

STATUS REPORT, EUROPEAN ENHANCED VEHICLE-SAFETY COMMITTEE (EEVC)

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INTRODUCTION

The European Enhanced Vehicle-Safety Committee (EEVC) was formed in February 1971 in Rome and has been active in participating in the ESV-programme since that time. EEVC comprised 8 members representing the administrations in charge of vehicle safety regulation from France, Germany, Italy, the Netherlands, Poland, Spain, Sweden and the United Kingdom.

During those four decades the environment of pre-regulatory research in the field of vehicle safety in Europe (and world-wide) has considerably evolved and it was necessary to realign EEVC to keep up with the future challenges. Therefore the EEVC Steering Committee agreed on new Transient Terms of Reference [1] which allow more flexibility and open EEVC to non-EEVC countries.

NEW TRANSIENT TERMS OF REFERENCE

EEVC, which has contributed to the former IHRA activities from the beginning, is convinced that pre-regulatory safety vehicle research has to be approached at a world-wide level; within that objective the Steering Committee of EEVC has confirmed that non-EEVC countries can participate at WG level to share their research.

The EEVC Steering Committee had an internal reflection on its future and how to determine future research directions and priorities.

As a result of the discussion new Transient Terms of References (TToR) were agreed.

According to the new TToR the objectives of EEVC are:

- to provide impartial scientific advice to support the development of European vehicle safety standards and legislation,
- to co-ordinate European research activities with regard to harmonised vehicle safety regulations,
- to support specific research, evaluate technical proposals and define scientific tools (such as biomechanical criteria, test dummies, test procedures) needed for further development of technical standards and legislation,
- to advise European governments, the United Nations Economic Commission for Europe (UNECE) World Forum for Harmonisation of Vehicle Regulations (WP29), and the European Commission including their groups of experts on vehicle safety, in the area of vehicle safety improvement,
- to organise, upon request, European representation to international research groups in the area of vehicle safety,
- to advise other groups if called upon, on issues related to vehicle safety,
- to promote enhanced vehicle safety by publishing research results

The government of any EU member state, which has sufficient scientific capacity to carry out practical research relevant to vehicle safety and is willing and able to contribute effectively to coordinated EEVC research programmes, may become a full member of EEVC.

Application for membership by the government administration in charge of vehicle safety regulation of an EU member state shall demonstrate that it has sufficient scientific capacity or is in a position effectively to contribute to EEVC research. Application shall be made to full members who shall agree to its membership unless one-third of the existing full members object.

At the end of each year, the secretary general shall ask all the full members to indicate to each other their volunteer to continue and to participate actively to the EEVC work for the year to come.

In case of negative answer of a full member, this full member shall be designated as “sleeping full member” and shall not be part of the steering committee for the year to come with no possibility to vote.

The full members of the year 2015 are France, Germany, Italy, the Netherlands, Poland, Spain and the United Kingdom. It is worthwhile to note that some of these members are members of Euro NCAP, too.

The EEVC Steering Committee has decided that the setting of the research agenda is the critical parameter in the further work of the EEVC, for both the scope of its activities and its priorities. It was agreed that short term and longer term research needed to be considered together.

NEW EEVC WEBSITE

The old EEVC website has been subject to major hacker attacks and was shut down for this reason. In 2014, the new EEVC website (www.eevc.org) has been launched. The web site serves as an information platform for all interested parties, both EEVC members and external, with a broad pool of documents/publications. Moreover, it is a useful tool for coordination and publication of the EEVC work, as well as for the internal data and information exchange. Each working group/task force has its own member area with the opportunity to promote their work, share documents and make it available for the members before it will be published in the public area of the website.

ADVANCED ANTHROPOMETRIC CRASH DUMMIES (WG 12)

This working group is the longest active Working Group within EEVC. The scope of the Working Group includes adult as well as child crash dummies and corresponding injury criteria.

Child Dummies

The main work of EEVC WG12 during the last years was related to child safety. From a study completed in 2008 [2] it was concluded that the Q dummies offer a major step forward compared to the current P dummies used in UNECE Regulation 44. The Q family consists of a new born, a 9 month, a 1.5 year, a 3 year and a 6 year old dummy. The 10 year old version of the Q dummies was developed within the framework of the European project EPOCH [3].

The objective of the work of WG12 was to advise on the Q family for child safety in the new UNECE regulation 129 on "Enhanced child restraint systems".

