

Advanced emergency braking systems for commercial vehicles

Resolution taken on 9 September 2016 based on recommendations of the DVR Executive Committee on Vehicle Technology

Preliminary remark

The German Road Safety Council (DVR) supports the EU regulation 661/2009/EC regarding the mandatory implementation of new road vehicles with safety-relevant driver assistance systems in the European Union. These systems will reduce the frequency and the severity of road accidents, in particular of accidents involving heavy commercial vehicles.

DVR welcomes efforts made by automobile manufacturers and system suppliers whose current systems to some extent substantially exceed existing requirements. Based on more recent evidence DVR recommends the further development of advanced emergency braking systems which do not meet the following recommendations as well as the timely amendment of the regulation 347/2012/EC and the relevant UNECE regulation 131 (hereinafter referred to as „AEBS regulations“).

Background

Longitudinal collisions where a goods vehicle crashes into the rear end of another vehicle, driving ahead at lower speed or being stationary, account for a high share of accidents involving goods vehicles. These are mainly head-to-tail accidents due to congestion, stop-and-go traffic etc. Such accidents usually lead to serious injuries and severe damages as well as high economic costs. In general growing traffic density, insufficient road infrastructure and higher traffic volume by goods vehicles increase this particular accident risk.

Since November 2015 the mandatory introduction of advanced emergency braking systems has been counteracting this scenario. The European regulation 347/2012/EC and the UNECE regulation 131 specify advanced emergency braking systems (AEBS) which should identify critical situations ahead in a timely manner, alert the driver in case of potential collision risk and autonomously brake the car in case of emergency if the driver does not respond adequately. The aim is to avoid a collision with a vehicle travelling ahead or to reduce the collision impact speed when closing up to a stationary vehicle.¹

The advanced emergency braking system has to be permanently active when driving. Sensors and algorithms have to be efficient enough to reduce the risk of false alarms and to apply full emergency braking only in critical situations.

In accordance with the Vienna Convention on Road Traffic the driver has to be in control of the vehicle at all times.² Under certain operating conditions in case of potential system failure the driver has to be able to ignore the warning and override the AEBS assistance by taking "positive actions" specified by the manufacturer. Furthermore, AEBS regulations allow the manufacturer to provide a device (e.g. switch) which enables the driver to deactivate the AEBS functionality. If appropriate, the assistance can be turned off during the whole journey until the next start of the ignition.

State-of-the-art of in-vehicle advanced emergency braking systems in the commercial fleet and their potential to avoid accidents

With effect from November 2015, practically all new commercial vehicles with a permissible maximum mass exceeding 8 t registered within the European Union have to be fitted with AEBS in compliance with the regulation 347/2012/EC. In general current systems offered as standard in-vehicle equipment already fulfill the approval requirements (level 2) which shall be valid as of November 2018. Some of the current systems reach a significantly higher reduction in collision speed than required by approval level 2 (≥ 20 km/h) or even a full halt avoiding the collision with a stationary vehicle.¹

¹ See separate „Wissenspapier“

² See resolution of the DVR board of 25.06.2010 regarding „Korrelation zwischen dem Wiener Übereinkommen und ECE-Regelungen“ (correlation between the Vienna Convention and ECE regulations)

According to AEBS regulations the systems are designed as “emergency systems”. Unlike adaptive cruise control, the AEBS warning and braking cascade is usually only activated in critical situations which have the potential of an imminent accident. High effectiveness, including collision avoidance, can only be reached with high grip performance of the tyre.³

If a vehicle with AEBS driving at high speed closes up on a vehicle driving in front at lower speed or being stationary, the first collision warning is provided at a larger distance than required by usual road traffic regulations. If there is less difference in speed, for instance in heavy traffic with high density of goods vehicles travelling on motorways, warning distances become very short. In this particular scenario the potential accident risk which may occur ahead of a preceding goods vehicle, cannot be detected by the driver (due to limited forward vision) nor by the AEBS sensors („radar beam shadow“) in time to avoid the accident. Hence, keeping the safety distance remains the responsibility of the driver also in vehicles with AEBS.

All advanced emergency braking systems allow the driver to override the AEBS braking functionality. Usually this is done by direction indicator, steering or braking action or by rapidly applying full pressure on the accelerator pedal (“Kick down”) during or shortly before the AEBS functionality cascade. Such actions may not only “override” the emergency braking phase but may even lead to a temporary “cancellation”.

In addition, in accordance with the AEBS regulations vehicle, manufacturers offer the driver the option to manually deactivate and to reactivate AEBS functionality.

