This paper presents a study of the impact of different complex situations on an advanced driver assistance system (ADAS) for anticipatory assistance for the reduction of fuel consumption. Different studies showed that it is possible to reduce the individual fuel consumption of drivers by extending the driver's anticipation horizon through an ADAS. But the influences of the driving situation on the success of such a system has not been researched yet. Therefore the driving simulator study which is presented in this paper deals with the impact of different traffic situations and its complexity on an anticipatory ADAS for fuel reduction in deceleration scenarios. For this, different rural and urban deceleration scenarios where chosen and situations of different complexity were implemented by changing traffic and environmental conditions. As the main focus of the ADAS lies on the reduction of the fuel consumption, this was one of the main variables which was measured. Additionally the glance time on the HMI was analyzed as an indicator for the manner how the system was used. The results showed that the degree of complexity of the chosen road traffic situations has generally no impact on the fuel consumption if it was driven without any assistance system. The glance times on the HMI of the ADAS shorten if a situation is more complex. But this does not lead to differences in the reduction of the fuel consumptions by the ADAS in different complex situations. The overall fuel consumption was reduced by about 10