European Transport Safety Council

POSITION PAPER

Revision of the General Safety Regulation 2009/661

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1 Introduction

26,300 people lost their lives on EU roads in 2015 compared to 25,970 in 2014, representing an increase of 1% and the second consecutive poor year for road safety. In 2014, more than 135,000[1] people were recorded as seriously injured. However, the long term safety trend has been positive, especially so for car occupants who have benefitted more than other road users from road safety measures adopted over the past decade.

The figures of the past years would have been significantly higher had it not been for the measures already taken by the EU to mandate improvements in vehicle passive and active safety, most recently in 2009 in the last revision of the General Safety Regulation.

As the EU has exclusive competence on vehicle safety measures and vehicle type approval under Article 114 of the EU treaty, these legally-binding tools represent the most direct and effective measures the EU has at its disposal to further reduce deaths and injuries on the road.

Within the context of the EU target to halve road deaths between 2010 and 2020, the forthcoming revision of the General Safety Regulation will require bold action to ensure that road deaths continue to fall, and that vehicle safety improvements are not limited to the wealthiest consumers or member states.

2 Background

2.1 All vehicles are equal, but some are more equal than others

The European Commission has stated that if all cars were designed to provide crash protection equivalent to that of the best cars in the same class, half of all fatal and disabling injuries could be avoided[2].

At present European citizens do not benefit equally from vehicle safety improvements. Some consumers may think that all new cars sold on the EU market are safe because they have to meet EU type approval requirements. Euro NCAP reveals that the safety levels

[1] European Commission Press release (March 2016), http://goo.gl/w0lQkv
[2] European Commission (2003), 3rd Road Safety Action Programme quoted in SafetyNet (2009) Vehicle Safety, retrieved 1st April 2014.

differ between models and that this difference could make the crucial difference between life and death in the event of a collision[3]. The country comparison published in 2009 by ETSC had revealed a geographical divide in Europe: safety levels of new cars sold were notably lower in Central and Eastern European countries[4]. Five years later, the gap has been reduced[5]. However, in all Central and Eastern European countries but four countries, new cars accounted for less than 2% of all the cars registered, compared to 4.8% on average in the EU. Consolidating the internal market for safety still needs to be an important cornerstone of achieving the 2020 road safety target and those that follow.

Until the economic downturn in 2008, more than 15 million cars were sold each year in Europe. New cars made up 4.8% of the 248 million cars registered in the EU in 2013, indicating cars on average have a lifetime of more than 20 years. Renewal of the fleet is a slow process, therefore it is important that currently available car safety improvements are taken up and all new cars have high safety standards.

The EU needs to ensure that robust in-vehicle safety technologies are mandated in the revision of the General Safety Regulation. This would help avoid safety technologies being sold as standard in one EU country and as an option in another. For safety equipment, the EU needs to promote their standard fitment across the EU 28 and address the differences observed in safety levels.

The EU should be also cautious that no inequalities are created between vehicles of different categories, and should therefore ensure that all in-vehicle safety technologies are mandated in a coherent fashion across all vehicle categories.

Different rules for different vehicle categories are already causing adverse effects on road safety. For instance, as light good vehicles are not covered by several pieces of EU legislation, particularly related to the drivers' driving and rest times, urban freight logistics have shifted towards vans.[6] Van use in Europe will continue to rise due to, for instance, the increased demand for home deliveries.[7] The EU should ensure a level playing field for all commercially used vehicles across Member States, as mandating different safety technologies for different categories could strengthen those adverse effects on road safety.

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[3] ETSC (2016) PIN Flash 30, How Safe are New Cars Sold in the EU.
[4] ETSC (2009) 3rd PIN Annual Report, Chapter 2 Boosting the market for safer cars in the EU.
[5] ETSC (2016) PIN Flash 30, How Safe are New Cars Sold in the EU.
[6] ETSC (2013) 7th Road Safety PIN Report. Chapter 2: Towards safer transport of goods and passengers in Europe, page 26.
[7] For example, LGV traffic in the UK has increased by approximately 40% during the 2001-2010 period. In: DfT, THINK!

In 2011, 4000 people lost their lives in collisions involving light goods vehicles (LGVs) – goods vehicles with a maximum permitted weight below 3.5t.[8] A German study on collision data on rural roads revealed that van drivers were causing more collisions compared to the drivers of passenger cars and that the main cause was speed. Both the exceeding of the maximum permitted speed on rural roads as well as failure to adapt one's speed appropriately occur remarkably frequently when compared to passenger cars.[9] Van drivers travelling for work are often under pressure to meet tight deadlines and this means that they are a group that are often likely to speed.[10]

The EU should prevent that occupants of, for example, vans have a comparatively higher risk of injuries than those in cars or pose more risks to vulnerable road users due to the fact that more safety enhancing technologies are required to be installed on cars. Light good vehicle drivers should benefit from the same level of safety as their counterparts.

2.2 The life-saving potential of vehicle safety measures

The life-saving potential of the proposal to revise the General Safety Regulation 2009/661 will depend on which vehicle safety measures are prioritised for fitment, to which vehicle types and by when.

ETSC estimates that Electronic Stability Control (ESC), has helped to prevent some 2500 adult occupant deaths between 2001 and 2008[11],[12]. ESC was one of the measures made mandatory for new cars as part of the 2009 General Safety Regulation review.

A more recent estimation from 2010 indicates a 69% reduction in fatality risk between 2- and 5-star rated cars, and the largest reduction was found between Euro NCAP 4- and 5-star rated cars, indicating that the number of saved road casualties is probably larger than the figure estimated for 2009.[13]

The calculations for the impact assessment by the EC should not only look at the cost benefit ratio of each measure in isolation but also provide an assessment based on the life-saving potential of the technology/measure compared to others. Measure A could

[8] ETSC (2013) 7th Road Safety PIN Report. Chapter 2: Towards safer transport of goods and passengers in Europe, page 26.
[9] BASt, DEKRA, UDV, VDA, 2013, Safety of Light Commercial Vehicles.
[10] ETSC (2014) Managing the Road Risk of Van Fleets, page 33.
[11] Ibid.
[12] Ibid.
[13] Kullgren, A. Lie, A. Tingvall, C. (2010) Comparison Between Euro NCAP Test Results and Real-World Crash Data Traffic Injury Prevention .

have a smaller benefit to cost ratio (BCR) than measure B but would save more lives because it tackles a bigger road safety problem such as for example seat belt reminders.