The main focus of the work was on the Q10 dummy. One report regarding the Q10 dummy was finalized so far "Q10 dummy Report - Advanced Child Dummies and Injury Criteria for Frontal Impact" [4]. The purpose of this report was to advise on an upper limit child dummy for frontal impact including advice on abdominal load sensing and injury criteria and corresponding tolerance.

Currently EEVC WG12 is working on a second report regarding the Q10 dummy, "Advice on the Q10 dummies for side impact testing". It will focus on the side impact biofidelity improvement of the Q10 dummy updated by a side impact kit. The dummy with this kit was evaluated in pendulum and Heidelberg type side impact sled tests and showed an improved biofidelity compared to the standard Q10.

WG12 will continue to work on a third deliverable "Advice on the use of the thoracic compression criteria balanced with possible abdominal pressure", which will be mainly based on review of the work conducted by a EEVC task group especially dedicated to this topic (see below).

Whiplash Dummies/Seat Performance Criteria

After completion in 2008 of an extensive evaluation of various crash dummies for low-speed rear impact, from which it was concluded that the BIORID is the most suitable dummy for this type of accident [5]; WG 12 has focused its activities on seat performance criteria (whiplash criteria). In Dec. 2010 an interim report on the analyses of real world (insurance) data was finalized. The main finding of this preliminary study was that the neck injury criterion NIC and upper neck shear force seem to be the best predictors for short and long term neck complaints following a rear-end impact.

The work on this topic continued using a larger insurance database and new seat tests with the BIORID dummy in order to verify and further elaborate on these initial findings. This EEVC WG12 report "Evaluation of Seat Performance Criteria for Future Rear-end Impact Testing" was provided to the UNECE GTR no. 7 informal group on head restraints and the BioRID Technical Evaluation Group (BioRID TEG) to serve as a basis for discussion [6] at a Group of Experts Whiplash Injury Criteria Meeting in September 2014 in Berlin in advance of the IRCOBI conference. However, the discussion on suitable injury criteria for whiplash associated disorders for regulatory purposes is still ongoing.

Further Work of WG12

In 2009 a status report concerning the 50th percentile adult male WorldSID dummy was completed [7] and in 2010 a status report concerning the 5th percentile female WorldSID dummy [8]. The development of the 5th percentile female WorldSID dummy has been carried out within the European R&D project APROSYS. An extensive international evaluation of this female dummy is still taking place and members of EEVC are participating in the Informal Working Group for Side Impact dummies that is considering the appropriateness of the 5th percentile female WorldSID for future regulations.

However, the 50th percentile adult male WorldSID dummy has been adopted as a regulatory tool for the GTR No. 14 on Pole Side Impact which was established in the Global Registry on 13th November 2013 [9].

Since the beginning of 2015 Euro NCAP is also using the 50th percentile adult male WorldSID dummy in its updated side [10] and pole test procedure [11].

Further work of EEVC WG12 during the last years includes advice on injury criteria for frontal impact dummies. Proposed injury criteria for the Hybrid-III 5% female to be used in an updated ECE R94 test procedure including a full width frontal test were revived. Furthermore the use of a proposed chest deflection criterion DEQ based on chest deflection measured in Hybrid III dummies and seat belt force was discussed within WG12.

SIDE IMPACT PROTECTION

The car side impact problem in Europe remains substantial and a frequent cause of fatal and serious injury. For this reason, the EEVC's Working Group 13 has been active over years in providing advice concerning measures to reduce the risk of injury to road vehicle occupants in the event of a side impact and issued a report in March 2010. In this latest period, the working group focussed on determining the accident and casualty profile of European side impact accidents, and considered the development of a modified barrier based, pole and interior headform test procedures. The societal benefits and associated costs of a series of potential options for the modification of UNECE Regulation 95 were also considered.

French, Swedish and UK national data were analysed and showed that around one quarter of car occupant casualties are injured as a result of a side impact. However, this rises to between 29% and 38% for those fatally injured, illustrating the more injurious nature of this type of collision. In side impacts 60% of casualties are 'struck side' (SS) occupants and 40% are 'non-struck side' (NSS). The proportion of fatal casualties in simple car to car or car to pole impacts is substantial, 50% and 67% for the United Kingdom and France, emphasising both the relevance and importance of the mobile deformable and pole impact tests.

