

# After years of inaction – it's time for progress on vehicle safety

25,500 people lost their lives on EU roads in 2016 – a figure that has hardly budged in three years. A further 135,000 people are seriously injured each year. It's a devastating human toll but also an important economic one.

The European Commission is set to revise the **General Safety Regulation 661/2009** and the **Pedestrian Protection Regulation 78/2009**. These regulations represent the most direct and effective measures the EU has to further reduce road deaths and injuries. This briefing sets out ETSC's main priorities for the review in terms of in-vehicle technology, crash testing, truck safety and pedestrian protection.

## Voluntary safety ratings are not enough

While many vehicles are tested by the Euro NCAP consumer testing programme, cars that only meet the minimum EU legal requirements today would receive zero stars. Not all car models sold in Europe are tested by Euro NCAP, and not all of the same type are sold with the same standards of safety equipment. Regulation is needed to ensure that safety benefits are spread equally to all EU citizens.

## Maintaining Europe's global lead in automotive safety

Ambitious safety standards benefit the automotive industry by helping European vehicle producers and suppliers maintain their global lead in safety technology. This strengthens their competitive position in the European market but also increases export opportunities.

## Pedestrians and cyclists - an increasing share of road deaths

The share of deaths of unprotected road users is increasing as car occupants have been the main beneficiaries of improved vehicle safety. A focus on vulnerable road users is now needed. Pedestrians represent around 21% of total EU road deaths - around two thirds of these occur in urban areas. Cyclists comprise around 8% of total EU road traffic deaths.

## Driver assistance systems can help towards the development of autonomous vehicles

Many of the technologies and sensors used for driver assistance systems will be required for autonomous vehicles. But proven technologies should be adopted as driver assistance systems today. Policymakers should not wait for driverless cars, or hope that they will be a panacea for road safety in the near future.

# General Safety Regulation – technology priorities

## Intelligent Speed Assistance (ISA)



How does ISA work? Watch it in action on the Ford Galaxy at <http://www.etsc.eu/isa>

Intelligent Speed Assistance (ISA) helps drivers comply with speed limits. It uses GPS, a database of speed limit locations as well as sign-recognition cameras to automatically limit a vehicle's speed. Several studies have found that the benefits substantially outweigh the costs.<sup>1</sup>

- ETSC recommends fitting all new commercial vehicles with assisting ISA systems by 2020 in line with the EC evaluation study<sup>2</sup>. The system should be overridable up to 100km/h for buses and 90km/h for lorries, in line with existing EU legislation on speed limiters.
- ETSC recommends fitting all new passenger cars with an overridable assisting Intelligent Speed Assistance system that defaults to being switched on by 2020<sup>3</sup>.

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<sup>1</sup> Carsten O (2005). PROSPER Results: Benefits and Costs. Presentation at the PROSPER Seminar on 23 November 2005 in Brussels, in (2016) Staff Working Document Saving Lives : Boosting Car Safety in the EU

<sup>2</sup> EC study is available at: <https://goo.gl/l8gMvo>

<sup>3</sup> '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

## Alcohol Interlocks



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 national legal Blood Alcohol Concentration (BAC) limit the engine will not start.

An EC-commissioned study estimated the casualty reduction figures for alcohol interlocks deployed across four groups based on 2010 fatality statistics and estimated benefit-cost ratios. The benefit-cost ratio was positive for drink driving offender and goods vehicle groups.<sup>4</sup>

- ETSC recommends introducing uniform standards for alcohol interlocks in Europe which ensure that vehicle interfaces make it possible to fit an alcohol interlock into any new car by 2020.
- The EU should legislate for a consistently high level of reliability of alcohol interlock devices by 2020.
- As a first step towards wider use of alcohol interlocks, the EU should require their use by professional drivers by 2020.

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<sup>4</sup> Ecorys (2014). Study on the prevention of drink-driving by the use of alcohol interlock devices. <https://goo.gl/U6rcPo> in (2016) Staff Working Document Saving Lives : Boosting Car Safety in the EU

## Seat Belt Reminders



Why are Seat Belt Reminder systems so crucial to road safety? Watch the video at: <http://etsc.eu/sbr>

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.

Positive benefit to cost ratios have been estimated for fitment of SBR to M1 front seat passengers and all M2/M3 and N2/N3 vehicle seating positions<sup>5</sup>.

- ETSC recommends extending the mandatory fitment of advanced seat belt reminders as standard equipment to the front passenger seat by 2020 for new types and 2022 for new vehicles.
- Mandatory fitment of advanced seat belt reminders (including occupancy detection) to rear seats should be required by 2022 for new types and 2024 for new vehicles.
- Seat belt pre-tensioners and load limiters should be required by 2020.