Due to the growing fleet penetration of AEBS for heavy goods vehicles there is increasing field experience regarding such systems. For example, it was noted by control authorities that drivers sometimes switch off the assistance permanently in order not to be „disturbed“ by collision warnings. On the other hand criteria to override AEBS braking functionality seem to be this “sensitive” that in critical traffic situations overriding of AEBS may be activated involuntarily by drivers when being suddenly alerted by the system. This behaviour may lead to accidents that could have been prevented by AEBS.^{1, 4}

³ In accordance with the DVR board resolution of 2013 on tyre quality any tyres used should comply at least with wet grip class C of the European tyre label.

⁴ See also detailed reports „Fernfahrer“, edition 8, 2015

A new in-depth study looking into all (138) fatal and serious injury accidents involving goods vehicles > 7.5 t, including AEBS relevant collisions (58), that occurred on motorways in Lower Saxony in the year 2015 indicates a high share of forward collision accidents involving vehicles at the tail of a traffic jam or stationary vehicles (about 50% of all relevant accidents).⁵

In such situations systems which more than exceed the approval level 2 of AEBS legislation, and which comply with the recommendations given below, are expected to have significant safety benefits. DVR estimates that for current “optimal” AEBS types the safety benefits in terms of prevention of AEBS relevant accidents involving goods vehicles >7.5 t may be more than three times that of systems which just comply with EU approval level 2. In terms of fatality reductions their safety benefits may be more than double that of level 2 systems.¹ As an example the table shows all serious injury accidents involving goods vehicles which occurred on German motorways in the year 2015 as indicated by the Federal Statistical Office (Destatis) ⁶. The table also shows AEBS relevant accidents – extrapolated by means of the data from Lower Saxony – as well as the potential for accident reduction if all goods vehicles > 7.5 t would be fitted with the respective AEBS type. ¹

⁵ Study undertaken by a working group of the Ministry of the Interior of Lower Saxony and the Landesverkehrswacht Niedersachsen (regional traffic association of Lower Saxony), see „Wissenspapier“

⁶ Special analysis of the Federal Statistical Office (Destatis) of July 2016

	DVR estimate of the potential for accident prevention by current AEBS for goods vehicles >7.5 t versus real accident occurrence in 2015			
	All accidents on German motorways in 2015 which result in fatalities/seriously injured persons and involve at least one goods vehicle ⁶	whereof AEBS-relevant ¹	Current AEBS in compliance with approval level 2	Current "optimal" AEBS
Accidents	1,707	566	-137	-488
Fatalities	232	104	-37	-98
Seriously injured persons	2,053	701	-559	-671
Slightly injured persons	1,048	527	-178	-473

Resolution

DVR recommends that in the framework of new and further development of advanced emergency braking systems vehicle manufacturers and system suppliers consider in a timely manner the following requirements unless they are already being fulfilled. Furthermore, DVR recommends the timely introduction of these recommendations into the legislative regulations for advanced emergency braking systems for buses and coaches as well as goods vehicles exceeding 8 t permissible maximum mass. Further recommendations concern drivers as well as their education and training.

1. Due to the high share of rear-end collisions with stationary vehicles¹ basic legislative requirements for advanced emergency braking systems have to be increased in order to take these scenarios into account. Rear-end collisions have to be avoided to the extent possible not only for moving forward vehicles but also for forward vehicles being stationary.

2. AEBS functionality should be permanently active. Manual “deactivation” by the driver should not be allowed. Temporary interruption should only be possible in specific situations. In such cases automatic reactivation should be provided.
3. AEBS braking functionality should remain overrideable. However, this should be restricted to intentional driver actions, such as steering or braking. In particular overriding the AEBS should not „cancel“ the autonomous emergency braking and should not be performed involuntarily.
4. In order to reduce false alarms while still being able to reliably alert the driver in collision critical situations, it is necessary to improve the detection of collision relevant vehicles. AEBS should detect also smaller vehicles incl. motorcycles and provide warnings and autonomous braking if appropriate. The regulation has to be adapted accordingly.
5. In order to enable drivers to take active control in case of a potential rear-end collision, the collision warning should be complemented by earlier distance information.
6. Until full implementation of these recommendations drivers of buses or coaches as well as drivers of goods vehicles are urged not to use optional manual deactivation or to limit such deactivation to specific operating conditions. At the same time the use of in-vehicles adaptive cruise control and/or forward distance warning is generally recommended.
7. Drivers of buses and coaches as well as drivers of goods vehicles have to become familiar with the effect of advanced emergency braking systems in an appropriate manner. Therefore, guidelines for professional driver training should be adapted.

signed
Dr. Walter Eichendorf
President