Pedestrian Safety - Developments in Crash Worthiness and Crash Avoidance

UN Decade Global Plan
Pillar Three – Safer Vehicles

Presentation by
David Ward, Secretary General
Global New Car Assessment Programme

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Pedestrian Injury In Focus

270,000 pedestrians are killed on the roads every year or 22% of all road traffic deaths.

Most pedestrian fatalities occur in low income countries but they are a major issue in all regions. In high income countries they are taking an increasing share of road deaths as other at risk groups such as vehicle occupants become safer.

In the USA in 2012, 4,743 pedestrians were killed accounting for 14% of crash deaths. In 2002, the 4,851 pedestrians killed made up 11% of crash deaths.

In the EU in 2010 there were 5,582 fatalities accounting for 18% of total deaths. In 2002 the 9,241 pedestrians killed made up 17% of crash deaths.
Crashworthiness for Pedestrians

Since the mid 1990s there has been a significant action to mitigate pedestrian injury during an impact with a passenger car.

Standards have been adopted in Japan, the European Union and in the United Nations (World Forum WP29- GTR No.9) to promote the design of softer and more forgiving car fronts.

Crash rating for pedestrian protection has also been strongly promoted notably by the European New Car Assessment Programme (Euro NCAP).

A series of tests replicate impacts involving child and adult pedestrians where impacts occur at 40kph (25mph). Impact sites are then assessed and the protection offered is rated as fair, marginal or poor.
Improving Pedestrian Protection

Protection can be improved with pedestrian friendly bumpers, which deform when they hit a pedestrian’s leg. Protection is improved if the leg is impacted low down, away from the knee, and if the forces are spread over a longer length of leg.

For the leading edge of the bonnet, improvements can result from the removal of unnecessarily stiff structures.

To protect the head, the bonnet top area needs to be able to deflect. It is important that sufficient clearance is provided above the stiff structures beneath, which would stop this deflection.

On some types of vehicles the engine compartment can be altered to create this clearance, other vehicles use deployable protection systems, to achieve the space.
Innovation Effects

Since 2009 Euro NCAP has included the test in its 5 star test requirement. This has resulted in improved performance by manufacturers. By 2012 cars scoring more than 50% in the tests have reached 88%.

Cars scoring more than 50%
Cars scoring equal or less than 50%

88%
Correlation between Euro NCAP pedestrian score and injury outcome in real-life*

Comparison of mean risk of serious consequences (mRSC) in one and two star cars in different speed limits

Crash Avoidance for Pedestrians

The development of crash avoidance systems such as Autonomous Emergency Braking has opened up significant further potential to avoid and mitigate pedestrian injuries.

Sensor systems are being used to detect pedestrians and enable AEB to avoid or reduce the severity of an impact.

The combination effect of improved pedestrian crashworthiness (passive) and crash avoidance (active) promises further gains in safety for pedestrians.

Lowering collision speed is a vital factor in reducing the risk of injuries. This will maximise the benefit of softer and ‘forgiving’ car fronts.
Potential Speed Reduction from Brake Assist Systems

Reduced Collision Speed with Brake Assistant*

Start of Braking
\[ v_0 = 50 \text{ km/h} \]

Impact with pedestrian
\[ v_K = 40 \text{ km/h} \]
\[ v_K = 35 \text{ km/h} \]
\[ v_K = 25 \text{ km/h} \]

Standard driver

Experienced Driver

Brake Assisted

*The Potential of Car Design and Impact Testing
DEKRA Automobil GmbH, F. A. Berg, M. Egelhaaf
DaimlerChrysler AG, Accident Research
J. Bakker, H. Bürkle, R. Herrmann, J. Scheerer
Testing Effectiveness

New tests for pedestrian safety have been carried out by the ADAC and the IIHS.

The German ADAC has tested five emergency brake assistant systems with pedestrian detection. Good results were achieved by the Lexus LS600h and the Volvo V40. However the ADAC think there is considerable room for improvement, especially in night driving situations.

The IIHS has also begun testing the effectiveness of pedestrian detection to develop a rating system. They have also studied the benefits of the UN (GTR 9) and EU crashworthiness tests and found that they were good predictors of pedestrian injuries and ‘look to be beneficial’.
Global NCAP Promotion of Pedestrian Safety

Global NCAP has written to the car manufacturers proposing a global voluntary agreement to apply the most important UN passenger car safety standards at the latest by 2020. These are:

Reg. 14  Seat belt anchorages  
Reg. 16  Safety belts and restraint systems  
Reg. 94  Occupant protection in frontal collision  
Reg. 95  Occupant protection in lateral collision  
GTR 8   Electronic stability control  
GTR 9   Pedestrian protection  

At last year’s Global NCAP Annual Meeting we gave our 2013 Innovation Award to Volvo Car Corporation for their pioneering work promoting pedestrian protection.
Summary – Key Points on Pedestrian Safety

Priority area for action with positive progress being made in developing new technologies to mitigate pedestrian injury.

Effectiveness of pedestrian detection and automated braking systems looks promising.

Strong potential gains from the integration Design and technology for pedestrian crash protection and crash avoidance.

The UN Decade provides a strong impetus to promote GTR 9 and stimulate consumer demand for vehicles that feature pedestrian safety systems.

Thank You!