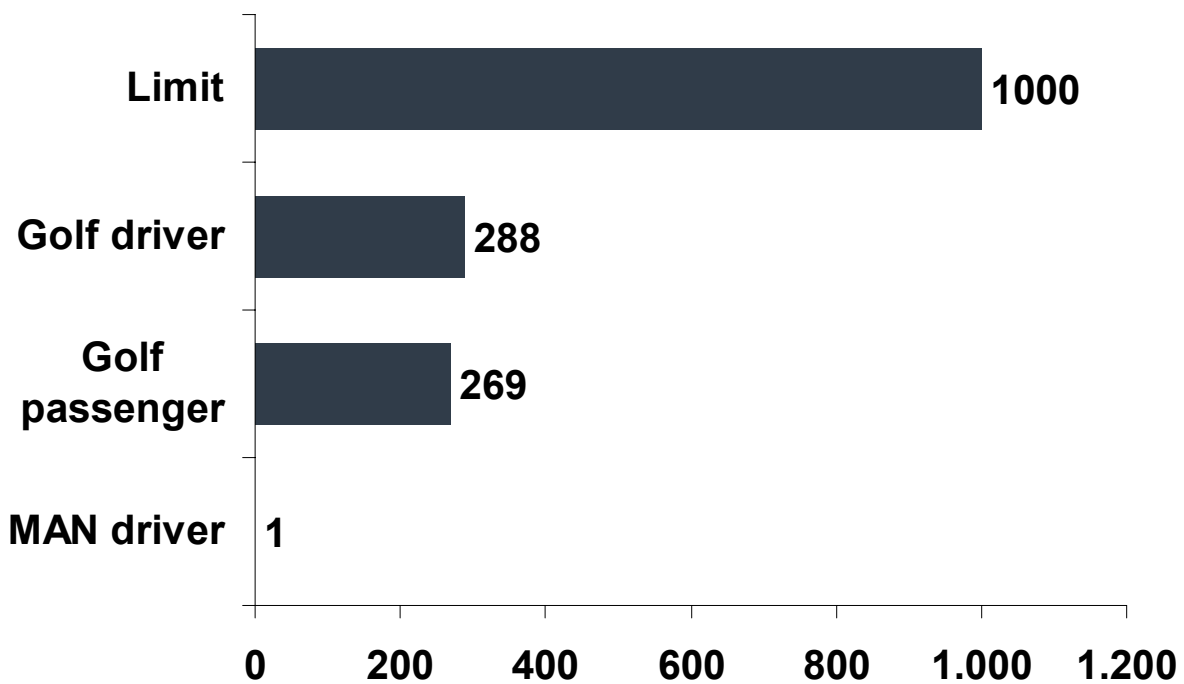
Video Golf crash test



Crash test
MAN TGA - VW Golf IV
MAN TGA 21 km/h, Golf IV 43 km/h; 70 % car overlap

Passenger load in crash

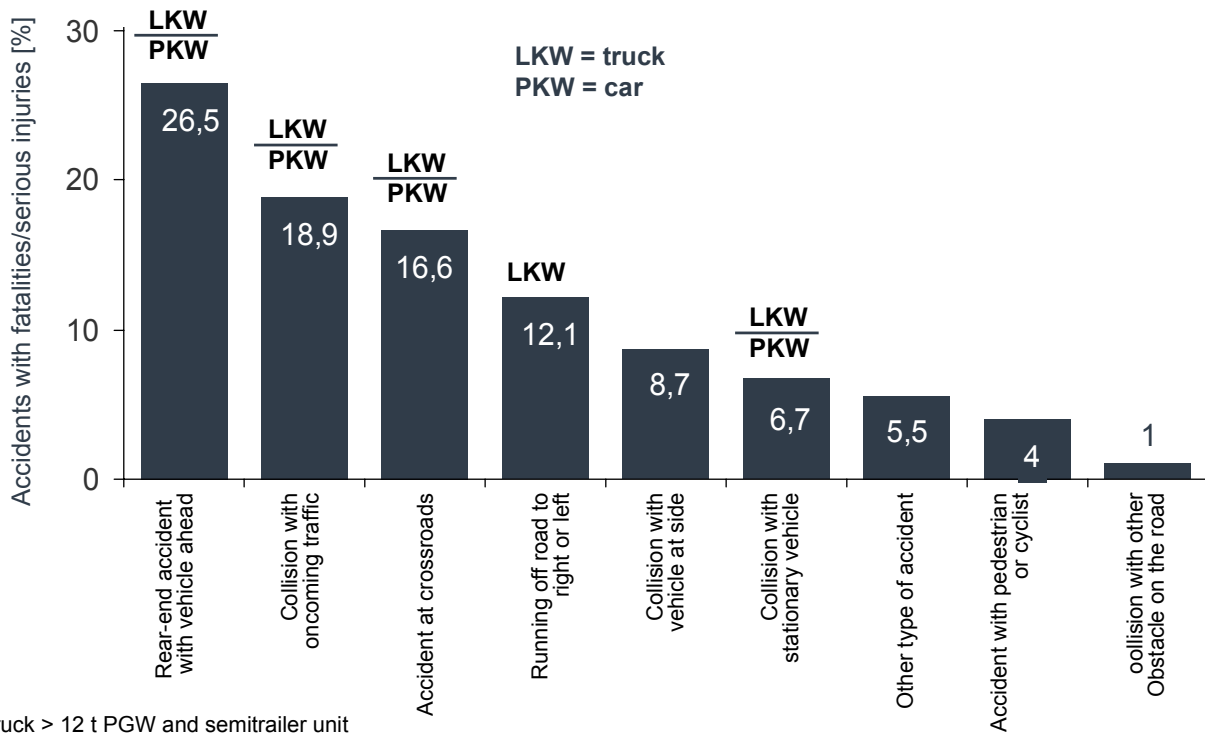
HIC (Head Injury Criterion)