Additionally, the EC does note that some of the candidate measures listed above could utilise the same systems[14]. Therefore, if these measures are considered as a package, the cost of the systems common to them would be spread amongst the individual measures and hence improve the benefit cost ratio of the package as a whole compared to that of individual measures. Manufacturers already use this approach to reduce costs for measures supplied as options or standard fit, for example Autonomous Emergency Braking (AEB) is often packaged with Adaptive Cruise Control (ACC) because ACC can use the same camera / radar that is used for AEB.

The EU should be also cautious that no inequalities are created between vehicles of different categories, and should therefore ensure that all in-vehicle safety technologies are mandated in a coherent fashion across all vehicle categories.

Different rules for different vehicle categories are already causing adverse effects on road safety. For instance, as light good vehicles are not covered by several pieces of EU legislation, particularly related to the drivers' driving and rest times, urban freight logistics have shifted towards vans.[15] Van use in Europe will continue to rise due to, for instance, the increased demand for home deliveries.[16] The EU should ensure a level playing field for all commercially used vehicles across Member States, as mandating different safety technologies for different categories could strengthen those adverse effects on road safety.

In 2011, 4000 people lost their lives in collisions involving light goods vehicles (LGVs) – goods vehicles with a maximum permitted weight below 3.5t.[17] A German study has found that collision data clearly reveal that there is a tendency by van drivers to cause collisions on rural roads compared to the drivers of passenger cars and that the cause is speed. Both the exceeding of the maximum permitted speed on rural roads as well as failure to adapt one's speed appropriately occur remarkably frequently when compared to passenger cars.[18] Van drivers travelling for work are often under pressure to meet tight

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[14] European Commission (2016) Staff Working Document Saving Lives : Boosting Car Safety in the EU

[15] ETSC (2013) 7th Road Safety PIN Report. Chapter 2: Towards safer transport of goods and passengers in Europe, page 26.

[16] For example, LGV traffic in the UK has increased by approximately 40% during the 2001-2010 period. In: DfT, THINK!

[17] ETSC (2013) 7th Road Safety PIN Report. Chapter 2: Towards safer transport of goods and passengers in Europe, page 26.

[18] BASt, DEKRA, UDV, VDA, 2013, Safety of Light Commercial Vehicles.

deadlines and this means that they are a group that are often likely to speed.[19] In-vehicle safety technologies, such as Intelligent Speed Assistance, Seat Belt Reminder or Alcohol Interlock, should be installed on vans.

2.3 A focus on vulnerable road users is needed

Car occupants represent 48% of road traffic deaths with frontal car-to-car collisions being the most common crash type followed by side impacts.[20] Different factors influence crash severity, the most important being speed of travel, restraint system use/deployment, vehicle mass and the level of crash protection provided in the vehicle.[21] New attention must also be given to improve vehicle crash design for those outside of the vehicle.

Pedestrians represent around 21% of total EU (28) road traffic deaths and around two thirds of these occur in urban areas.[22] Cyclists comprise around 8% of total EU (28) road traffic deaths but a higher share of total deaths in countries where cycle use is high.[23] In the EU27 PTWs represent 17% of the total number of road deaths while accounting for only 2% of the total kilometers driven.[24] Minibus, bus occupant and heavy commercial vehicle users in crashes are a smaller but treatable part of the vehicle problem, though heavy vehicles have a disproportionate involvement in fatal crashes.[25]

Euro NCAP has changed the market for vehicle safety, but regulatory measures are needed to maximise safety benefits for all

Occupant protection has improved considerably over the past decade as manufacturers have been spurred on by the European New Car Assessment Programme (Euro NCAP) to meet consumer demands for safer cars. When Euro NCAP started to test the crash performance of cars twenty years ago, the average car was awarded 2 stars for occupant protection. Now almost all cars tested are awarded 5 stars for combined occupant and pedestrian protection.

Euro NCAP introduced in 2009 a new additional assessment area, called safety assist, to

[19] ETSC (2014) Managing the Road Risk of Van Fleets, page 33.
[20] Ibid.
[21] DaCoTA (2013) Vehicle Safety.
[22] ETSC (2015) Making Walking and Cycling on Europe's Road Safer. PIN Flash
[23] ibid
[24] ETSC (2011) 5th Road Safety PIN report, Chapter 2, Unprotected road users left behind in efforts to reduce road deaths.
[25] ETSC (2013) 7th PIN Annual Report, Back on track to reach the EU 2020 Road Safety Target?

test collision avoidance and injury mitigation technologies.[26] The majority of car manufacturers successfully responded to the challenge of meeting the requirements. It shows that in-vehicle technologies tested by Euro NCAP, among others, are mature enough and car manufacturers are ready to provide higher safety standards than what is required by the EU regulation.

However, not all car models sold in Europe are tested, and not all models of the same type are sold with the same standards of safety equipment. Regulation is needed to ensure that safety benefits are spread wider.

2.4 Maintaining a lead in safety technology will help the EU car industry compete

The EU is the world's largest producer of motor vehicles with a 25% share of global production. It is an important source of employment in the European economy, providing over 12 million jobs.[27] In 2013 the EU sustained a surplus of €82.7 billion in trade on passenger cars[28] and a surplus of €127.8 billion[29] for the sector as a whole, the largest among manufacturing sectors. Beating off the international competition remains a challenge for the EU but developing safety technology can play a crucial role. Europe represents a home market of 500 million consumers with a relatively high income. The EU market seems to be rebounding from the economic downturn[30] giving the automotive industry an opportunity to further improve their economic situation with increased revenues from European operations. Third markets are growing fast with the global economic recovery, changing the trade flows and the automotive value chain. Upgrading crash test requirements will create a market advantage for the European car industry as European manufacturers will be in a better position than third market producers to face higher safety standards.

Beyond this, there is strong impetus to promote higher levels of vehicle automation underway in Europe with a roadmap expected for publication by the European Commission in 2017. This is likely to create a market for and requirements to fit accurate, robust, durable and affordable sensor technologies. There are already signs that these are becoming widely available. This in turn should boost in-vehicle safety technologies with a

[26] ETSC (2016) PIN Flash How Safe are New Cars Sold in the EU.
[27] Ibid.
[28] Eurostat, Comext database.
[29] Ibid.
[30] European Commission, (July 2014) CARS 2020 Report.

high life-saving potential. Some of the semi-automated in-vehicle systems up for future regulation such as pedestrian AEB are already being included in Euro NCAP's current testing[31].