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<sup>5</sup> McCarthy M and Seidl (2014). Benefit assessment for fitment of Seat Belt Reminder (SBR) systems to M1 passenger seat positions and to other vehicle types. CPR1818 Available from EU bookshop <https://goo.gl/YQci9E>

## Advanced Emergency Braking Systems

Advanced Emergency Braking (AEB) systems can help avoid crashes or mitigate their severity by warning the driver and supporting braking response and/or applying the brakes independently of the driver.

Costs for these systems are reducing. Current consumer costs for AEB are as low as £200 (Ford, VW), so it is likely that the benefit to cost ratio of fitment of AEB to M1 vehicles will be positive. This is even more likely to be the case for 'city' AEB systems that help prevent low speed collisions and associated whiplash injuries and relatively minor vehicle damage<sup>6</sup>.

- ETSC recommends mandatory installation of AEB systems with pedestrian and cyclist detection in 2020 for all new types of vehicle including for new heavy goods vehicles.

## Lane Keep Assistance

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 system gently guides the vehicle back into the lane by the application of torque to the steering wheel or one-sided braking. 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 effectiveness range of 15-60% for 'side swipe' collisions<sup>7</sup>.

- ETSC recommends introducing Lane Keep Assist by 2020 to passenger cars and light trucks and vans.

## Distraction

Driving whilst using a mobile phone or other device significantly impairs driving ability.

- ETSC recommends that vehicle manufacturers be obliged to publish their tests to show compliance with the human-machine interface (HMI) Guidance Statement of Principle on in-vehicle information and infotainment systems<sup>8</sup>.

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<sup>6</sup> (2016) Staff Working Document Saving Lives : Boosting Car Safety in the EU

<sup>7</sup> 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.

<sup>8</sup> <http://umich.edu/~driving/documents/DF-T%20with%202006%20Updates-prot.doc>

- The development of a multi-phase, technology neutral testing protocol for all M and N vehicles for distraction and drowsiness monitoring should be completed by 2020.

## 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.

Most new M1 and N1 European vehicles have EDR functionality already although the data is not easily accessible. Therefore, the benefit-cost ratio for the M1/N1 category of vehicles should be positive. Care must be taken to legislate minimum performance requirements as well as the structure of data and access requirements (e.g. similar to US CFR 49 Part 563)<sup>9</sup>.

- ETSC recommends requiring Event Data Recorders in all new vehicles by 2020 with a high level of specification 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 EDRs mandatory for all vehicles by 2020 not just M1 and N1; EDR would be beneficial for professional drivers as well.

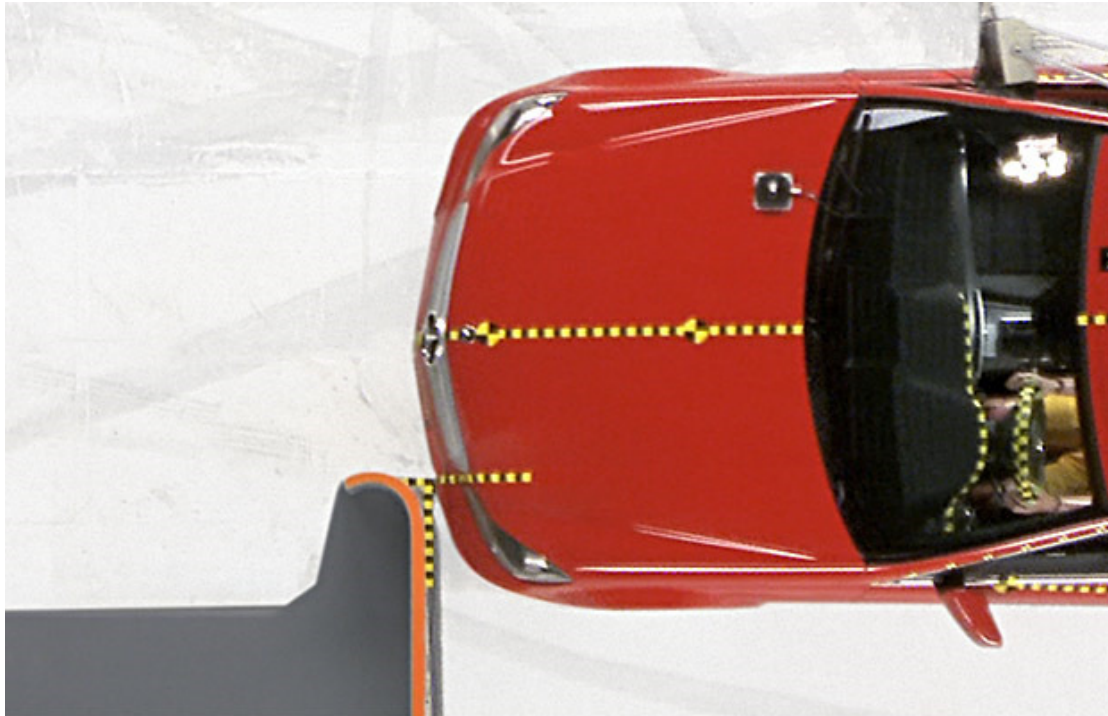
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<sup>9</sup> Staff Working Document Saving Lives : Boosting Car Safety in the EU.