An analysis to estimate the likely societal benefits for modifications to UNECE Regulation 95 was completed for Great Britain; this highlighted that there is still much benefit to be gained from the side impact safety measures in place today for Europe (i.e. UN-ECE Regulation 95 and Euro NCAP). However, the introduction of a regulatory pole test (to the current Euro NCAP specification with full dummy assessment) into the existing UN-ECE Regulation 95 would deliver significant benefits to society in terms of fatal and serious injuries.

Whilst the configuration of the current Regulation 95 barrier based test remains relevant, it is accepted that a more representative barrier is desirable and supportable from a safety perspective. Key characteristics of a revised test have been defined, though further work is needed to finalise the specification of the AE-MDB barrier Version 3 before it can be considered for use.

An analysis of National and in-depth data has been identified as the requisite first step towards better understanding of the injuries to non-struck side occupants, their associated mechanisms and determining the effectiveness of potential countermeasures.

Euro NCAP has taken the outcome of the AE-MDB research on board. An expert group of former WG13 and APROSYS members preceded the work after WG13 was formally put on hold.

Based on the recommendation of the expert group Euro NCAP focussed on the final stiffness corridor design followed by an accreditation process for the barrier manufacturers.

From 2015 onwards the AE-MDB replaces the ECE R95 barrier in Euro NCAP testing [10].

IMPROVEMENT OF CAR CRASH COMPATIBILITY AND FRONTAL IMPACT

The working group on compatibility was initiated in 1996 and worked with methods to test and evaluate compatibility in frontal impacts as well as improve frontal impact protection. Compatibility within the working group is understood as both partner and self protection as compatibility should not compromise existing safety levels.

Research activities included national research programs as well as European projects like the 5th Framework project VC-Compat and the FP7 Project FIMCAR. WG 15 conducted experimental tests, computer simulations,

and analyses of different databases to understand and describe the key issues in crash compatibility including structural interaction, global force levels, and compartment strength.

The results of the FIMCAR project identified the need for both full width and offset frontal impact tests in regulations. Test protocols, evaluation criteria, and benefit analyses were developed in the project and provided to the UNECE Informal Working Group on Frontal Impact. Although not all results for the FIMCAR project were accepted the incorporation of a full width rigid barrier test is under final review by the UNECE working party on passive safety (GRSP).

EEVC CURRENT ACTIVITIES

Restart of WG21

On its December 2014 meeting the EEVC Steering Committee decided to reactivate EEVC WG 21. It was the feeling of the Steering Committee that an independent look on the current accident data is needed with regard to detect research priorities on vehicle (and road) safety for the future. There might be still white spots but also a critical review of what has been reached in the last decade shall be undertaken.

The outcome of this research shall help to determine future research directions and priorities.

THOR Task Force

The main role on this work item of WG 12 was to advise on an advanced frontal dummy for regulatory use with appropriate injury risk functions. For this purpose WG 12 followed closely the international activities concerning the THOR dummy taking into account the recommendations formulated by EEVC in 2006 [12]. Specific to lower leg injuries, EEVC WG 12 published a study in March 2009 addressing the THOR-Lx Design and Performance [13].

Meanwhile the production version of the 50% percentile male THOR-M is available and the first THOR-M dummies have been delivered to Europe. There are also some older THOR upgraded with a special THOR ModKit. NHTSA is in the process of the federalization of the THOR.

Euro NCAP has recently published an updated roadmap [14] in which the use of the THOR in an advanced frontal impact test procedure is announced.

However, there are still a lot of open issues related to the use of the THOR for regulatory purposes and consumer testing. Therefore a new EEVC task force which is open to all interested parties willing to contribute shall work on those open questions.

Q Dummy Chest and Abdominal Injury Task Force

The CASPER project failed to develop injury risk functions for the Q-dummies' chest because there were only few valid accident cases available with AIS 3+ injuries for frontal impact and only 2 valid cases with AIS 3+ injuries for lateral impact. In addition in a number of accident reconstruction cases chest deflection measurement data was not available.

Abdominal injury risk functions were developed within the CASPER project for Q3 and Q6 only due to a lack of instrumented dummies of other sizes.

Accident reconstruction was outside the scope of the EPOCH project in developing the Q10.