Source: Our own investigations

Distribution of types of accident

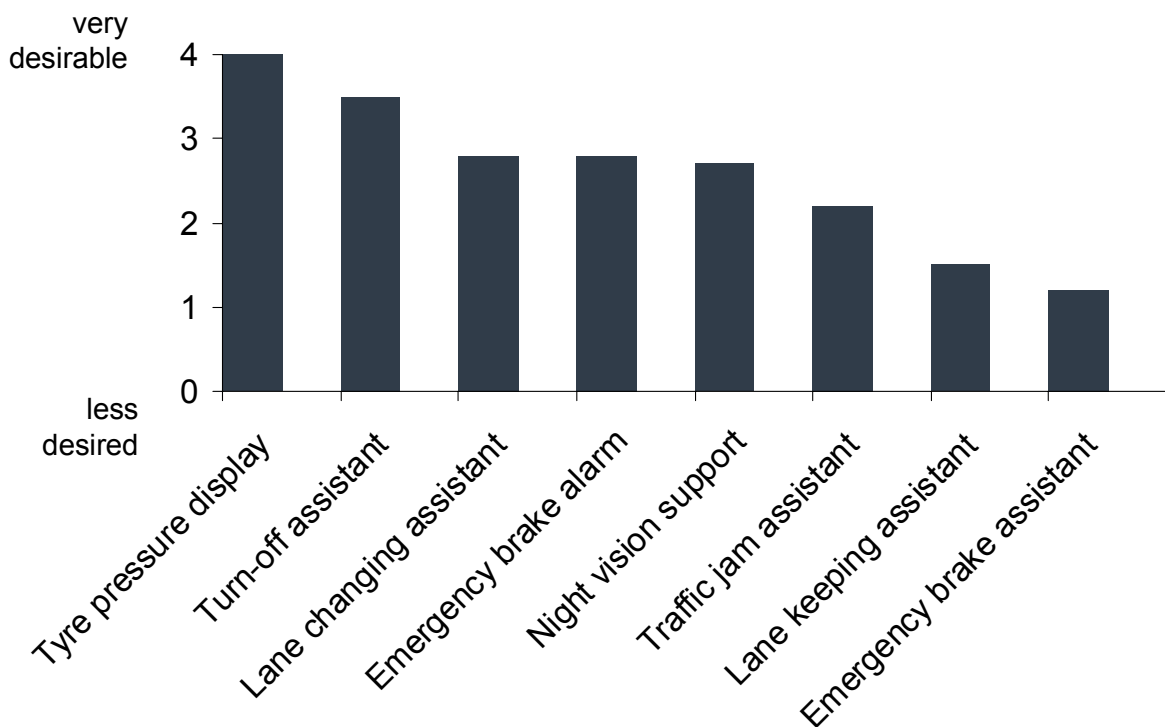
Accidents with fatalities or serious injuries (2005)*



* Truck > 12 t PGW and semitrailer unit
Source: Federal German Office for Statistics,

Drivers' survey*

Drivers wishes



*Source: Own survey of 50 drivers



- Acceptance of warning systems higher than acceptance of intervening systems
- Greater need for safety systems when turning off and changing lanes
- Scepticism with regard to (too much) electronics
- Fear of losing control and too much automation
- Concern about possibly being underchallenged, overtired, loss of tasks

Agenda



Motivation

Active safety

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by support in the longitudinal guidance control

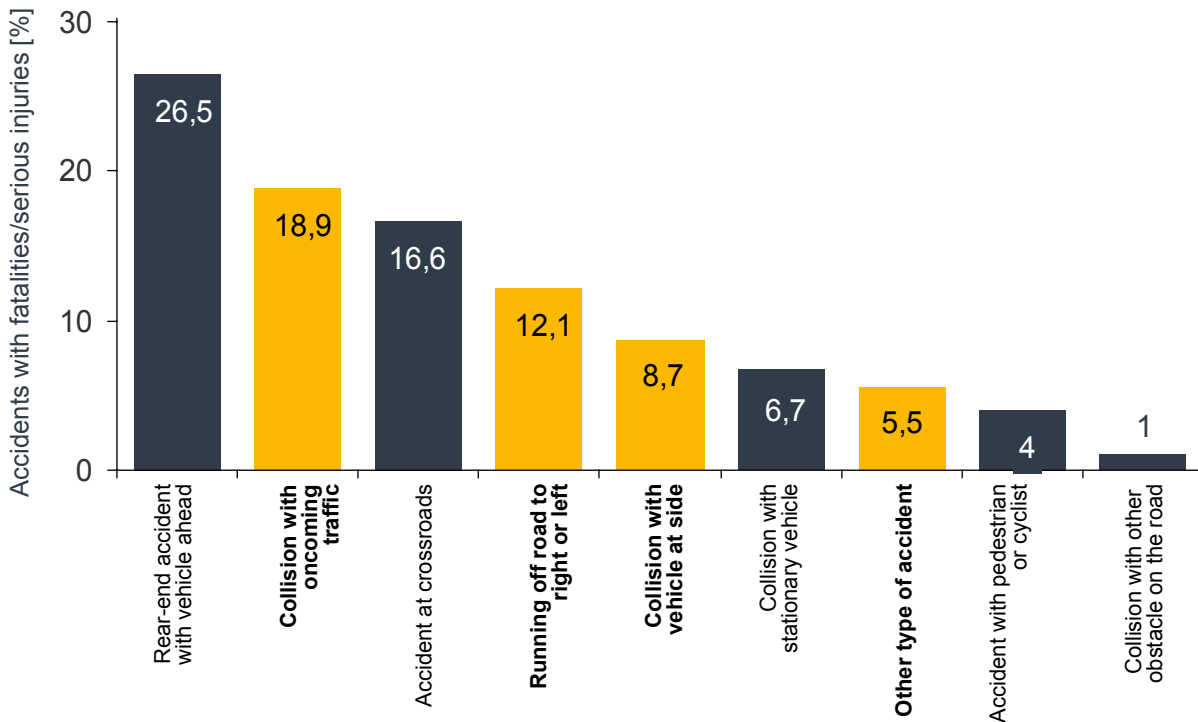
by support when turning off

VDA joint initiative – “SafetyTruck“

Summary

Distribution of types of accident

Accidents with fatalities or serious injuries (2005)*



Influencing the driving dynamics

Electronic Stability Programme (ESP)



