FEDERATION INTERNATIONALE DE L'AUTOMOBILE
REGION I - EUROPE, THE MIDDLE EAST AND AFRICA

POLICY POSITION ON THE PEDESTRIAN PROTECTION

SAFETY

Executive Summary

FIA Region I welcomes the European Commission's plan to revise Regulation 78/2009 on the type-approval of motor vehicles, to improve the protection of pedestrians and other Vulnerable Road Users (VRUs). While the Regulation has significantly improved the safety of VRUs in recent years, casualties remain excessively high: in 2017, 5,313 pedestrians and 2,024 cyclists were killed on European roads. Adding safety test requirements to the unregulated front areas, e.g. the bonnet leading edge and windscreens, of passenger cars (M1) and vans (N1) could lead to improvements.

FIA Region I recommends to:

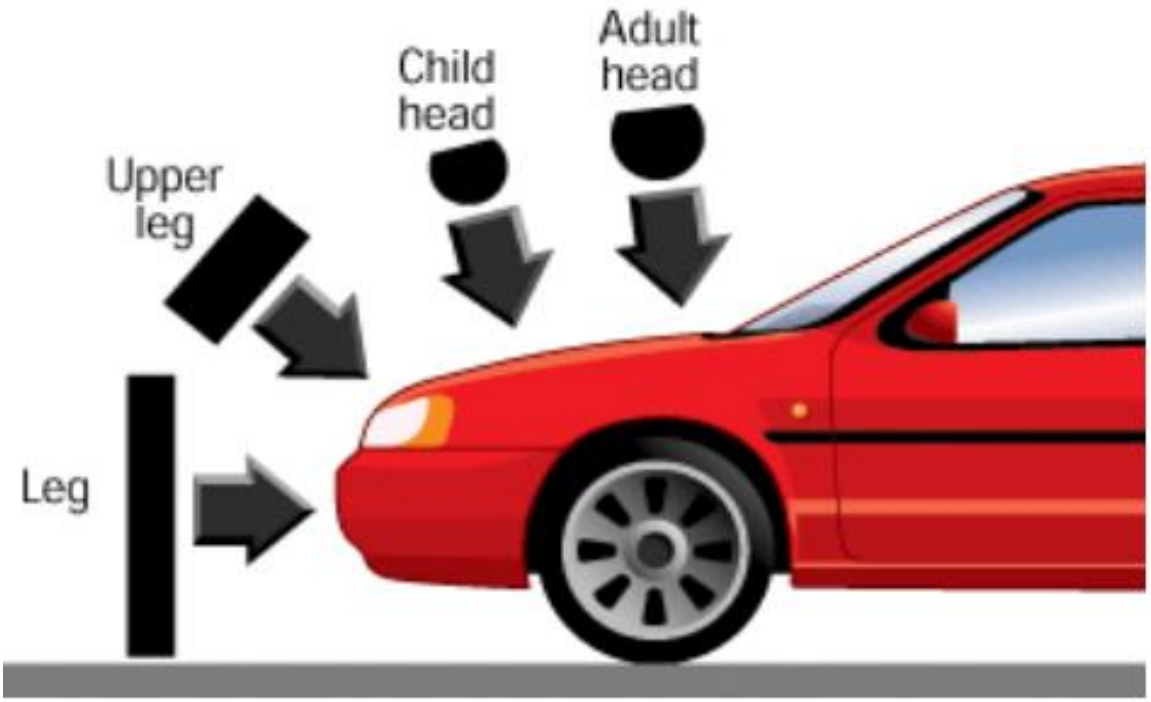
- Amend the legal framework to correspond to stringent Euro NCAP VRU protection test and assessment requirements and to make these requirements mandatory for M1 and N1 category vehicles
- Mandate that M1 and N1 vehicles must pass the adult-head-to-windscreen test performance threshold to receive type approval with an increase of the test impact speed from 35 to 40 km/h
- Accelerate the market deployment of active safety systems that can detect VRUs

Introduction

The European Union's, Regulation on the protection vulnerable road users foresees the obligatory installation of brake assist systems. It includes passive safety requirements via three mandatory tests of the vehicle's front end for M1 and N1 categories. The three tests are the "leg-to-bumper", "adult's head-to-bonnet", and "child's head-to-bonnet" impact tests. Vehicles must meet certain test performance thresholds to be granted type-approval.

