



# POLICY POSITION ON THE PEDESTRIAN PROTECTION REGULATION



SAFETY

## Executive Summary

FIA Region I welcomes the European Commission's plan to revise Regulation 78/2009 on the type-approval of motor vehicles, in order to improve the protection of pedestrians and other Vulnerable Road Users (VRU)<sup>1</sup>. While the Regulation has significantly improved the safety of VRUs in past years, casualties still remain excessively high: in 2013, 5,542 pedestrians and 2002 cyclists were killed on European roads. Improvements can be achieved by adding safety test requirements to unregulated areas of passenger cars (M1) and vans (N1) vehicle fronts, such as the bonnet leading edge and windcreens areas.

### FIA Region I recommends to:

- Mandate a revised upper leg to bonnet leading edge test for M1 and N1 vehicles, with reference to the Euro NCAP 2015 pedestrian testing protocol
- Mandate that M1 and N1 vehicles must pass the adult-head-to-windscreen test performance threshold in order to receive type approval, but with an increase of the test impact speed from 35 to 40 km/h
- Make it a priority to conduct cost-benefit analysis of solutions to improve the crashworthiness of A-pillars (vertical elements supporting the windscreen) as well as windscreen edges and frame protection areas
- Accelerate the market deployment of active safety systems that can detect VRUs

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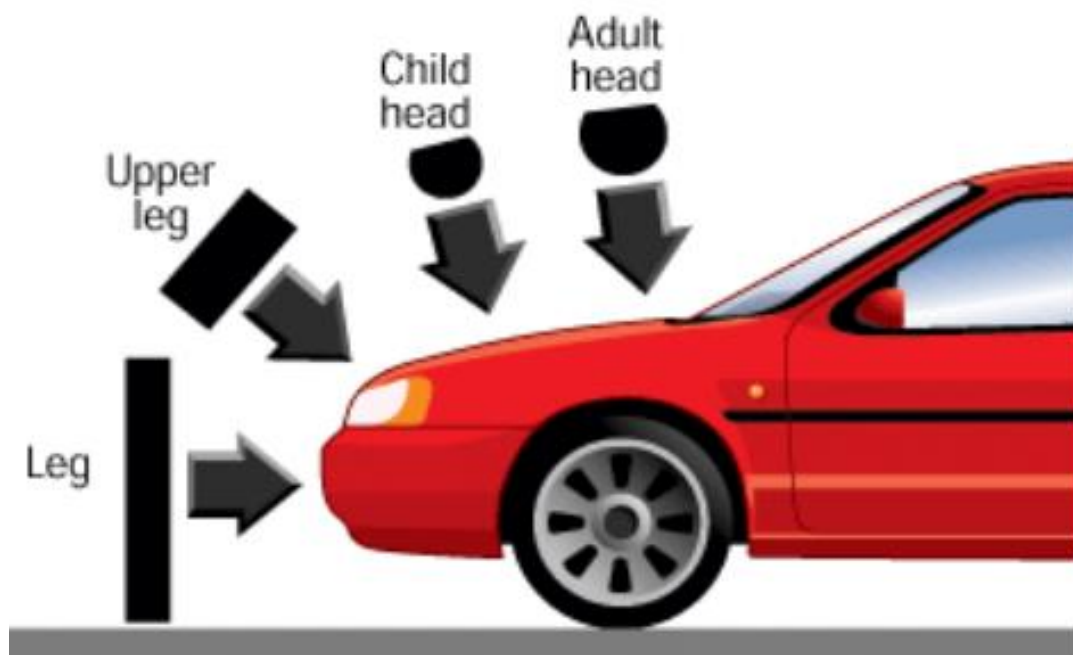
<sup>1</sup> European Union, "[Regulation \(EC\) No 78/2009](#) on the type-approval of motor vehicles with regard to the protection of pedestrians and other vulnerable road users", Brussels, 14 January 2009

## Introduction

The current Regulation foresees the obligatory installation of brake assist systems and includes passive safety requirements via three mandatory tests of the vehicle's front end for M1 and N1 categories. The three tests are the "bumper-to-leg", "bonnet-to-adult's head", and "bonnet-to-child's head" impact tests. Vehicles must meet certain test performance thresholds in order 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"<sup>2</sup> and the "windscreen-to-adult head" tests were also mandated for monitoring purposes only. They therefore must 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.