# General Safety Regulation – testing priorities

## Front testing → Add a front small overlap test

ETSC strongly supports the introduction of Front Small Overlap tests. This test exposes a weak point of most vehicles and benefits could be significant.



Insurance Institute for Highway Safety (IIHS), United States - Small overlap frontal test configuration

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)<sup>10</sup>. Therefore the benefit to cost ratio could likely be positive.

- ETSC recommends introducing Front Small Overlap tests by 2020.

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<sup>10</sup> European Commission (2016) Staff Working Document Saving Lives : Boosting Car Safety in the EU

## **Front testing → Introduce a full-width frontal occupant protection (UNECE R137) test**

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.

- ETSC recommends introducing the THOR dummy (which is more biofidelic for thorax injuries) into the test, currently Hybrid III dummies are specified.
- Adaptive restraint systems should be required, in particular to improve protection of older persons (against thorax injuries) in lower speed impacts.
- The full-width occupant protection test should be introduced by 2020 for new types and 2022 for all new vehicles.

## **Front testing → 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 the off-set impact (UNECE R94) test is performed only for M1 < 2,500kg maximum mass.

- ETSC recommends supporting the EC proposal<sup>11</sup> to expand the scope to include all M1 and N1 by 01/09/2022 new types and to 01/09/2024 all new vehicles.

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<sup>11</sup> European Commission (2016) Staff Working Document Saving Lives : Boosting Car Safety in the EU



## Side testing → Side impact occupant protection (UNECE R95 ) – update the barrier and removal of exemptions



Insurance Institute for Highway Safety (IIHS), United States – Side crash test with side barrier representing an SUV

Currently only the side impact (UNECE R95) test 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 larger and heavier car impacting into the side of the struck vehicle<sup>12</sup>.

- ETSC recommends expanding the scope to include all M1 and N1 vehicles, i.e. removing current exemptions by 2020 for new types and to 2022 for all new vehicles.

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<sup>12</sup> European Commission (2016) Staff Working Document Saving Lives : Boosting Car Safety in the EU

## Side testing → Add a side pole impact test



Euro NCAP consumer side pole test

At present, vehicles generally perform well in the Euro NCAP pole test, which is similar to the UNECE R135 specification. ETSC would support such a test becoming mandatory and supports the EC proposal for an additional requirement that an assessment of the window curtain airbag coverage is added.<sup>13</sup>

- ETSC recommends adding the pole impact crash test UNECE R135, with an airbag coverage requirement by 2020 for new types and by 2022 for all new vehicles.

## Side testing → Side impact collision protection for far side occupants

It was estimated that fitment of far-side occupant protection in Europe could prevent up to 670 fatalities and up to 4,600 serious injuries annually, with a monetary value of €1.2 to €1.9 billion<sup>14</sup>. ETSC supports the EC analysis that there now seems to be a sufficient technology base for far-side protection to be evaluated and rated by side impact testing<sup>15</sup>.

- ETSC recommends adding far-side occupant protection and supporting the development of a test protocol by 2022 for new types and by 2024 for all new

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<sup>13</sup> European Commission (2016) Staff Working Document Saving Lives : Boosting Car Safety in the EU

<sup>14</sup> ibid

<sup>15</sup> Ibid.

vehicles.

## 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<sup>16</sup>.

- ETSC recommends making a rear impact crash test (UNECE R34) mandatory, acceding to R34 revision 3. For M1 and N1 vehicles by 2020 for new types and by 2022 for all new vehicles.

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<sup>16</sup> Eis V, Sferco R, Fay P (2005). A Detailed Analysis of the Characteristics of European Rear Impacts. 19th ESV

# General Safety Regulation – truck safety priorities

Following the revision of the Weights and Dimensions Directive (EC 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 in collisions with cars and other vulnerable road users such as pedestrians and cyclists.

Studies performed by EEVC WG 14 have shown that passenger cars can ‘survive’ 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<sup>17</sup>.