Tests to the bonnet leading edge and windscreen areas are performed, but manufacturers do not need to pass the tests to receive type-approval

The "bonnet leading edge-to-upper leg form"[1] and the "windscreen-to-adult head" tests were also mandated for monitoring purposes only. They must, therefore, be conducted at type-approval, but the granting of the type-approval is not linked to reaching any specific test performance threshold. Results achieved in both tests have been documented to assess the possible need to mandate thresholds to improve VRU safety in the future.



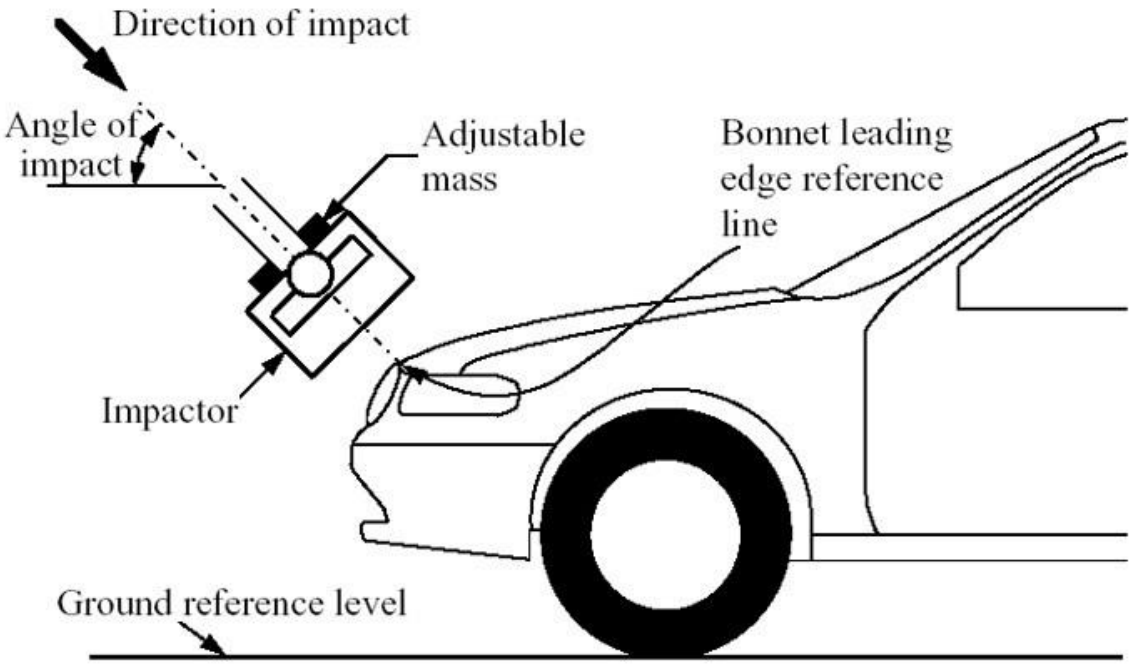
[1] The area where the upper leg or pelvis area is likely to hit the vehicles

Data from the UK and Germany shows that pedestrians can receive injuries from all regions of the vehicle front in road accidents. This shows that the area for potential injury to VRUs is widely distributed on the vehicle's front end.[2] Also, cyclists are particularly prone to collide with the windscreen and A-pillar areas.

FIA Region I stresses that the increased deployment of active safety technologies should not prevent authorities and manufacturers to ensure the highest VRU protection possible in case of a crash. Active safety solutions, while most welcome, should complement and not replace stringent passive safety requirements. The limitations of active safety systems, such as obscured situations for pedestrians, will also be assessed in the future. A passive solution is the fallback scenario.

Bonnet Leading Edge

The upper-leg-to-bonnet-leading-edge test records leg bending moments. Only very few vehicles have passed the test since 2009. At this stage, test parameters could be improved prior to being made mandatory.