ESP intervenes in a motorway exit from a speed of 50 - 60 km/h*

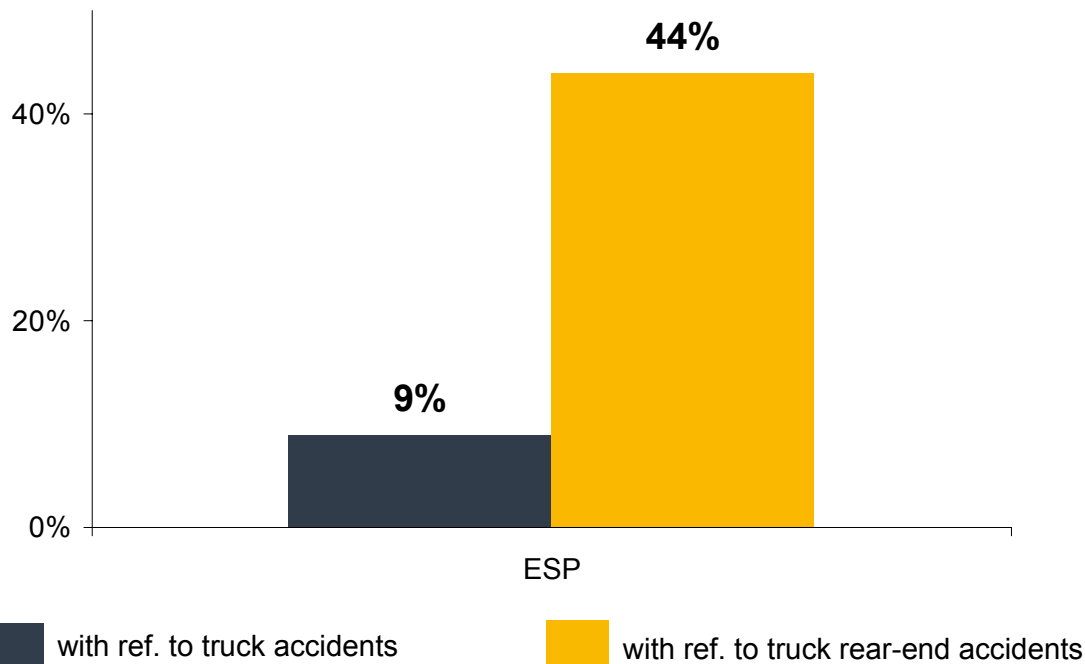


Since January 2007 in all 2-axle semitrailer tractors with automatic gearboxes and sustained-action brakes

*Assumption: Truck 4m high, 2.5m wide, $V_Q=3,1\text{m/s}^2$

Electronic Stability Programme

Potential for avoiding accidents



Source: Own investigations, Allianzzentrum für Technik GmbH, Ismaning, Oct 2005

Prevention of straying from the lane

Warning system: Lane Guard System (LGS)



Acoustic warning in the event of accidental straying from the lane



Driver warning by seat vibration relating to direction

Area of deployment

Lane Guard System (LGS)



Mode of functioning

- Monitoring of the lane by video camera
- Under 75 km/h warning on the inside edge of the lane marking
- Over 75 km/h warning on the outside edge of the lane marking

Function limits / no warning

- Under 60 km/h
- When flasher is activated
- In tight corners
- With poor/no lane marking
- In snow, very unfavourable contrasts



Ongoing development: Sensor fusion, traffic sign recognition, night vision (NIR)

Prevention of straying from the lane

Active return to lane



Automatic corrective intervention
on lane marking:

Effect direct on steering by braking
of individual wheels



Course of the aligning torque



Prevention of straying from the lane

Active tracking



- Permanent intervention in the transverse guidance control of the vehicle (optimal holding of the vehicle on trajectory)
- Active tracking requires an active steering system.

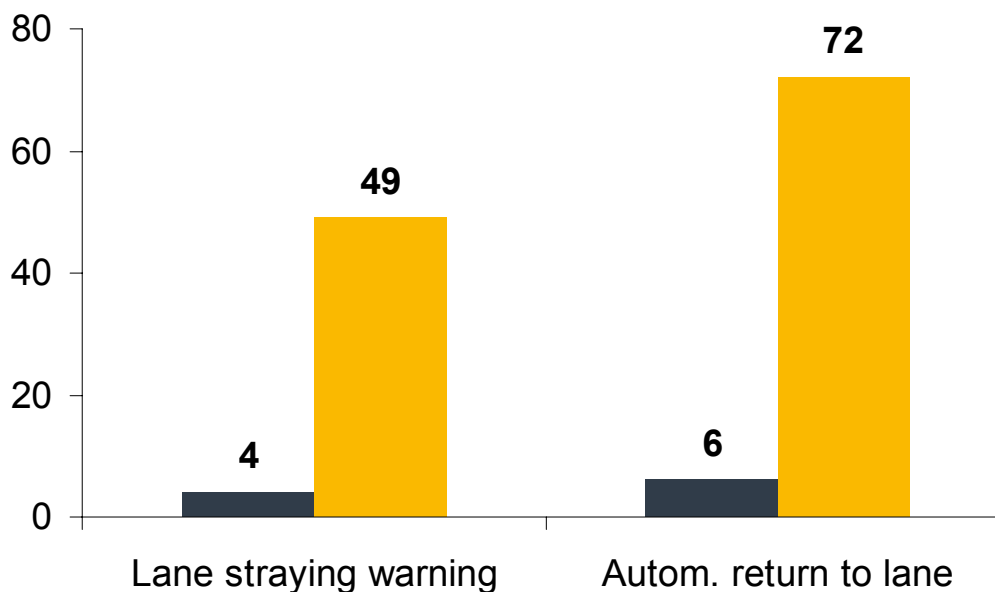


Course of the aligning torque

In today's legal situation permanent tracking is not permissible.

Prevention of straying from the lane

Accident prevention potential



with ref. to the total number of truck accidents
 with ref. to LGS-relevant accidents

Source: Own investigations, Allianzzentrum für Technik GmbH, Ismaning, Oct 2005, driving simulator Engineering University Munich

Accident prevention potential

by support in the transverse guidance control



Driving errors which bring the vehicle to the limits of driving dynamics or unintentional straying from the lane owing to inattentiveness.

