

APROSYS Final Event Workshop report

Session 1 Vulnerable Road User: Pedestrians / Pedal Cyclists / Motorcyclists

Agenda

Chairman: Mr Dominique Cesari (INRETS-EEVC)

Champions: Mr Roger Hardy (CIC) and Aquilino Molinero (CIDAUT)

Part 1 Vulnerable Road User Safety – New Test Methods

- 1) Introduction, Mr Dominique Cesari (INRETS-EEVC)
- 2) New test methods for pedestrians and cyclists, Mr Roger Hardy (CIC)
- 3) New test methods for powered two wheelers (PTWs), Mr Aquilino Molinero (CIDAUT)
- 4) Aggressivity index for VRU vs. truck accidents, Sven Fassbender (IKA)

Discussion

Part 2 Advanced Protection Systems

- 5) Advanced protection systems for pedestrians - Solutions implemented on the Fiat Stilo prototype, Mr Roberto Puppini (CRF)
- 6) Advanced Protection Systems for PTWs, David Manzardo (Dainese) and Angel Martínez (HIASA)

Discussion

Presentation summary

1) Introduction – Mr Dominique Cesari (INRETS-EEVC)

Early efforts to reduce pedestrian casualties were identified ranging from the 1920's to a 1975 ESV with a pedestrian catcher. The history of EEVC activities relating to pedestrian safety were reviewed, from WG1, to WG7, to WG10 and finally WG17. The brief that guided the WG10 and 17 activities was outlined and the test methods that were developed were reviewed. The pending questions and outstanding issues for each test were reviewed. The EEVC activities enabled Europe to be first in the world to require pedestrian protection improvements and pushed other countries to do the same. They also served as a basis for Consumer tests.

2) New test methods for pedestrians and cyclists, Mr Roger Hardy (CIC)

Sub-titled 'Developments to more widely address real world accident scenarios' this presentation reviewed the methods developed in WP3.3 of the APROSYS Integrated Project covering head impacts, leg impacts, the needs of cyclists and the application of the test methods. First, the accident statistics that clearly identified the need for action on vulnerable road user safety improvements were reviewed and the priority accident scenarios involving leg impacts and head impacts were defined. A new adult headform impactor was reviewed that enabled angular accelerations to be monitored for a fuller assessment of injuries to the skull and the soft tissue of the brain. A further head impactor for assessing injuries to the skull from edge or localised loading was outlined to address issues raised by deployable bonnet systems.

Developments to enable a proper assessment of knee injuries during impacts by high bumper vehicles were outlined and involved the addition of an upper body mass representation on top of the EEVC leg impactor and the FlexPLI. Amended test to address the differences between cyclists and pedestrians were outline in the leg and head impact regions – raising the leg impactor and extending the adult head impact zone. Finally, a proposal to use a hybrid test procedure was outlined that would tailor impact parameters more closely to vehicle shape and also assess injury potential more closely by utilising a finite element model of the head.

3) New test methods for powered two wheelers (PTWs), Mr Aquilino Molinero (CIDAUT)

The need to address powered two wheeler safety was reviewed by reference to accident statistics and injury causation Two different but critical real world accident scenarios for powered two wheelers were reviewed – run-off and run-into. Test methods to quantify the safety of road infrastructure when struck by a motor cyclist after they have been thrown from the motorcycle were outlined and also to determine the working parameters for new passive safety systems implemented in the motorcycle or the rider garment. The steps in the development of an upgraded infrastructure testing procedure were outlined and demonstrated. Some modifications to anthropomorphic test devices (dummies) were identified and the head, neck and thorax evaluation criteria were defined.

4) Aggressivity index for VRU vs. truck accidents, Mr Sven Fassbender (IKA)

The accident statistics for trucks in collision with vulnerable road users were reviewed and the greater fatality risk identified. The development of the three component parts of Aggressivity Index was outlined. The structural index that assesses the stiffness of the vehicle front with WG17 adult and child impactor tests, the run-over index that assesses the inter-action between a VRU and a truck in a number of accident scenarios by virtual testing techniques and the active index that geometrically evaluates the field of view of a 50th percentile driver. Means of achieving good scores in these indices were illustrated and the enhancement in VRU protection quantified.

5) Advanced protection systems for pedestrians - Solutions implemented on the Fiat Stilo prototype, Mr Roberto Puppini (CRF)

The advanced protection systems that had been developed and implemented on the Fiat Stilo demonstrator vehicle were reviewed and their performance illustrated. The systems were to reduce leg injuries and head injuries and both utilised deployable systems. For leg impacts a simplified adaptive bumper concept (SABC) was outlined whereby the front bumper deployed forward when the vehicle speed was consistent with urban driving and retracted during higher speed driving on main roads and motorways. For head impacts an integrated airbag system (IHPA) was outlined that raised the rear edge of the bonnet, thereby generating greater under-bonnet clearance, and also provided protection from head impacts at the base of the windscreen and the lower portions of the windscreen A-pillar. Tests with these systems were shown and the results listed for comparison with the standard evaluation criteria.