This is why some interested parties (BAST, Britax, Dorel, Humanetics, IFSTTAR, LAB, TRL, TUB/VFSB, UTAC, VTI) started a Q Dummy Chest and Abdominal Injury Criteria Task Force in April 2013. No funding was available for the program at this status. All partners are contributing on a voluntary basis or are securing support by their own means. After the start of the Task Force other organizations joined (e.g. ADAC, BMW, PDB).

It was the feeling of some of the involved parties that a more formal structure or umbrella was needed to improve the support and speed up the work of the group. This is why EEVC has taken this task force under its wings. The task force is chaired by Dr. Heiko Johannsen.

Results shall be reported to UNECE GRSP for further consideration on regulation, EEVC WG12 and Euro NCAP.

The objective of the task force is to deliver a scientific basis for the definition of chest and abdomen performance criteria. The participants agreed to concentrate on the objectives and to collaborate openly in order to reach the objectives.

New partners that contribute resources to the work described above are welcome.

Further Work

Virtual testing / human body models

The possible use of virtual testing was discussed within WG12. This could be a future work item of a working group. Based on the results of the EC funded project IMVITER project the use of the virtual testing for the regulatory process was discussed. Based on the EU 371/2010 a flow chart was obtained within IMVITER. The developed methodology has been applied with 3 regulatory pilot tests. Both the Virtual Tests and the reference Tests are merged to obtain a response corridor where the model needs to be “included”. As possible application of virtual testing in a regulatory context three options were identified, which could be further evaluated by the working group

- Use the Digital Human Body Models in current type approval process to provide supplementary information where dummies or experimental tools show limitations.
- Use of virtual testing as aid for the definition of test tool based procedures, improving experimental test tool, e.g. impactors or dummies
- Only virtual testing based approval including Digital Human Body Models.

Injury criteria for elderly

EEVC has signed a letter of support for the EC Horizon 2020 SENIORS project (Safety Enhanced Innovations for Older Road Users). The SENIORS project is expected to start in June 2015.

The efforts put the last years in road safety derived to a reduction of almost 48% of total fatalities in Europe, and the number of elderly fatalities due to road accidents has also decreased. However, among all the road fatalities, the proportion of elderly is steadily increasing. SENIORS aims at providing the needed knowledge and enable the suitable tools to reduce the number of elderly fatalities and serious injuries suffered in road traffic accidents in the near future. The increase of the level of protection for the elderly road users will be achieved by the in-depth understanding of the injury causation and mechanisms of this particular sub-group of VRU by enhancing the introduction of advanced safety systems through the implementation of assessment tools for elderly protection based on PMHS studies, volunteer testing and accident data (thus real-based).

The main goal of SENIORS project is to improve the safe mobility of the elderly, including obese, using an integrated approach and real-based knowledge that includes the main modes of transport as well as the particularities of this vulnerable road user group.

Thus, this project will investigate and assess the injury reduction that can be achieved through innovative tools and safety systems targeting the protection of the elderly as passenger car occupants, external road users (pedestrians, cyclists, e-bike riders) and while using other means of transport (such as public buses).

As such EEVC is looking forward to a good cooperation with SENIORS initiative. This is preferably to be established via joined meetings, active contribution in the course of the dissemination activities, next to the participation in Advisory Board meetings.

European part of the Student Safety Technology Design Competition

Three finalist teams from each region (Asia, Europe, North America) compete for top honors at this 24th ESV Conference in Gothenburg where their prototype devices/demonstrators will be on display in the exhibition hall. EEVC has taken over the responsibility for organizing the European part of the student competition ten teams from Europe submitted abstracts. A panel of five judges from Spain, Poland, Germany, France and Sweden reviewed and evaluated the abstracts.

Based on the evaluation some teams have been selected for the competition. In March/April 2015 a panel of judges – members of the EEVC Steering Committee - shall visit the selected teams’ universities to evaluate the developed safety concept and functional design model. Based on the evaluation three teams have been selected for the competition.

The European Commission is sponsoring the European part of the student competition.

CONCLUSION

Since the start of EEVC in 1971 the environment of pre-regulatory research in the field of vehicle safety in Europe (and world-wide) has considerably evolved. EEVC has now realigned and agreed on new Transient Terms of Reference to keep up with the future challenges. The new TToR allow more flexibility and open EEVC to non-EEVC countries. Therefore EEVC is inviting non-EEVC countries to contribute to its activities like the new THOR and the Q dummy chest and abdominal injury task forces.

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