Active measures:

- Electronic Stability Programme
- Warning on straying from lane
- Active return to lane
- Active tracking



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Motivation

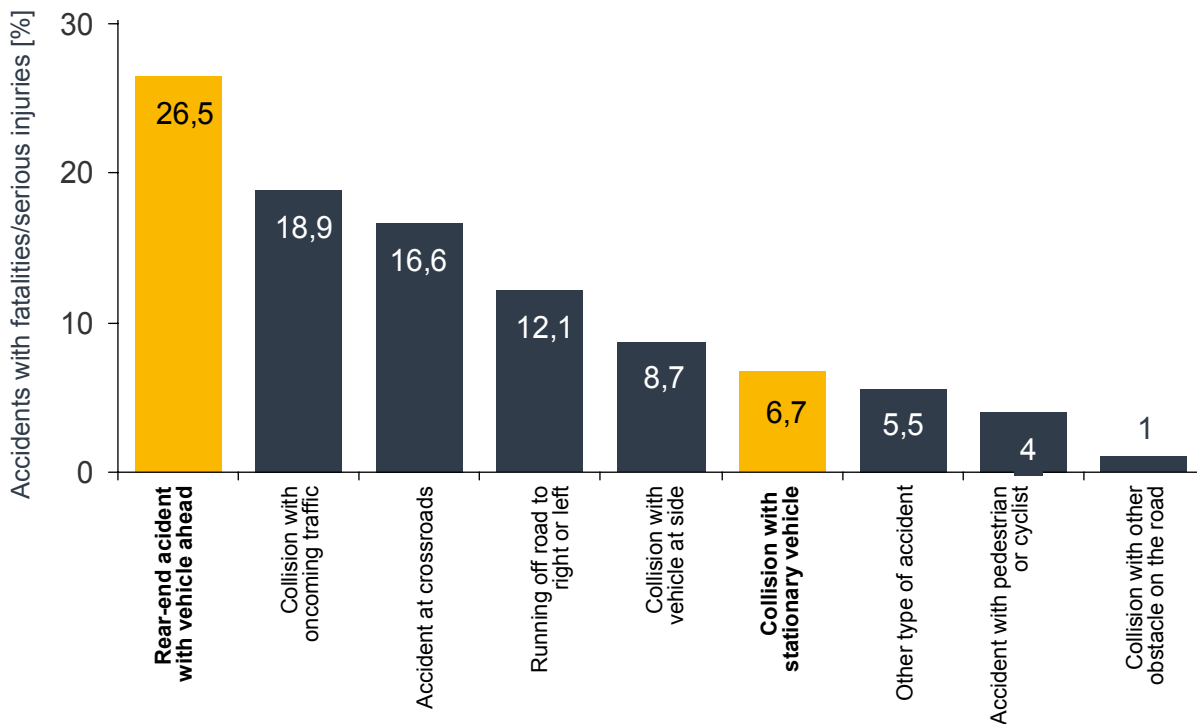
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Distribution of types of accident

Accidents with fatalities or serious injuries (2005)*



Accident prevention potential

by support in the longitudinal guidance control



Rear-end accidents from rear with vehicles in the same lane

Active measures:

- Comfort systems for longitudinal control
- Adaptive Cruise Control
- Emergency brake systems



Longitudinal guidance control

Adaptive Cruise Control (ACC)



Series since 2002



Series since 2006

Area of deployment

Adaptive Cruise Control (ACC)



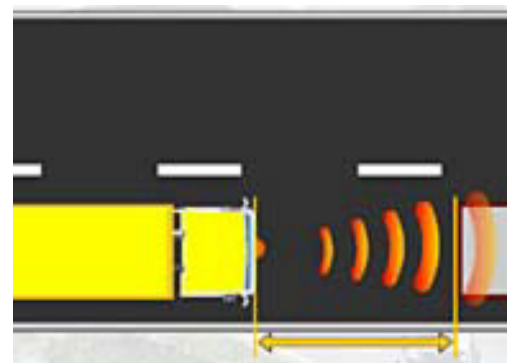
Mode of functioning

- Brake control of up to 30 % of the max. possible deceleration
- Can be overdriven at any time by the driver



Function limits

- Can be activated from 25 km/h
- No recognition of stationary vehicles
- May not be any recognition of vehicles in corners
- May not function in heavy rain, snow or if sensor is soiled



Longitudinal guidance control

Automatic emergency braking



Introduction of an automatic hard stop to reduce the severity of the collision

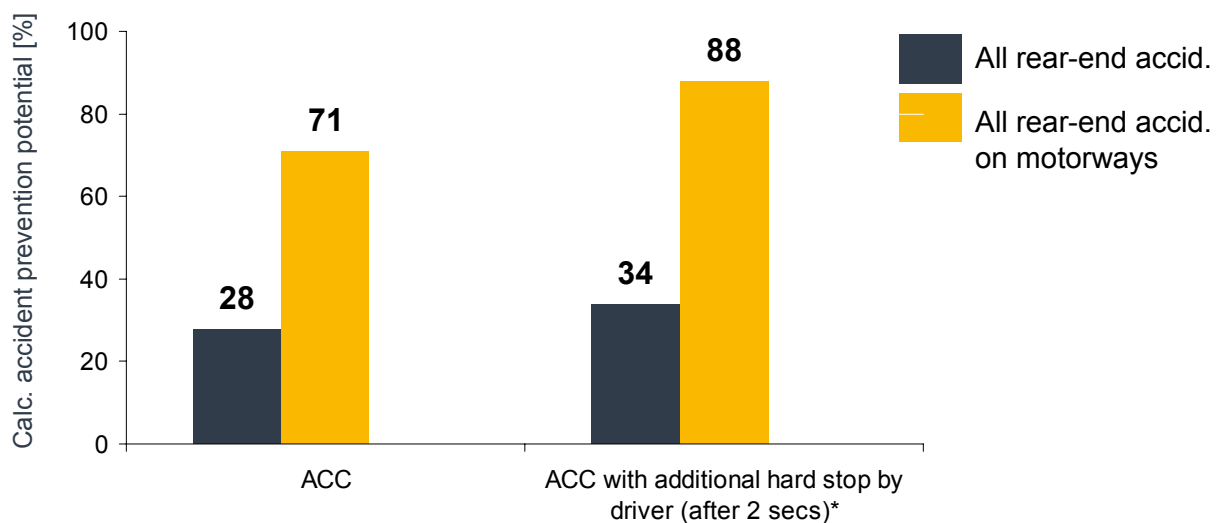
3-step warning and intervention strategy:

1. Acoustic warning braking with 30% of the max. braking power
2. Hard stop
3. Triggering only in simple, clearly structured traffic situations



Longitudinal guidance control

Prevention potential



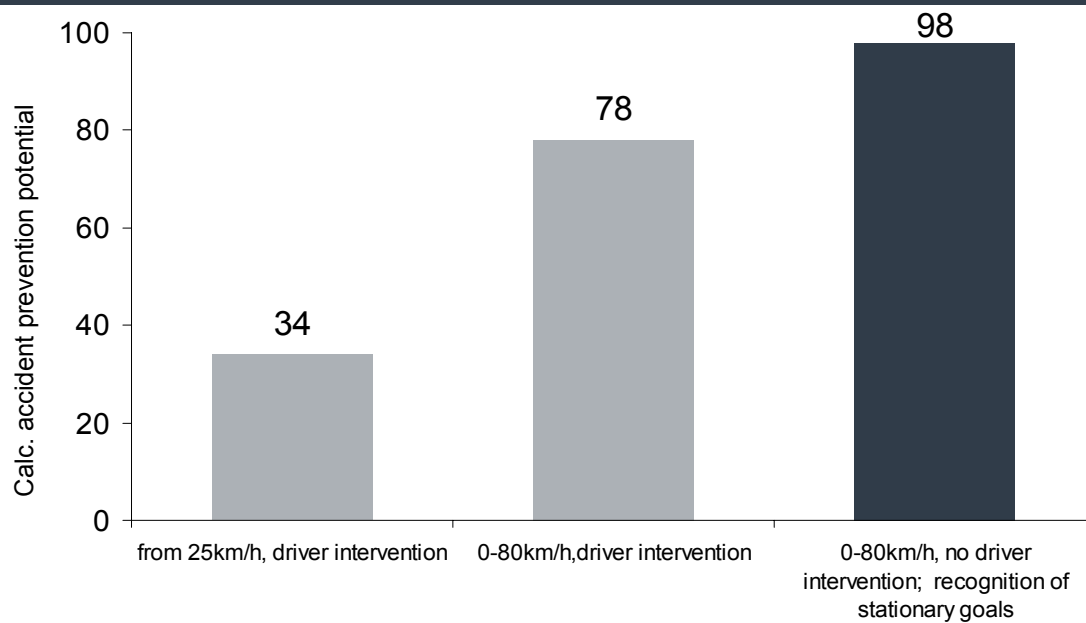
*Emergency brake systems have comparable potential for reducing the severity of collisions

Summary:

Compared with ACC systems, emergency brake systems to reduce the severity of collisions have a slightly higher prevention potential

Accident prevention in longitudinal traffic

Accident prevention potential - all rear-end accidents



Summary:

The maximum accident prevention potential can be reached with systems which react in the range of 0-80km/h and recognise stationary vehicles

Source: Own investigations, Allianzzentrum für Technik GmbH, Ismaning, Oct 2005

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Motivation

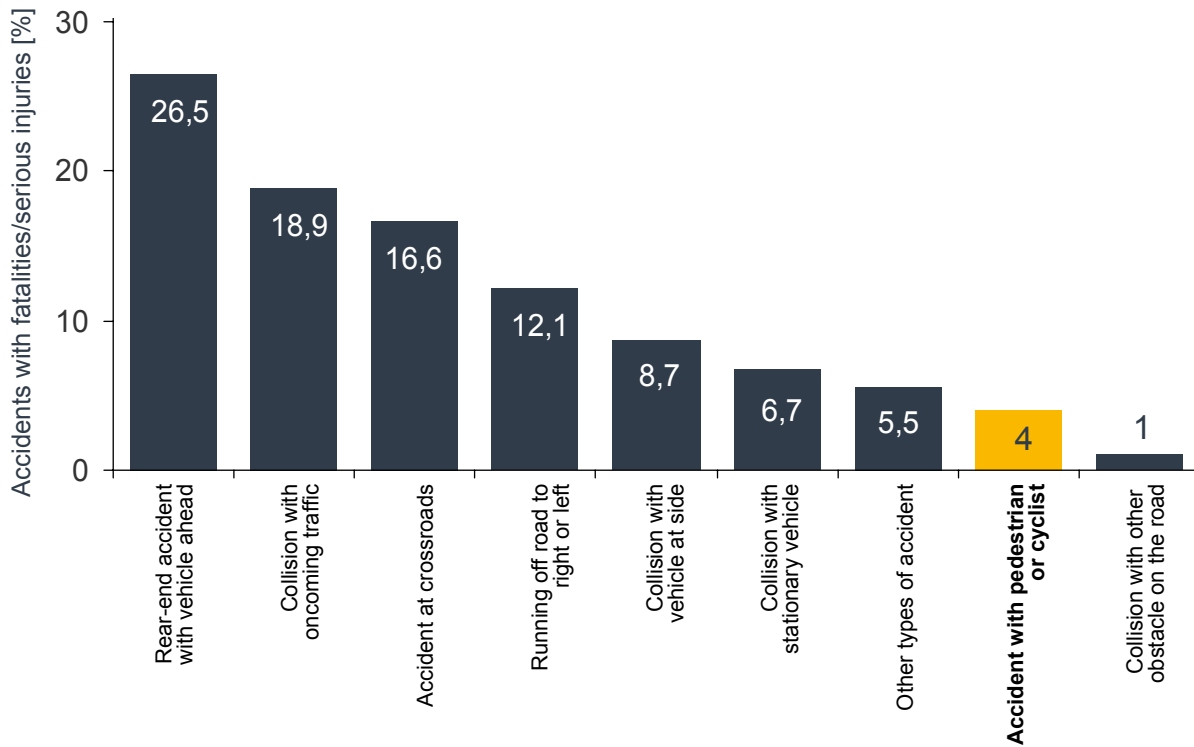
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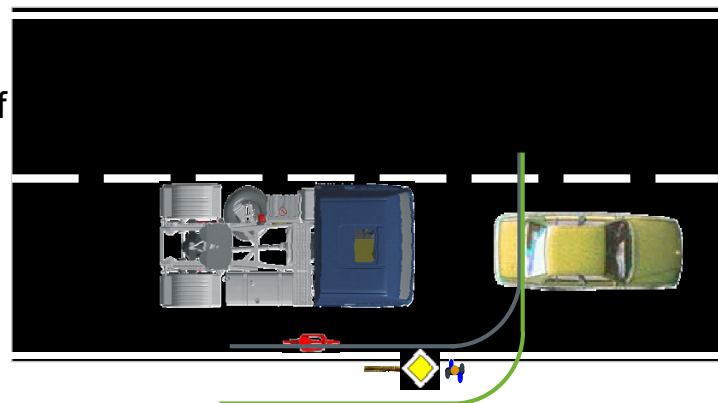
Active safety when turning off