Current upper leg to bonnet leading edge test

As passenger cars come in an ever-increasing variety of market segments/classes (e.g. minis, family cars, SUVs) and tend to have a rounder front shape, Euro NCAP[3] VRU testing protocol now focuses on the injured body region and an alternative definition of the area to be tested. The protocol

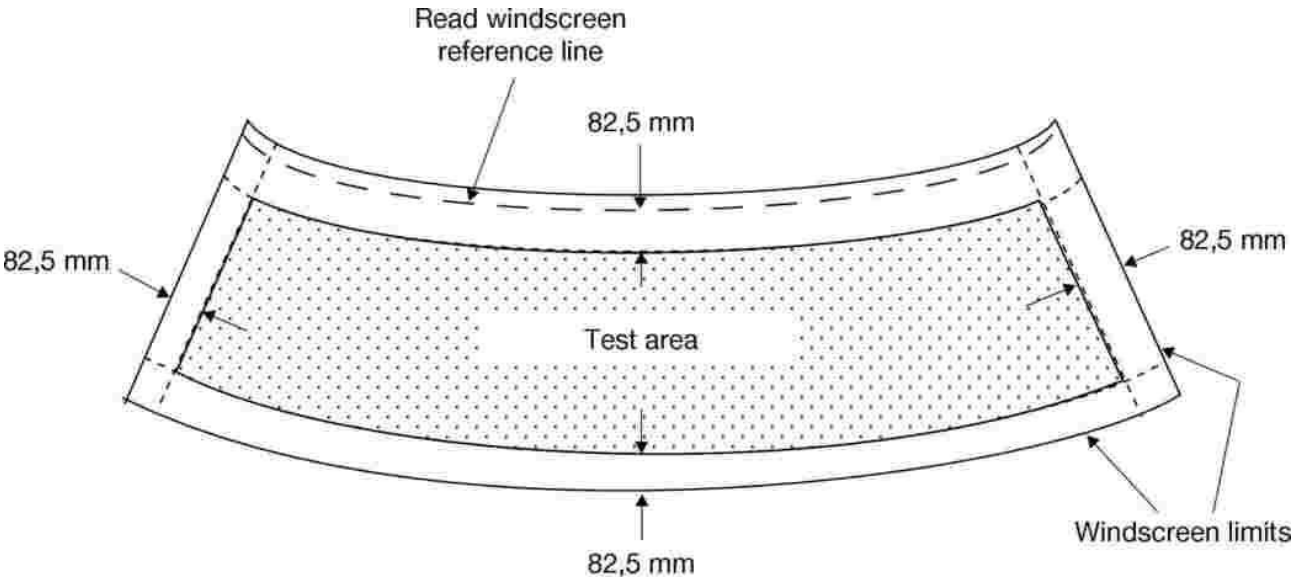
[2] J A Carroll, et al., 2014, Pedestrian leg form test area assessment Final report

[3] Euro NCAP is a voluntary vehicle safety rating system for consumers backed by seven European governments, as well as motoring and consumer organisations in every EU country.

standardises the height at which the impact needs to be tested so that the tested area reflects the location where a VRU's upper leg area would hit the vehicle.

Design improvements can improve the performance when testing a vehicle's front areas, such as increasing the space before solid objects, such as the engine, are hit or adopting more curved fronts. FIA Region I recommends using the Euro NCAP VRU protection testing approach as a reference for testing the impact leading to upper leg and pelvis injuries. In the future, it should be considerably easier for battery electric vehicles to meet the traditional pedestrian impact tests (leg-form and bonnet/head impact) because of the more flexible materials and lack of an engine under the bonnet.

Windscreens



Current head to windscreen test

The windscreen is the most frequent source of head injury[4], and head injuries represent 80% of all serious and fatal pedestrian injuries. Data suggests that, since 46% of cars meet the current test performance threshold, more should be done to improve the safety of the windscreen area[5].

[4] Otte D, Severity and mechanism of head impacts in car-to-pedestrian accidents, IRCOBI, 1999 (figures from GIDAS database)
[5] TRL, Benefit and Feasibility of a Range of New Technologies and Unregulated Measures in the fields of Vehicle Occupant Safety and Protection of Vulnerable Road Users_ Car Occupant and Pedestrian Safety, 2015.

Unlike the other tests mandated by the regulation conducted at 40km/h, this test is currently performed at 35 km/h. However, trends in accident data clearly indicate that the fatality risk for pedestrians increases when the collision speed is 40 km/h or higher[6]. Research on injuries and collision parameters found that 53.2% of pedestrians suffer head injuries at impact speeds below 40 km/h, and the frequency increases to 85.3% at speeds above 40 km/h[7]. Consequently, FIA Region I recommends for the test to be performed at 40 km/h instead of 35km/h.

85% of pedestrians suffer head injuries in collissions at speeds above 40 km/h

A-pillars and areas surrounding windscreens

A study commissioned by the European Parliament's Transport Committee concluded that the windscreen and its surrounding parts are the most frequent vehicle injury sources for cyclists[8]. This is due to the higher centre of gravity when sitting on a bicycle. Whilst the centre of the windscreen may be relatively safe, the glass towards the edge of the screen may not break at the same load. Hence, the upper half of the windscreen, the upper-A-pillars and the roof edge are often responsible for injuries.