3 Implementing the most effective technologies

In ETSC's view, the most effective technologies from a road safety perspective are:

- Intelligent Speed Assistance (ISA)
- Alcohol interlocks
- Seat belt reminders
- Autonomous Emergency Braking (AEB)

3.1 Intelligent Speed Assistance (ISA)

ISA could cut collisions on all roads by a fifth.

Speeding is a primary factor in about one third of fatal accidents and an aggravating factor in all accidents where it occurs.[32] Cases of drivers exceeding speed limits are widespread. In countries where data are available, and in free-flowing traffic, between 10 and 50% of drivers exceed speed limits on motorways, between 10 and 60% on rural roads and between 30 and 60% on urban roads.[33]

Speed limiters, already mandatory in lorries and coaches, help drivers abide by maximum speed limits by limiting the top speed of the vehicle. But speed limiters do not have the technically more advanced function to adapt the maximum speed to the prevailing conditions. Speed limiters limit speed on motorways but are not adapted to limit speed on rural roads and in urban areas where most collisions happen.

Intelligent Speed Assistance (ISA) is the term given to a range of devices that assist drivers

[31] ETSC (2016) Prioritising the Safety Benefit of Automated Driving in Europe.
[32] OECD/ECMT (2006), Speed Management.
[33] ETSC (2010) PIN Annual Report Road Safety Target in Sight - Making up for lost time.

in choosing appropriate speeds and complying with speed limits[34]. Intelligent Speed Assistance technologies bring speed limit information into the vehicle. Drivers receive the same information that they see (or sometimes miss seeing) on traffic signs through an on board communication system, helping them to keep track of the legal speed limit all along their journey. Information regarding the speed limit for a given location is usually identified from an on board digital map in the vehicle. Other systems use speed sign reading and recognition or a combination of the two.

The TN-ITS platform facilitates cooperation between map makers and national authorities. If ISA were mandated, this will give a clear incentive for member states to invest in even more reliable digital maps, including updated speed limits. Indeed drivers, as end users, will demand such maps.

The information is then communicated to the driver in any of the following three ways: informing the driver of the limit (advisory ISA[35]), warning them when they are driving faster than the limit, the driver can choose if the system can restrict their vehicle speed (voluntary ISA[36]) or actively aiding the driver to abide by the limit (assisting ISA[37]).

The introduction of Intelligent Speed Assistance will help to achieve a high level of compliance with speed limits and thereby reduce road deaths substantially[38]. Estimates by Carsten[39] show that assisting ISA could cut collisions on all roads by 29% (33% on urban roads; 18% on motorways)[40]. Assisting ISA could cut all deaths by 21% and with non-overrideable ISA this figure rises to 46%[41]. A cost-benefit analysis of ISA was performed by Carsten and Tate[42] which produced ratios of 7.9 to 15.4 depending on the type of ISA system considered. The effectiveness of any form of ISA would be very substantially reduced if the driver had to deliberately enable it on each trip and if that ISA did not subsequently resume after being overridden, e.g. to overtake, or disabled at a speed limit

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[34] ETSC (2013) Intelligent Speed Assistance : FAQs.
[35] 'Assisting' ISA is what the EC calls the « voluntary system » in (2016) Staff Working Document Saving Lives : Boosting Car Safety in the EU – EC definition of different types, Page 10.
[36] ibid
[37] ETSC definition
[38] Carsten, O. and Tate, F. (2005) Intelligent Speed Adaptation: Accident savings and cost benefit analysis.
[39] Carsten O., Fowkes M., Lai F., Chorlton K., Jamson S., Tate F., & Simpkin B. (2008), ISA-UK intelligent speed adaptation Final Report.
[40] Lai, F, Carsten, O., Tate, F. (2012) How much benefit does Intelligent Speed Adaptation deliver: An analysis of its potential contribution to safety and the Environment.
[41] Calculations by Carsten, O. based on Carsten O., Fowkes M., Lai F., Chorlton K., Jamson S., Tate F., & Simpkin B. (2008), ISA-UK intelligent speed adaptation, Final Report.
Using R. Elvik Power Model February 2015.
[42] Carsten, O. and Tate, F. (2005) Intelligent Speed Adaptation: Accident savings and cost benefit analysis.

change.

With the attraction of scoring high on the Euro NCAP Safety Assist protocol, manufacturers such as Ford are already offering Assisting ISA to the mass market and that, according to Ford, the take-up is very high.

Since 2013 Intelligent Speed Assistance (ISA) has been included in the new Euro NCAP safety rating with both advisory and voluntary active systems being awarded points.

The 2013 evaluation study conducted on behalf of the European Commission on the impact of the safety benefits of speed limiters on trucks and buses also included an evaluation of the impacts of extending the scope of the Directive to Light Commercial Vehicles (vans). The authors estimated that if Light Commercial Vehicles were fitted with assisting ISA, 600 road deaths could be prevented annually, and 150 more road deaths could be prevented annually and if Heavy Goods Vehicles were fitted as well.[43] The study also included the results of a survey showing broad support for ISA and that the ISA system should be introduced to all commercial vehicles.

There are substantial synergies between ISA (particularly intervening forms of ISA) and all forms of AEB. Restriction of extreme speeds will result in a higher probability that AEB can prevent crash occurrence as opposed to mitigating crash severity. This synergistic effect is likely to be particularly relevant to collisions with vulnerable road users and in side impacts, where the risk of a fatal outcome is high even when collisions occur at speeds below 50 km/h. The cost benefit ratio of ISA, AEB and pedestrian protection (passive safety) are higher if the three are working together.

ETSC recommendations

- Fit all new commercial vehicles, including vans, with assisting Intelligent Speed Assistance systems by 2020 in line with the recommendations of the evaluation study conducted on behalf of the European Commission. The system should be overridable up to 90km/h for lorries, 100km/h for buses, in line with existing EU legislation on speed limiters, and 130km/h for vans.
- Fit all new passenger cars and vans with an overridable assisting Intelligent Speed Assistance system that defaults to being on by 2020.