Monitoring the side area



Turn-off assistant

Warns the driver when moving off if there is a risk of a collision



In stationary truck:

No warning if nothing has changed since the vehicle stopped.

Optical warning, if an object has approached within the green area.

In truck moving off:

Acoustic warning, if an object has approached in the red area.

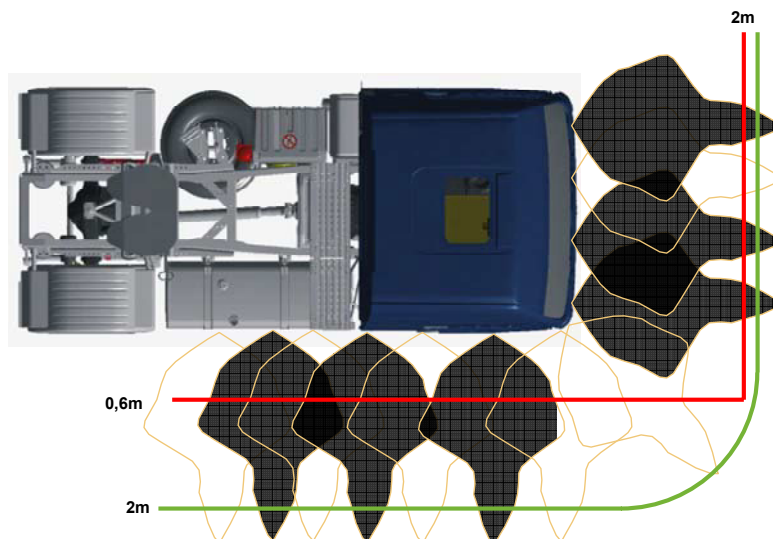
Active safety when turning off

Turn-off assistant



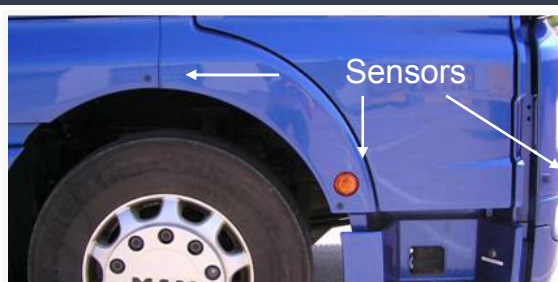
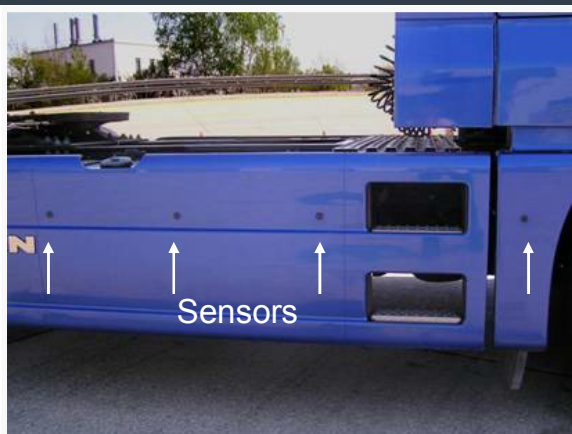
Green line: Area of the advance warning

Red line: Aread of the risk warning



Active safety when turning off

Turn-off assistant



**Warning of the driver
before a collision with
pedestrians and cyclists**

Efficiency analyses open

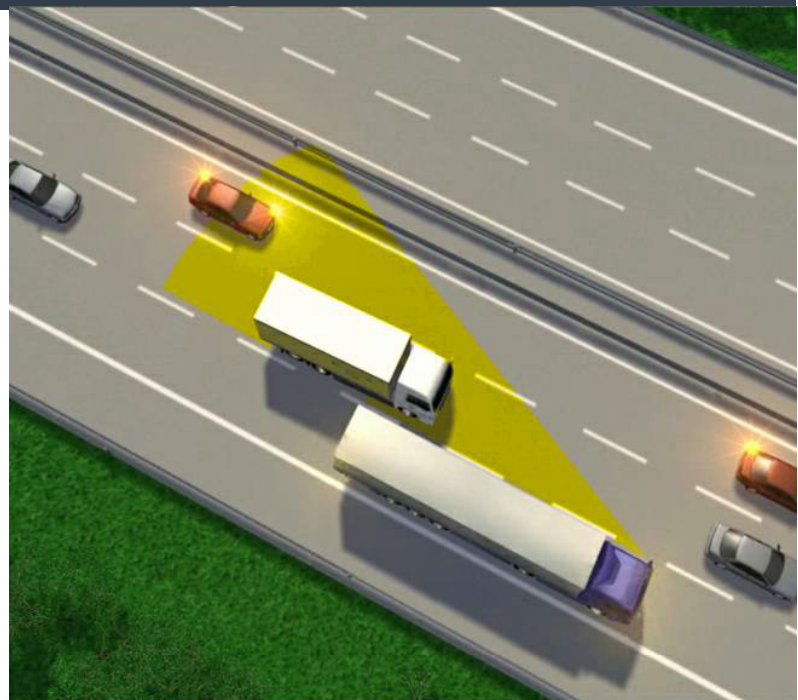
Active safety when changing lane

Monitoring of the side area



Monitoring the
blindspot

Warns the driver when
changing lanes if there
is a risk of a collision
with a vehicle in the
neighbouring lane