Pillars are the vertical or near vertical supports of a car's window. The "A" pillars hold each side of the windshield in place

The windscreen frame itself is very stiff because it is an important load-bearing part. Impacts to the windscreen frame and edges can be considered a gap area that is not addressed by legislation. The adult head impact zone must be extended to the areas covering both A-Pillars and the front windscreen. While it is not easy to address, some manufacturers are investigating the use of deployable protection systems such as windscreen airbags. A cost-benefit analysis for solutions to improve A-pillars, windscreen edges and frame protection areas should be made a priority research area.

The legal testing framework should be adapted to match the Euro NCAP VRU protection test and assessment requirements. This test method includes a broader scope of head-impact areas on the front of the vehicle, including the A-pillar and windscreen areas. These testing requirements should be made mandatory for M1 and N1 category vehicles. FIA Region I believes that by mandating these significantly more stringent crash test requirements, many lives of vulnerable road users can be saved, and many serious injuries mitigated.

[6] Watanabe, R. et al (2012) Research of collision speed dependency of pedestrian head & chest injuries using human FE model
[7] Dietmar, O., Birgitt, W. (2012) Comparison of Injury Situation of Pedestrians and Bicyclists in Car Frontal Impacts and Assessment of Influence Parameter on Throw Distance and Injury Severity
[8] Cuerden, R. et al (2015) The Impact of Higher or Lower Weight and Volume of Cars on Road Safety, Particularly for Vulnerable Users, Transport Research Laboratory.

These stricter testing requirements would be most effective when coupled with mandatory introduction of Automatic Emergency Braking (AEB), capable of detecting vulnerable road users well in advance of any possible collision. Avoiding an accident with AEB technologies reduces the need for additional protections on the A-pillars / windscreen areas.

However, active safety systems, such as externally fitted A-pillar airbags, should not be prioritised over passive systems. It may be tempting for manufacturers to reduce cost and mass by lowering design standards and passive safety features. Passive safety systems help to protect car occupants from harm during a crash and cannot be replaced by increased deployment of active safety systems. Only the best possible mix of both active and passive systems will further improve safety for vehicle occupant and VRUs.

There are other measures that would be more economically viable and at the same time lead to an increased reduction of casualties and serious injuries than externally fitted A-pillar airbags. These active and passive safety systems are outlined in our position paper on the General Safety Regulation.

Active safety systems for the detection of VRUs

The deployment of active safety systems will play a major role in preventing accidents and mitigating their outcome. This is particularly critical in the context of an ageing population, prone to more severe injuries. Vehicles with VRU detection capabilities are gradually being introduced on the market, with about 30% of new cars tested by Euro NCAP in 2016 equipped with VRU detection equipment.

The European research project ASPECCS[9] indicates the following:

- 50 to 75% of pedestrian accidents can be detected by a car to brake before impact
- Forward-looking integrated pedestrian safety systems can reduce impact speed by 15 to 20 km/h for pedestrians hit by the front of cars
- Integrated pedestrian safety systems could yield a reduction of 15% to 30% in the number of pedestrian road fatalities in Europe upon full penetration into the fleet

FIA Region I encourages regulators, consumer testing programmes and car makers to accelerate efforts to deploy active safety systems that can detect VRUs.

Conclusion

FIA Region I encourages the adoption of the latest Euro NCAP Vulnerable Road User protection test and assessment procedures to improve the crash compatibility of vehicles with VRUs. The goal must be to ensure that all vehicle areas are made safer. This should be done in view to improve the safety of all VRUs, given current trends such as the increased promotion of cycling and our ageing population.

Furthermore, FIA Region I strongly supports making Automatic Emergency Braking mandatory for M1 and N1 category vehicles, that is also equipped with VRU detection well in advance of any crash.

[9] http://www.aspecss-project.eu/articles/background.html

Fédération Internationale de l'Automobile (FIA) Region I office

FIA Region I is a consumer body representing 107 Mobility Clubs and their 38.5 million members from across Europe, the Middle East and Africa. The FIA represents the interests of our members as motorists, riders, pedestrians and passengers. FIA Region I is working to ensure safe, affordable, clean and efficient mobility for all. Learn more at www.fiaregion1.com