6) Advanced Protection Systems for PTWs, Mr David Manzardo (Dainese) and Mr Angel Martínez (HIASA)

A literature review and in-depth accident analyses had identified that thoracic injuries to motorcyclists can be severe and most head injuries derive from chin impact. Therefore, a new thorax protector and helmet were developed. The stages in the development of these items were illustrated through the use of virtual testing techniques, manufacture of prototypes and safety assessments by practical testing. The safety improvements achievable with these devices were illustrated.

The development of a motorcyclist protective device (MPD) at safety barriers was outlined. Current safety barrier design considers impact by vehicles having four or more wheels and understanding the needs of motorcyclists from in-depth accident analyses was a critical first step. Reconstruction of representative impacts was conducted and the results compared with accident data. The crash test parameters, injury assessment and mechanical performance parameters that would be used in practical assessment of the protective device were identified. The development of the motorcyclist protective device at safety barriers through an iterative design process was reviewed. Design validation tests were performed and the consequent benefits to motorcyclist safety were demonstrated.

Description of the discussion

Since the presentations were very descriptive there were no major questions on the technical content. When considering what safety needs had not been addressed there were a number of comments on aspects of the work presented.

It was commented that tests on the MPD had been conducted on straight sections but in real life these run-off accidents occurred at bends. Further, it was commented that moves towards wire rope barriers for cars may not be suitable for motorcyclists and presumably further development would be needed to interface the MPD with a wire rope barrier.

A comment was made concerning the use of a motorcycle mounted airbag. This had not been considered during APROSYS since previous research work had been conducted.

In reply to a question on the development of the new helmet it was commented that the concept behind the new chin protection part had been patented. This raised a further comment on the patentability of ideas and concepts generated in APROSYS but the Consortium Agreement is clear on this matter and encourages Partners to protect their ideas for future exploitation.

With respect to the truck Aggressivity Index it was asked if the class 5 mirror mandated from March 2009 had been considered. In fact it had and also the means of evaluating its performance in the active index tests.

Concerning the IHPA there was a comment that an airbag to cover the whole windscreen may be advisable. In response it was pointed out that the volume of such an airbag would require a very much larger gas generator, that inflation would take much longer and that the timing associated with the two previous items may be too long to afford any measure of protection to VRUs.

A comment was made that for impact testing on the vehicle windscreen there would need to be an evolution in the current directive. Further that there was a great distinction between the needs identified by research and what could be adopted into regulation. There were cost-benefit considerations to be assessed in addition to the justification for a change and the benefit in terms of fatalities saved and a reduction in injury severity. An initial route through Euro NCAP was most likely to be far easier for any new test methods relating to VRU collisions with cars.

Conclusions, highlights, actions and recommendations

New Test methods

- Pedestrian and cyclists
 - New tests methods lend themselves to introduction by Euro NCAP and regulatory bodies
 - Timescale for adoption varies
 - Cyclist measures could be adopted relatively quickly
 - Pedestrian UBM for legform requires further development and validation
 - Pedestrian head and neck and head edge impactors also require further development
 - Full costs benefit analysis would speed process
- Motorcyclists
 - New tests methods need to be accepted by regulatory bodies
 - In principle adoption could be started quickly since the evaluation criteria are straightforward
 - Full costs benefit analysis would speed process
- HGV
 - New test methods involve a virtual testing and practical testing approach
 - Acceptance of VT in regulations will need concerted action

Advance protection systems

- Pedestrian and cyclists
 - Advanced protection systems shown could be brought forward to production reasonably quickly in the case of the IHPA but the SABC would take longer
- Motorcyclists
 - Thorax protector and helmet close to production
 - Motorcyclist protective device (MPD) longer term due to need for extensive roadside installation - cost benefit considerations

Which safety needs have not yet been addressed?

- Pedestrian and cyclists:
 - Emphasis on major injuries sustained
 - Scope to address other body regions that sustain injuries e.g. thorax injuries

New needs triggered by APROSYS results?

- Re-affirmation that head impacts on car windscreens should be given higher priority in legislation
- Solutions to motorcyclist accidents are available and need to be adopted
- Solutions to VRU to truck accident injuries are available and should be used

Stakeholders for APROSYS results?

- Test methods: Euro NCAP, regulatory bodies, safety lobby groups
- Advanced protection systems: vehicle manufacturers, tier 1 suppliers, barrier manufacturers, motor cycle clothing manufacturers

Evolution of regulations

- Distinct difference between research conclusions and adoption into regulations
- Cost benefit considerations play a very significant role
- Gain and justification equally important

Introduction of Protection systems

- Normal commercial considerations apply
 - Will consumer pay?
 - How much will they pay?
 - Effect on safety image of company?