Efficiency analyses open

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Political activities

VDA joint initiative – “SafetyTruck”



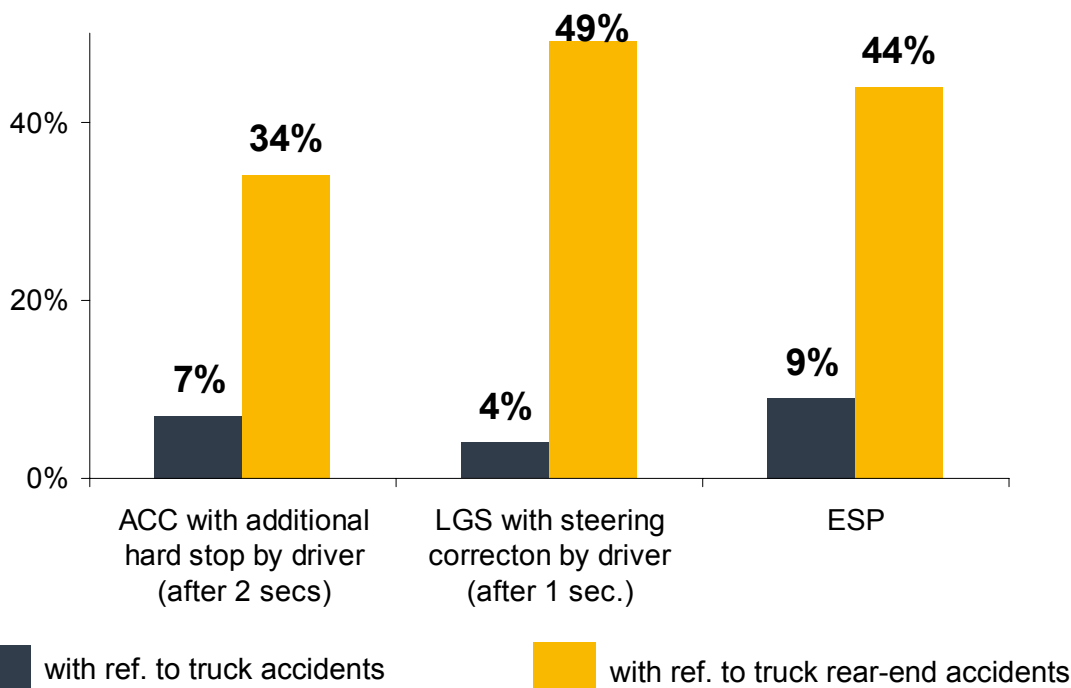
- Initiative of the automobile industry and insurances (chaired by VDA)
- Creation of financial incentives to purchase assistance systems

Measures:

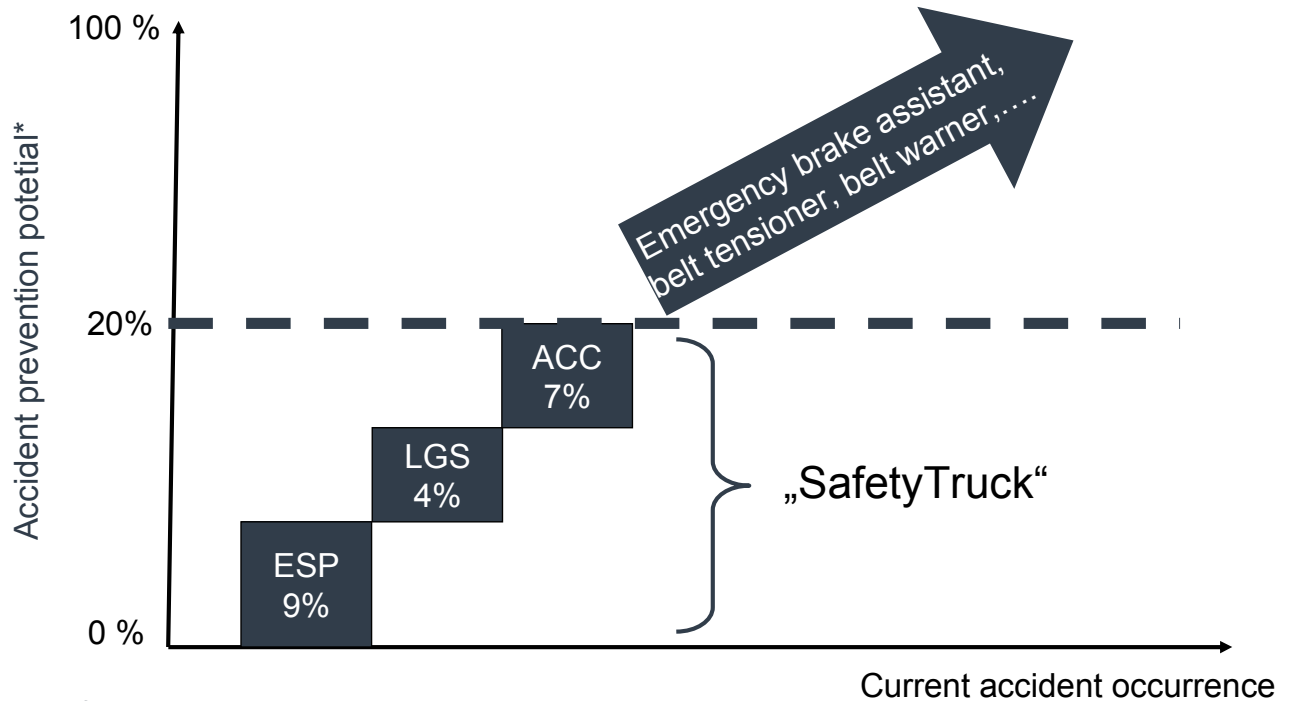
- Offer of safety packets consisting of ACC, LGS and ESP with better conditions
- Granting of a SafetyTruck certificate for a vehicle depending on the degree of its fitting with safety systems
- Discount system for insurance policies with SafetyTruck certificate classification