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.

## Improving visibility and reducing blind areas

In today’s HGVs, driver eye-level is around 2 meters 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.

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<sup>17</sup> ETSC (2005) The Safety of Vulnerable Road Users.

It is predicted that improved direct vision could reduce the number of VRU fatalities by up to 553 per year in the EU.<sup>18</sup> 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.<sup>19</sup>

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 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.

Additional recommendations:

- Improve the driver's current field of view by direct vision standard assessment protocol as developed by TRL<sup>20</sup> 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.
- Extend 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 (covering turning) in 2024 for new types and 2026 for all new trucks.

## Side and rear underrun protection

When heavy goods vehicles and vulnerable road users (VRUs) are side-by-side and the vehicle turns in their direction, the VRUs 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. Accident data and crash tests have shown that rear under-run protection devices as currently

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<sup>18</sup> 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

<sup>19</sup> FKA Design of a Tractor for Optimised Safety and Fuel Consumption Report 104190

<sup>20</sup> in European Commission (2016) Staff Working Document Saving Lives : Boosting Car Safety in the EU.

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.

For fitment of a device with adequate strength, Smith et al. (2008) estimated a benefit for the EU of between 43 and 93 fatalities and 694 and 2,063 serious injuries prevented per year. This equated to a benefit to cost ratio of 0.6 to 14.8 using best cost estimates<sup>21</sup>. The benefit to cost ratio is likely to be less than one for vehicles that genuinely need either an exemption or adjustable side guards.<sup>22</sup>

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.
- 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.

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<sup>21</sup> Smith T, Grover C, Gibson T, Donaldson W and Knight I (2008). Development of test procedures, limit values, costs and benefits for proposals to improve the performance of rear underrun protection for trucks, ENTR 05/17. [https://circabc.europa.eu/sd/a/bf5be9b8-54d5-42be-866d-a1c47e81cad4/20140903-121938\\_PPR317\\_RUP\\_Final\\_report\\_March\\_08.pdf](https://circabc.europa.eu/sd/a/bf5be9b8-54d5-42be-866d-a1c47e81cad4/20140903-121938_PPR317_RUP_Final_report_March_08.pdf) in European Commission (2016) Staff Working Document Saving Lives : Boosting Car Safety in the EU

<sup>22</sup> European Commission (2016) Staff Working Document Saving Lives : Boosting Car Safety in the EU

# Pedestrian Protection Regulation – testing priorities

In addition to preserving the existing test requirements for pedestrian protection, ETSC recommends the following additions and modifications. Driver assistance systems such as advanced emergency braking should be seen as a complement to, not a replacement for pedestrian safety testing requirements.

## Pedestrian upper leg to bonnet leading edge protection test



Euro NCAP's upper leg impact test

This test is currently carried out for 'monitoring purposes only'.

ETSC recommendations:

- Mandate the bonnet leading edge test according to the latest 2015 Euro NCAP pedestrian testing protocol.

## Adult headform to windscreen protection test

This test is designed to observe the impact of an adult headform on the windscreen and the protection offered by vehicles in this area. Currently this test is performed at 35 km/h an adult headform impactor. It is currently carried out for 'monitoring purposes only'.

ETSC recommendations:

- Mandate the adult headform to windscreen protection test.

- Mandate an evaluation study to investigate the type of injuries resulting from vehicle to pedestrian and cyclist collisions and update the existing test.
- Update the headform to windscreen test, adjusting the impact speed to at least 40km/h, a level appropriate to real life collision circumstances.
- Ask type-approval authorities for the results of these tests to be communicated more frequently and results be made available every three years.
- No vehicle design concessions should be made by type-approval authorities for vehicles equipped with collision avoidance technologies.

## Cyclist safety

Cyclist injuries from collisions with cars are an oft-neglected subject. The review of the Regulation should consider investigating injury mechanisms for cyclist and car collisions.

A recent study found that impactor testing as currently done for pedestrians is basically a suitable methodology, but adjustments are needed to account for some differences between pedestrian and cyclist impact. First of all the head impact area needs to be adjusted, furthermore the impact conditions (angle / velocity) must be reviewed<sup>23</sup>.

ETSC recommendations:

- Update existing tests and extend the scope of regulation EC78/2009 to include cyclist protection.
- Specify the word "cyclist" in the regulation instead of "other vulnerable road users".
- Revisit the impact conditions in terms of impact velocity and impact angle, but use the same impactors as today.

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<sup>23</sup> AGU Zurich, 2017, Study on Safer Motor Vehicles for Cyclists in the context of the EU Pedestrian Protection Regulations



## FOR FURTHER INFORMATION

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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.