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

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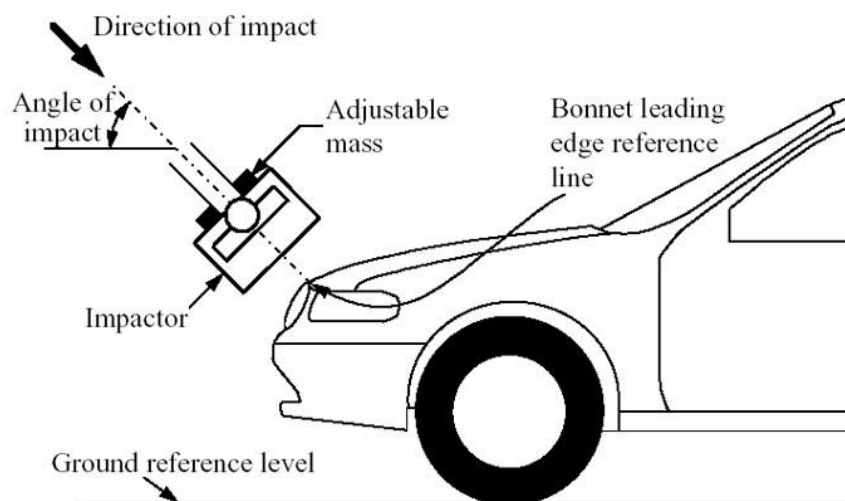
<sup>2</sup> The area where the upper leg or pelvis area is likely to hit the vehicles

distributed on the vehicle's front end.<sup>3</sup> 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 from continuing to improve the crash compatibility of vehicles with VRUs. Active safety solutions, while most welcome, should complement and not replace stringent passive safety requirements.

## Bonnet Leading Edge

The upper leg to bonnet leading edge test records bending moments. Forces caused by the contact are between the upper leg and pelvis area to the bonnet leading edge. Only very few vehicles passed the test since 2009. At this stage, test parameters could be improved prior to being made mandatory.



*Current Upper Legform to bonnet leading edge test*

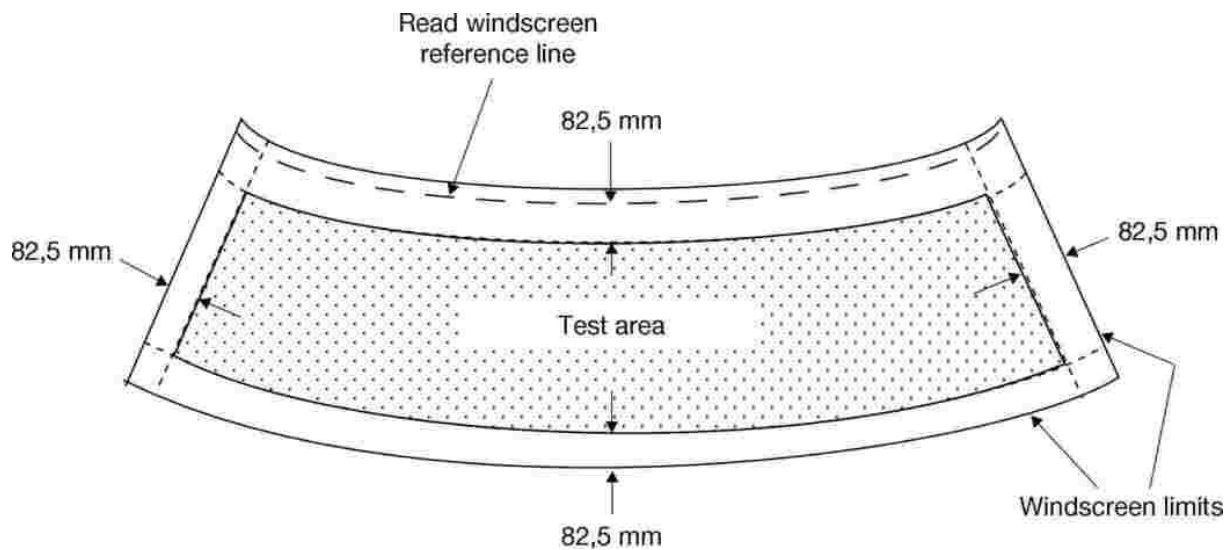
As passenger cars come in an ever increasing variety of market segments/classes (e.g. minis, family cars, SUVs) and tend to have a rounder front shape, Euro NCAP pedestrian testing protocol now focuses on the injured body region and an alternative definition of the area to be tested<sup>4</sup>. In particular, the protocol 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 to crush depth (space before immovable objects such as the engine are hit) or deformation stiffness, in particular if more curved fronts are adopted, can improve vehicles' performance in a testing of their front areas. The FIA Region I recommends to use the Euro NCAP pedestrian protection testing approach as reference for testing of cars' front end, that can lead to upper leg and pelvis injuries.