[43] TM Leuven (2013) on behalf of the European Commission, Ex-post evaluation of Directive 92/6/EEC on the installation and use of speed limitation devices for certain categories of motor vehicles in the Community, as amended by Directive 2002/85/EC, Page 126 https://goo.gl/ux6CGC

- Recognise benefits of synergies between AEB, ISA and pedestrian protection measures.

3.2 Alcohol interlocks

The European Commission estimates that across the EU at least 20% of all road deaths are alcohol related. Alcohol interlocks are an effective countermeasure in the fight against drink driving.

Alcohol Interlocks are connected to the vehicle ignition system and require the driver to take a breath test in order to drive the vehicle. If the driver is found with alcohol above the legal BAC limit the engine will not start.

In many EU countries the technology has found its way on a voluntary basis into vehicles which are used for the transport of goods or passengers. The interlock is used as a quality assurance tool to comply with a company's alcohol and drugs policy. Some EU MSs such as France and Finland have also mandated alcohol interlocks for vehicles that transport school children.

In addition, more and more countries in Europe are adopting legislation for the use of alcohol interlocks in rehabilitation programmes for first-time high-level offenders and for recidivists, as a substitute for driving licence withdrawal in punishment for drink driving.[44]

A study commissioned by DG MOVE and published in February 2014[45] concluded that alcohol interlocks can offer effective and cost-beneficial improvement to road safety in Europe, particularly for offender and commercial vehicle populations. The report says that if in future the devices would become less intrusive and costs came down due to economies of scale in production or technological development the option of making an alcohol interlock a compulsory device in all passenger cars could show a "robust net benefit to society".

The European Parliament also commissioned a study[46] published in April 2014 on the same topic. It includes recommendations calling for the adoption of a legislation within 5 years to extend the mandatory use of alcohol interlocks as part of rehabilitation programmes targeting certain categories of users, and as a preventive measure in specific

[44] See ETSC latest Alcohol Interlock barometer http://etsc.eu/alcohol-interlock-barometer/
[45] ECORYS & COWI (2014) Study on the Prevention of Drink Driving by the use of Alcohol Interlock Devices.
[46] http://www.europarl.europa.eu/RegData/etudes/etudes/join/2014/513993/IPOL-TRAN_ET(2014)513993_EN.pdf

categories of commercial vehicles.

The new GSR regulation should include a "dynamic reference" to CENELEC standards to allow to take into account future technological developments. Firstly mandate the CENELEC standard for a standardised installation document. Allow for the CENELEC standard for the electrical interface connection between the alcohol interlock and the vehicle to be made mandatory when it is ready.

ETSC recommendations

- Introduce uniform standards for alcohol interlocks in Europe which ensure that vehicle interfaces make it possible to fit an alcohol interlock by 2020 to all new vehicles.
- Legislate for a consistently high level of reliability of alcohol interlock devices by 2020.
- As a first step towards wider use of alcohol interlocks, legislate their use by professional drivers by 2020.

3.3 Seat belt reminders and seat belts

900 deaths could be prevented annually if all vehicles were fitted with seat belt reminders in all seats.

The seat belt remains the single most effective passive safety feature in vehicles. Despite the legal obligation to wear a seat belt across the EU28[47], seat belt use in cars in the EU is estimated to be only 88% for front seats and as low as 74% for rear seats in the countries that are monitoring wearing[48]. The rate of seat-belt use is significantly lower amongst passengers of vans and trucks when compared to cars and on different road types, according to several studies.[49]

These figures are of particular concern because research has shown that non-wearers are, on average, more likely than wearers to be involved in potentially fatal collisions in which wearing the seat belt would have saved their life[50]. This explains why the safety benefits obtained from a given number of percentage points increase in seat belt usage are

[47] EU Directive 2003/20/EC extends the obligatory use of seat belts to occupants of all motor vehicles, including trucks and coaches when a seat belt is available for the seat.
[48] ETSC (2014) Ranking EU Progress on Car Occupant Safety, PIN Flash Report 27.
[49] For instance: BASt, DEKRA, UDV, VDA (2013), Safety of Light Commercial Vehicles.
[50] ETSC (2014) Ranking EU Progress on Car Occupant Safety, PIN Flash Report 27.

greatest where the percentage already wearing belts are highest.[51]

Increased usage can be achieved with seat belt reminders. Seat belt reminders detect occupants and their seat belt use in all seating positions, and then create a series of alarms to alert the car occupant if he or she is not belted. There are different types of seat belt reminders – some issue only visual warnings while others issue both visual and auditory warnings. SBRs increase the effectiveness of all passive protection measures (all crash tests in the EU are undertaken with belted dummies). This is not yet taken into consideration in the cost benefit analysis of SBRs in the EC December 2016 report.

ETSC has estimated that 900 deaths could have been prevented in 2012 if 99% of all occupants had been wearing a seat belt, a rate that could be reached with seat belt reminders[52]. The 2009 General Safety Regulation required new vehicles to be fitted with visual and audible seat belt reminders for the driver's seat by November 2012. This should now be extended swiftly to all seats (a recommendation endorsed by the CARS 21 Final Report) and based on existing best practice and guidelines developed by Euro NCAP. Euro NCAP will start giving incentives to advanced SBRs (with occupancy detection) on rear seats as from 2017. A lead time of 2022 for new types and 2024 for new vehicles would give enough time to manufacturers to comply with new legislation.

Seat belt pre-tensioners and load limiters

A recent UK accident data analysis has identified that elderly and other more vulnerable vehicle users can still sustain severe thorax injuries in commonly occurring frontal crash conditions[53].

Population ageing is expected to increase the numbers of older drivers. Advanced restraints routinely will have load limiters and pre-tensioners but there are still many opportunities to improve protection by the development of restraint systems that adapt to the needs of the user, their individual bio-mechanics and the severity of the specific collision. Seat belt pre-tensioners and load limiters should be mandated.

ETSC recommendations

- Extend the mandatory fitment of advanced seat belt reminders as standard

[51] Turbell T et al. (1997) Optimising seat belt usage by interlock systems (VTI särtryck 270). Swedish National Road and Transport Research Institute, Linköping.
[52] ETSC 2014
[53] Ann Adv Automot Med. Oct 5, 2009; 53: 51–60. The Potential for Further Development of Passive Safety Richard Frampton and James Lenard

equipment to the passenger seat by 2020 for new types and 2022 for new M1 and N1 vehicles.