SafetyTruck Assistance Systems

Accident prevention potential



Source: Own investigations, Allianzzentrum für Technik GmbH, Ismaning, Oct 2005



* with ref. to all truck accidents

Source: Own investigations, Allianzzentrum für Technik GmbH, Ismaning, Oct 2005

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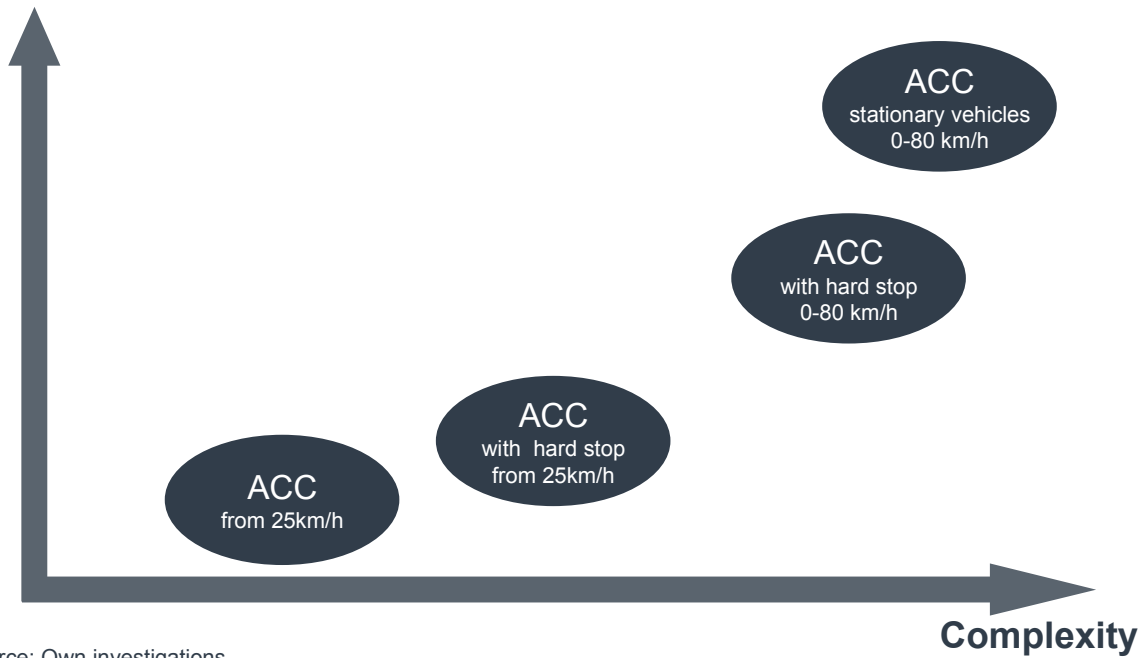
Summary

Roadmap

Longitudinal control



Safety gain



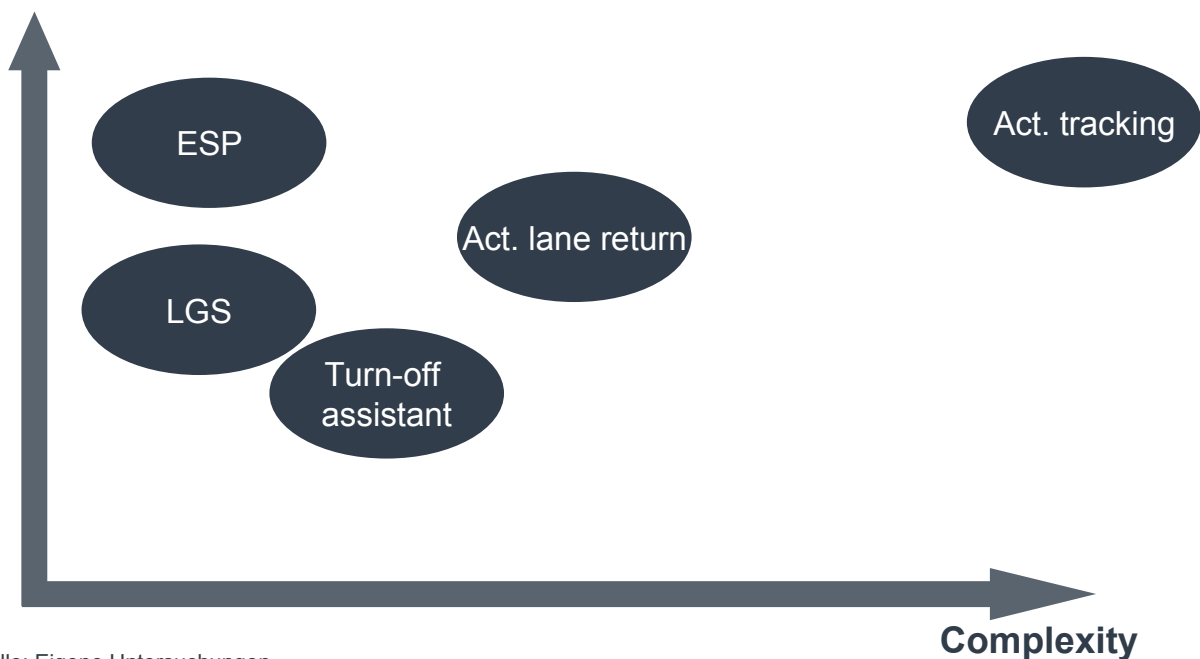
Source: Own investigations

Roadmap

Transverse guidance control



Safety gain



Quelle: Eigene Untersuchungen

Summary



- By means of today's and future safety systems a very high accident prevention potential can be achieved
 - Tangible systems are preferred by the driver
 - The efficiency of systems already available as series today can make a major contribution to fewer accidents
- Increase in acceptance by improved customer information
- Rapid ongoing development of the systems
- Create customer incentives



MAN Nutzfahrzeuge AG

Prof. Dr. Karl Viktor Schaller



Driver Assistance Systems



7. April 2008

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Thank you!



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Driver Assistance Systems

7. April 2008

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