<sup>3</sup> J A Carroll, et al., 2014, Pedestrian leg form test area assessment Final report

<sup>4</sup> Euro NCAP, 2015: <http://www.euroncap.com/fr/pour-ing%C3%A9nieurs/protocols/pedestrian-protection/>

## Windscreens



Current Head to windscreen test

The adult-head-to-windscreen test records values when an adult's head is projected into the centre windscreen area. The windscreen is the most frequent source of head injury<sup>5</sup>, and head injuries represent 80% of all serious and fatal pedestrian injuries. Data available suggests that, since 46% of cars meet the current test performance threshold, more should be done to improve the safety of the windscreen area<sup>6</sup>. 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<sup>7</sup>. GIDAS 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<sup>8</sup>. Consequently, FIA Region I recommends for the test to be performed at 40 km/h instead of 35km/h.

*The windscreen area is the most frequent source of head injury. Head injuries represent 80% of all serious and fatal pedestrian injuries*

<sup>5</sup> Otte D, Severity and mechanism of head impacts in car-to-pedestrian accidents, IRCOB, 1999 (figures from GIDAS database)


<sup>6</sup> 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.

<sup>7</sup> Watanabe, R. et al (2012) Research of collision speed dependency of pedestrian head and chest injuries using human FE model

<sup>8</sup> 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

## A-pillars and areas surrounding windscreens

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



A recent study also commissioned by the European Parliament's Transport Committee concludes that the windscreen and its surrounding parts are the most frequent vehicle injury sources for cyclists<sup>9</sup>. These are in particular the upper half of the windscreen, the upper-A-pillars and the roof edge. 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.

Also, at the base of the windscreen, it is likely that the head of a VRU would penetrate the glass sufficiently to hit the dashboard underneath. 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. While it is not easy to address, some manufacturers are investigating the use of deployable protection systems such as windscreen airbags. In a context of increased promotion of cycling, cost benefit analysis of solutions to improve A-pillars as well as windscreen edges and frame protection areas, should be made a priority research area.

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<sup>9</sup> 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.



## 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 injury outcomes. Vehicles with pedestrian detection capabilities are gradually being introduced on the market, with about 30% of new cars tested by Euro NCAP in 2016 equipped with pedestrian detection equipment.

The European research project ASPECCS<sup>10</sup> indicates the following:

- 50 to 75% of pedestrian accidents are foreseeable (i.e. the pedestrian can be detected for a car to brake before the 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 the automotive industry to accelerate efforts to deploy active safety systems that can detect VRUs.

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<sup>10</sup> <http://www.aspecss-project.eu/articles/background.html>

## Conclusion

FIA Region I encourages the adoption of more stringent test procedures to improve the crash compatibility of vehicles with vulnerable road users. An overruling principle should be that efforts are made to ensure 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.





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

FIA Region I is a consumer body representing 112 Motoring and Touring Clubs and their 37 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.

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