- Extend the mandatory fitment of advanced seat belt reminders (including occupancy detection) to rear seats by 2022 for new types and 2024 for new M1 and N1 vehicles.
- Introduce seat belt pre-tensioners and load limiters by 2020.

3.4 Autonomous Emergency Braking (AEB)

AEB could cut deaths by 7% in the EU25 and has one of the highest benefit-cost ratios there is for a driver support system

Autonomous Emergency Braking (AEB) systems can help avoid crashes or mitigate their severity by warning the drivers and supporting their braking response and/or by applying the brakes independently of the driver. All new EU heavy commercial vehicles have been fitted with advanced emergency braking technology since November 2013, thanks to a requirement set out in the 2009 review of the General Safety Regulation, however AEB with both pedestrian and cyclist detection should now also be mandated for trucks. EuroNCAP is testing AEB for pedestrian detection from 2016 and for cyclist detection as of 2018.

AEB could reduce rear-end collisions by 20%[54] to 57%[55] depending on implementation scenario. Hummel et al (2011) found that 2.2% of road deaths and 9.4% of serious injuries could be prevented with AEB[56]. AEB is also a technology that will help reduce serious injuries. AEB also maximises the benefit of softer and 'forgiving' car fronts. So the combined effect of improved pedestrian crashworthiness and crash avoidance promises further gains in safety for pedestrians.

A study looking at the effectiveness of AEB in reducing real-life crashes, based on Swedish police-reported injury crashes in 2010-2014 has found that with AEB the reduction of striking rear-end crashes in 50 km/h speed areas was 54%. The reduction of all striking rear-end crashes was 25%[57].

ETSC recommendations

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[54] TRL, Benefit and feasibility of a range of new technologies and unregulated measures in the field of vehicle occupant safety and protection of vulnerable road users, 2015, Hummel et. Al. (2011)
[55] Matteo Rizzi et al Injury crash reduction of low-speed Autonomous Emergency Braking (AEB) on passenger cars, 2014 http://www.ircobi.org/wordpress/downloads/irc14/pdf_files/73.pdf
[56] TRL, Benefit and feasibility of a range of new technologies and unregulated measures in the field of vehicle occupant safety and protection of vulnerable road users, 2015, Hummel et. Al. (2011)
[57] Rizzi M., Kullgren A., Tingvall C. (submitted to Traffic Injury Prevention 2014) Injury crash reduction of low-speed Autonomous Emergency Braking (AEB) on passenger cars.

- AEB should operate at all speeds.
- Mandate AEB systems with pedestrian and cyclist detection in 2020 for all new types of vehicles including for new trucks.

3.5 Lane Keep Assist

Current Lane keep Assistance (LKA) systems help the driver to stay in their lane. They function at speeds typically from 65 km/h and work by monitoring the position of the vehicle with respect to the lane boundary, typically via a camera mounted behind the windscreen sited behind the rear view mirror. When the vehicle drifts out of the lane the LKA gently guides the vehicle back into the lane by the application of a torque to the steering wheel or one-sided braking. Current LKA systems can help avoid accidents in which a vehicle leaves the lane unintentionally, usually because of driver distraction or fatigue, that can result in head-on collisions with oncoming vehicles, involve impacts with roadside furniture or side-swipe of the vehicle that is travelling in the same direction in an adjacent lane. Fitment of Lane Departure Warning Systems (LDWS) to M2/M3 and N2/N3 vehicles is mandatory from 2013 for new types and 2015 for new vehicles. LDWS warn the driver if the vehicle leaves its lane unintentionally, however they do not guide the vehicle back into the lane. Benefits of fitment of LKA for M1/N1 vehicles in the EU are estimated to be up to 3,500 fatalities and 17,000 serious injuries with an the effectiveness ranges of 15-60% for 'side swipe' collisions[58].

ETSC recommendation

- Introduce Lane Keep Assist by 2020 to passenger cars and light trucks and vans.

3.6 Distraction and Drowsiness

Driving whilst using a mobile phone and other electronic devices significantly impairs driving ability. Driving whilst using a mobile phone and other electronic devices significantly impairs driving ability[1]. Distraction on the roads is a major source of concern. Driver distraction is thought to play a role in 20-30% of all road collisions[2]. There is a long list of distractions, mainly in-vehicle distractions that undermine the driver or the rider's ability to perform the driving task. Fatigue is also a road safety challenge. A wide

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[58] Visvikis C, Smith TL, Pitcher M and Smith R (2008). Study on lane departure warning and lane change assistant systems: Final report. PPR374. TRL Limited, Crowthorne, UK.

[1] IGES Institut, ITS Leeds, ETSC (2010): Study on the regulatory situation in the Member States regarding brought-in (i.e. nomadic) devices and their use in vehicles. Study tendered by the European Commission, Berlin 2010.
http://www.etsc.eu/documents/Report_Nomadic_Devices.pdf

[2] Dews, F. A., & Stayer, D. L. (2009). Cellular Phones and Driver Distraction. In M. A. Regan, J. D. Lee, & K. L. Young, Driver Distraction Theory, Effects and Mitigation (pp. 169-190). CRC Press.

range of technologies may be used to identify distraction or drowsiness in drivers in order to minimise collisions. Systems may employ physiological monitoring, physical monitoring or behavioural indices and patterns. The EC has proposed developing a multi-phase, technology neutral testing protocol for all M and N vehicles with application dates recommended to be coupled with AEB and LKA[59].

ETSC Recommendations

- Oblige manufacturers to publish their tests to show compliance with HMI Guidance Statement of Principle on in-vehicle information and infotainment systems[60].
- Support the development of a multi-phase, technology neutral testing protocol for all M and N vehicles for distraction and drowsiness monitoring by 2020.

3.7 Event Data Recorders

Event Data Recorders (EDR) record a range of vehicle data over a short timeframe before, during and after a triggering threshold and are typically used to record information about road traffic collisions which cannot be reliably identified by the usual police investigations. A study commissioned by the European Commission has found considerable potential safety benefits and low costs for the installation of EDRs in cars, vans and lorries[61]. The research, carried out by TRL in the UK, found that EDRs are already fitted to almost all new cars in Europe, and have been for some years. The systems are generally linked to the control units used to deploy airbags in the event of a collision. Most meet the minimum specification set by the US federal standard (49 CFR Part 563) and many exceed it. The authors recommend recording of additional data not covered by Part 563, such as the status of all in-car safety systems (when fitted), in the moments leading up to a collision, as well as ensuring that an EDR is also able to record data surrounding a collision with a pedestrian or cyclist. Retrospectively unlocking access to EDR on vehicles already in the fleet (as some manufacturers have already done in some markets) would increase the potential benefits.

The additional costs of standardising the technology for new cars in Europe would be

[59] European Commission (2016) Staff Working Document Saving Lives : Boosting Car Safety in the EU
[60] http://umich.edu/~driving/documents/DF-T%20with%202006%20-Updates-prot.doc
[61] Hynd, D. and McCarthy M., Study on the benefits resulting from the installation of Event Data Recorders. Transport Research Laboratory
http://ec.europa.eu/transport/road_safety/pdf/vehicles/study_edr_2014.pdf

negligible, as car manufacturers already fit the devices. The benefit-cost ratio for commercial vehicles is also positive and there are many examples of fleets using the technology as part of existing fleet management processes which also monitor driving behaviour at all times to enable fuel saving and safer driving. Event Data Recorders, as defined by the report, would only record data immediately before a collision.

EDRs can offer first-hand information about the safety systems available on the vehicle and their operation. Additional information could include speed information, measures of crash severity and vehicle manoeuvres. Liability for collision would be more accurately and objectively determined, therefore reducing time and legal costs and providing road users and society with access to justice.

ETSC recommendations

- Mandate Event Data Recorders in all new vehicles by 2020 with high level of specifications in order to record the status of all in-car safety systems (when fitted) in the moments leading up to a collision, and also record data surrounding a collision with a pedestrian or cyclist. This will become crucial for confirming the life-saving benefits of ADAS and semi-auto-driving technologies in real world situations.
- Make EDR mandatory for all vehicles by 2020 not just M1 and N1 as EDR would be beneficial for professional drivers as well.
- Ensure broad access to the data for accident investigations and research.

4 Upgrade crash tests

The EU has exclusive competence on vehicle safety and vehicle type approval, yet EU legislation on passive safety has not changed much over the last decade and as a result type approval crash tests need to be updated. Existing consumer information tests such as EuroNCAP do not test all models of car and permit variations in safety equipment for the same model between EU Member States. Strong EU legislation is therefore needed in order to also reach the lower priced segments of the market and address aspects of protection that are less attractive to car buyers.

4.1 Front tests

4.1.1 Front small overlap

ETSC strongly supports the introduction of Front Small Overlap tests. This test exposes a weak point of most vehicles and benefits could be significant. ETSC agrees with the EC analysis that the effectiveness may be high because countermeasures are likely to reduce high costs, head (improved airbag coverage to mitigate effect of head impact in A pillar region) and lower extremity injuries (improved passenger compartment integrity)[62]. Therefore the benefit to cost ratio could likely be greater than one. The EC suggests to introduce the small overlap test for M1 by 2022 for new types and all new vehicles by 2024 but ETSC would favour an earlier introduction date of 2020. The technical feasibility of protection against longitudinal small-overlap collisions is clearly demonstrated by the response of car manufacturers to the new IIHS small overlap test procedure in the U.S.

ETSC recommendation

- Introduce Front Small Overlap tests by 2020.

4.1.2 Full-width frontal occupant protection Reg 137

A full width test is required to provide a high deceleration pulse to control the occupant's deceleration and check that the car's restraint system provides sufficient protection ('softness') at high deceleration levels. The Regulation 137 test speed is 50 km/h which is lower than the 56 km/h for US FMVSS 208. The EC notes that the fact that UNECE Working Party 29 have adopted Regulation 137 illustrates that it is technically feasible to

[62] European Commission (2016) Staff Working Document Saving Lives : Boosting Car Safety in the EU

meet its requirements[63].

The Regulation 137 full width test is suitable for regulatory application. However, it is noted that an EC study that is currently being finalised indicates that the benefits that it may deliver may not be significant because most current vehicles would meet the requirements without modification.

ETSC recommendations

- Introduce the THOR dummy (which is more biofidelic for thorax injuries) into the test, note that currently Hybrid III dummies are specified.
- Change to enforce the introduction of adaptive restraint systems, in particular to improve protection of older persons (against thorax injuries) in lower speed impacts.
- Introduce the full-width occupant protection year 2020 for new types and 2022 for all new vehicles.

4.1.3 Offset impact crash test UNECE R94 removal of exemptions

An offset test is required to load one side of the car to check compartment integrity. Currently off-set impact UNECE R94 is performed for only M1 < 2,500kg maximum mass.

ETSC recommendation

- Support the EC proposal[64] to expand the scope to include all M1 and N1 by 01/09/2022 new types and to 01/09/2024 all new vehicles.

4.2 Side crash testing

Side impact still remains an issue on EU roads. Between 29 and 38% of all car crash fatalities are in side collisions where 60% are seated at the struck side and 40% at the non-stuck side[65].

4.2.1 S95 Side impact occupant protection – removal of exemptions

Currently only side impact UNECE R95 is performed which consists of a mobile barrier test which represents being impacted by another vehicle. ETSC would support the suggested option to introduce an updated mobile deformable barrier, representing a

[63] ibid
[64] European Commission (2016) Staff Working Document Saving Lives : Boosting Car Safety in the EU
[65] EEVC (2010): WG13: A Review and Evaluation of Options for Enhanced Side Impact Protection.

larger and heavier car impacting into the side of the struck vehicle[66].

ETSC recommendation

- Expand scope to include all M1 and N1, i.e. remove current exemption. o 01/09/2020 new types to 01/09/2022 all new vehicles.

4.2.2 Pole side impact

Vehicles perform well in the current Euro NCAP pole test, which is similar to the Regulation 135 one, which demonstrates clearly that current vehicles can meet the proposed test requirements. ETSC would support the EC proposal for an additional requirement that an assessment of the window curtain airbag coverage is added to the Regulation 135 for implementation in the EU[67]. This requirement could be based on the Euro NCAP one, which assesses the inflated airbag position with respect to a zone defined by the seating and head positions of 5th percentile female and 95th percentile male dummies.

ETSC recommendation

- Add the pole impact crash test UNECE R135., with an airbag coverage requirement by 01/09/2020 new types to 01/09/2022 all new vehicles

4.2.3 Side impact collision protection for far side occupants

It was estimated that in Europe by fitment of far-side occupant protection it could be possible that up to 670 fatalities and up to 4,600 seriously injured casualties may be prevented annually, with a monetary value of €1.2 to €1.9 billion[68]. ETSC supports the EC analysis that there now seems to be a sufficient technology base so that far-side protection can be evaluated and rated by side impact testing[69].

ETSC recommendation

- Add the far-side occupant protection and support the development of a test protocol for 01/09/2022 new types for 01/09/2024 all new vehicles.

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[66] European Commission (2016) Staff Working Document Saving Lives : Boosting Car Safety in the EU
[67] ibid
[68] European Commission (2016) Staff Working Document Saving Lives : Boosting Car Safety in the EU
[69] European Commission (2016) Staff Working Document Saving Lives : Boosting Car Safety in the EU

4.3 Rear impact crash testing

A rear-end collision is defined as a crash in which the front of one vehicle collides with the rear of another vehicle and it has been reported that 19% of all passenger cars involved in an accident have at least one rear impact[70]. Rear impact testing is not mandatory in the EU, but it has been regulated in the USA and Japan for many years.

ETSC recommendations

- Make rear impact crash test in UNECE R34 mandatory, i.e. accede to R34 revision.
- Make mandatory for M1 and N1 vehicles.

[70] Eis V, Sferco R, Fay P (2005). A Detailed Analysis of the Characteristics of European Rear Impacts. 19th ESV

5 Heavy Goods Vehicle safety

Due to the size and mass of heavy vehicles, the problem of compatibility with other road users is challenging. Whilst representing only 3% of vehicles on EU roads, trucks have been involved in a disproportionate number of collisions, namely over 15%, killing more than 4000 people in 2009[71]. Improving front, side and rear underrun protection of heavy vehicle would reduce casualties among pedestrians, cyclists, PTWs as well as car occupants in underrun impacts.

5.1 Front end design and underrun protection

Following the revision of the Weights and Dimensions Directive 2015/719, trucks will have extra length to redesign the brick shaped front to a more rounded and longer nose. This extra length can be used to improve the crash performance of trucks with cars and other vulnerable road users such as pedestrians and cyclists. However the European Commission report[72] does not mention improved crash performance, either truck-to-car or truck-to-VRU. This is a missed opportunity and should be remedied as a matter of priority.

The characteristics of the front and side structures in terms of their geometrical and structural properties will affect how they strike either passenger cars or vulnerable road users. A rounded profile will be beneficial in reducing the actual change in velocity in frontal collisions between cars and HGVs by allowing the car to be deflected and not lock into the sharp corner of existing HGV bumpers. A rounded profile for HGV fronts which would deflect the pedestrian (or cyclist) sideways, will also be beneficial in reducing the risk posed to them. In the EU, nearly 2000 car occupants in 2013 were killed in a collision involving a truck. Around 65% of truck-car collision are frontal car-to-truck crashes with the most sever collision type (35%) is truck to car front.[73]

Frontal car-to-truck collisions are the greatest problem in collisions where trucks are involved. An EU requirement was introduced requiring mandatory rigid front underrun protection defining a rigid front underrun protection system for trucks with a gross weight over 3.5t. Rigid underrun protection is a step in the right direction, but, as these collisions normally take place at higher relative speeds where energy absorption is necessary on the truck, the new proposal should mandate energy absorbing front underrun protection systems. Studies performed by EEVC WG 14 have shown that passenger cars can 'survive'

[71] http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52013SC0108&from=EN
[72] European Commission (2016) Staff Working Document Saving Lives : Boosting Car Safety in the EU
[73] Wismans (2016), What are the most significant safety improvements that can be made to trucks used in urban and rural areas ?, p. 6.

a frontal truck collision with a relative speed of 75km/h if the truck is equipped with an energy absorbing front underrun protection system. Furthermore, these systems could prevent about 1,170 deaths and 23,660 seriously injured car occupants in Europe per year. The monetary benefit is about 1,482 million Euro[74].

ETSC recommendations

- Introduce energy absorbing front underrun protection for all new heavy goods vehicles to attenuate the severity of car/HGV collisions by 2020.
- Introduce energy absorbing structures on HGVs to attenuate the forces occurring in VRU/HGV collisions using separate impactors for the appropriate zones of the front end by 2020.
- Devise a new simple deflection test procedure with separate impactors for the appropriate zones of the front end using a simplified standing dummy to reduce the frequency of VRUs going under the front of the HGV or its wheels by 2020?
- Develop a separate test using a simple uninstrumented standing dummy to assess the deflection laterally and the risk of the pedestrian being run over by 2020.

5.2 Improving visibility and reducing blind areas

In today's HGVs, driver eye-level is around 2 metres or more above the ground. The dimensions of the windows at the front and sides also lead to large blind areas in the driver's field of view. Those blind areas change when the vehicle is turning, particularly because the trailer unit always turns along a shorter radius than the tractor (cab) unit. That results in the driver being unable to see pedestrians, cyclists and motorcyclists who are close to the vehicle, particularly when turning.

It is predicted that improved direct vision could reduce the number of VRU fatalities by up to 553 per year in the EU[75]. Improving the driver's field of view can be achieved by lowering the eye height, enlarging the size of the windows and extending the size and positioning of mirrors[76]. Some designs with much improved direct vision are already in production such as the. This low-entry vehicle has a particularly large windscreen area and improved glazed areas to the side.

The European Commission has suggested that it would introduce a new direct vision standard, but only in 2028. ETSC would support the introduction of a differentiated approach with earlier introduction times for direct vision for certain vehicles, starting with

[74] ETSC (2005) The Safety of Vulnerable Road Users.
[75] European Commission 2016 Discussion paper, Monitoring and assessment of advanced vehicle safety features, their cost effectiveness and feasibility for the review of the regulations on general vehicle safety and on the protection of pedestrians and other vulnerable road users
[76] FKA Design of a Tractor for Optimised Safety and Fuel Consumption Report 104190

N2-N3 up to 26t GVW which are most likely to circulate in urban areas by introducing all round and low entry style vision. In a next phase introduce a direct vision standard for N3G – construction and off-road vehicles and then in a third phase the direct vision standard for N3 tractor cabs.

When considering mirrors, mounting height needs to take pedestrians/cyclists and their possible collision trajectory into account. Installing video cameras and screens may also be an option but these are second best to direct vision. Efforts should also be made to improve the vision of the passenger side both through the windscreen and through the side door window. Visibility of the back of the HGV is also of vital importance.

ETSC recommendations

- Improve the driver's current field of view by direct vision standard assessment protocol as developed by TRL by 2020.
- Improve the vision of the passenger side both through the windscreen and through the side door window and to the rear by 2020.
- Extending the size and positioning of mirrors, introducing cameras and detection systems that can detect and warn of cyclists and pedestrians in 2020 for new types and all new trucks.
- Mandate AEB systems with pedestrian detection in 2022 for new types and 2024 for all new trucks
- Mandate AEB systems with cyclist detection in 2024 for new types and 2026 for all new trucks.
- Mandate AEB systems with pedestrian detection in 2022 for new types and 2024 for all new trucks
- Mandate AEB systems with cyclist detection (covering turning) in 2024 for new types and 2026 for all new trucks.

5.3 Side underrun protection

When heavy goods vehicles and vulnerable road users are side by side and the vehicle turns in their direction, the vulnerable road users are at risk of being run over by the vehicle. Trucks and trailers have to be equipped with a protection system at the side preventing pedestrians, bicycle riders and motorcyclists from falling under the wheels of the truck when it turns. The protection system fills the open space between the wheels. However, current legislation accepts an "open" frame (i.e. two planks on the side with a maximum distance of 30 cm). Therefore, under some circumstances, pedestrians and cyclists could be caught by such a side underrun protection system. Investigations have shown that improved side underrun protection systems could reduce deaths among

pedestrians and cyclists in such situations by about 45%[77]. Furthermore, the current exemptions for the obligation for lateral protection of trailers and trucks should be removed in line with work ongoing at the UNECE. In addition, the strength requirement should be increased to accommodate side collisions with motorcycles as the strength of current side underrun protection systems has shown to be insufficient[78]. In addition the permissible height of the lower edge needs to be lowered.

ETSC recommendations

- Ensure that side protection closes off the open space between the wheels of all new heavy goods vehicles and increase current strength requirement to accommodate side collisions with motorcycles.
- Remove exemptions that exist (in line with ongoing amendment of UNECE Regulation 73) by 2020, and oblige the use of side guards to protect other road users in collisions with trucks.

5.4 Rear underrun protection

Accident data and crash tests have shown that rear under-run protection devices as currently required by legislation appear to be inadequate for collisions of modern passenger cars into the rear end of a truck or trailer, in particular at speeds exceeding 50 km/h. The Council Directive 70/221/EEC defined a rear underrun protection system for trucks and trailers with a gross weight of more than 3.5t. It describes, for example, a ground clearance of 550mm and test forces of maximum 25km/h, respectively 100kN, depending on the test pointThe ground clearance needs to be reduced to 400mm. Furthermore, the test forces need to be doubled. First conservative estimates of EEVC Working Group 14 showed that improved rear underrun protection systems with a lower ground clearance as well as higher test forces would reduce killed and seriously injured car occupants by a third in rear underrun impacts in Europe. In addition, WG 14 has found that the costs for deaths and serious injuries could be reduced by 69 -78 Million.

ETSC recommendations

- Improve rear underrun protection systems in line with ongoing work at UNECE on Regulation 58 with a lower ground clearance as well as higher test forces.

[77] ETSC (2001) Priorities for EU Motor Vehicle Design.
[78] **ETSC (2005) The Safety of Vulnerable Road Users.**

6 Information and data

ETSC strongly believes in indicators, based on the attained level of attributes leading to a desired final outcome[79]. To monitor the progress towards the ambitious target of 50% reduction in road deaths, the European Commission needs to create a monitoring framework that includes a set of sub-targets and safety performance indicators. Although the European Road Safety Observatory provides a framework, a pan-European in-depth accident data analysis accessible for all stakeholders should be set up. A common set of performance indicators would be essential, together with a well-functioning Road Safety Observatory.

ETSC would also encourage the need to document the real-world effectiveness of the different new vehicle safety measures.

ETSC recommendations

- Implement the recommendations of the EU funded research project DaCoTA on in-depth accident investigations and build an EU common in-depth accident investigation database.
- Require manufacturers to provide information on in-vehicle safety technologies fitted on a model in its Vehicle Identification Number (VIN).
- Recommend Member States to include data on safety systems (based on the information provided by VINs) into collision reports to assess the effectiveness of safety technologies. Build on the CARE database, improve the accessibility of the various data collected and make them available as soon as possible.
- Support countries in setting up data collection and evaluation procedures and stimulate the use of harmonised protocols for accident, exposure and performance indicators using SafetyNet recommendations.
- Encourage Member States to set quantitative targets based on compliance indicators and monitor their performance.
- Use the evidence gathered to devise and update relevant policies.

[79] ETSC (2010) 4th Road Safety PIN Report.

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For more information

ETSC Positions and Responses

All ETSC positions and responses are available from www.etsc.eu/publications

ETSC (2013) Weights and Dimensions of Heavy Goods Vehicles – Maximising Safety

ETSC (2013) Contribution to Road Safety Cars 2020

ETSC (2011) Response to the Transport White Paper

ETSC (2010) Response to the EC Policy Orientations on Road Safety

ETSC (2009) Position on the EC proposal for an ITS Action Plan and Directive

ETSC (2008) Blueprint for the 4th Road Safety Action Programme

ETSC (2008) Position on the EC proposal for a Regulation on Type-Approval Requirements for the general Safety of Motor Vehicles

ETSC (2008) Position on the EC proposal for a Regulation on the protection of pedestrians and other vulnerable road users.

ETSC Reports

All Road Safety PIN Reports are available from www.etsc.eu/pin

ETSC (2016) 10th PIN Annual Report Ranking EU Progress on Road Safety

ETSC (2016) How Safe are New Cars Sold in the EU

ETSC (2014) Ranking Progress on Car Occupant Safety PIN Flash Report 27

ETSC (2005) The Safety of Vulnerable Road Users

ETSC (2001) Priorities for EU Motor Vehicle Design
http://etsc.eu/documents/mvdesign.pdf

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The European Transport Safety Council (ETSC) is a Brussels-based independent non-profit making organisation dedicated to reducing the numbers of deaths and injuries in transport in Europe.