



**EUROPEAN
ENHANCED
VEHICLE-SAFETY
COMMITTEE**

**Status Report for the 20th ESV
Conference**

Dr. Dominique Cesari, Chairman

INTRODUCTION

The EEVC, European Enhanced Vehicle-Safety Committee, exists since June 1974 and has been active in participating in the ESV-programme. We are pleased to present the EEVC Status report containing a summary of the most recent results of our work at the 20th ESV Conference.

Advanced Anthropometric Crash Dummies

This working group was originally dealing with adult anthropomorphic dummies, and its scope was recently expanded to child dummies.

In the field of adult dummies, the group considers frontal dummies, especially the THOR, side impact dummies, and rear impact dummies.

After completion of the THOR FT, the group has recently organized a 2-days workshop to exchange evaluation results comparing the two versions of THOR (i.e. FT and NT), and views on possible improvements. EEVC is concerned by dummy harmonization and is expecting to work with other parties around the world to go towards a harmonized THOR dummy.

The group has developed an extensive test and evaluation programme for rear impact dummies (i.e. the BIORID and the RID3), including biofidelity, repeatability and reproducibility. Also Japan was involved in this evaluation. A final report on this work will be available before summer 2007.

The group follows the development of the WorldSID dummy, both the internationally developed 50th percentile male version and the small female version developed in Europe within the APROSYS EU funded project.

Child dummies constitutes another important part of the work done by EEVC in the area of anthropomorphic dummies. This group has started a research aimed at developing injury risk curves for children to be applied to Q series dummies. A report related to child safety activities, including dummy issues, will become available this year.

Side Impact Protection

The working group in charge of side impact protection has developed a roadmap for the coming years, which was approved by the EEVC Steering Committee. The main research topics for the side impact protection are the following:

- 1) Evidence Review: Review the nature of European side impact accidents and consider the likely effects of advances in vehicle technology on the current accident and casualty profile.
- 2) Barrier based test: On the basis of the Evidence Review, and taking account of the most recently available studies, assess the societal benefit of improving the current regulated barrier based test procedure (ECE Regulation No. 95). Review the updated AE-MDB barrier and test procedure as proposed by the APROSYS project and other bodies that have evaluated the barrier and procedure.
- 3) Non-struck side protection: On the basis of the Evidence Review make recommendations regarding necessary research with regard to 'non struck side' occupant protection and the societal benefit of introducing measures to mitigate such injury risk.
- 4) Pole Test: On the basis of the Evidence Review examine the work that has been undertaken by IHRA members, APROSYS and any other groups into the pole test (perpendicular and oblique).
- 5) Review the proposed EEVC interior surface test procedure, including any validation testing that has been completed and, if necessary, refine the procedure such that it is fit for regulatory application.

Compatibility

The work done by EEVC has progressed over the last two years in conjunction with EU funded VC Compat project. EEVC acknowledges that compatibility is a complicated matter.

As the work of VC Compat has just been completed, the group will analyse the results of the project in relation with the objectives of EEVC.

The group has developed two candidate test procedures:

1. A full width frontal impact against a deformable element (FWDB) and high resolution force measurement.
2. A frontal offset impact against a progressive deformable barrier.

The group has developed a large evaluation programme which analyzed the outcomes of car to car frontal tests in order to have a better understanding of advantages and disadvantages of the candidate procedures.

A paper summarizing EEVC activities on compatibility will be presented during the ESV Conference.

Pedestrian Safety

The EEVC working group dealing with pedestrian safety has developed a work plan for the next years.

Based on accident analysis results, the work will focus on six main topics.

The issue of high bumper is approached through understanding of the effect of upper body to pedestrian kinematics and leg/knee loadings, in comparing different bumper heights.

The group is focusing a large part of its activity on the question of A pillar/windscreen impacts. The group prepares a state of the art - including feasibility issues - aiming at developing the test conditions and requirements for head injury assessment in relation to A pillar/windscreen impacts.

Leg injury criteria for pedestrian protection are under continuous discussion and EEVC is involved in that discussion and has developed an approach combining experimental tests and numerical simulation to propose validated injury criteria, especially for knee injury assessment.

The issue of head rotational acceleration is also included in the EEVC pedestrian safety work plan.

Certification procedures for pedestrian impactors were developed without a large experience gained from their use; EEVC is currently making a critical review of these procedures in order to improve them.

Deployable systems for pedestrian protection assessment (such as pop-up bonnet) went into mass production after the EEVC procedure was developed; EEVC is carefully looking at possible additional requirements aimed at proving that those devices work as intended in different crash situations.

EEVC has completed a report on virtual testing for pedestrian protection assessment which indicates that virtual testing would allow to improve pedestrian protection and test procedures. This report will be presented during the pedestrian safety session of the 20th ESV.

Child Protection in cars, buses and coaches

The group dealing with the protection of children is composed of national government representatives. Some of these representatives opt to include the support of technical advisors.

This group was created in 2001 with clearly defined terms of reference:

- Review accident statistics with respect to car child occupants and injuries in all type of car accidents.
- Review research with respect to car child occupant safety.
- Describe the state-of-the-art taking into account all existing regulations .
- Identify lacks in knowledge, methods and tools

Results on the first part of the terms of reference were reported and approved by Steering Committee. In 2003 the terms of reference were expanded to include children in buses and coaches. this is also reported in the document with some recommendations for possible improvements. In October 2003, the European Enhanced Vehicle-safety Committee initiated collaborative research with the group in charge of anthropomorphic dummies in order to investigate the use of the P and Q series child dummies and make scientific recommendations for their future use.

This group has established a link with the child EU project, especially in the area of accident studies. The Steering Committee of EEVC is considering the continuation of this group with new terms of reference.

Rear Impact Protection and Whiplash Injuries

EEVC WG20 was formed in 2003 to develop test procedures for rear impacts with a prime focus on neck injury reduction. WG20 is collaborating with WG12 (Biomechanics), which is tasked with recommending dummies, injury criteria and injury risk functions for WG20 test procedures, based on biomechanical evidence.

The Working Group has three test procedures under development:

- A static test of head restraint geometry. A robust test procedure with geometric requirements can ensure head restraint provision is adequate for those occupants taller than the 50th percentile male
- A dynamic test of head restraint geometry, as an alternative to the static test of geometry

- A dynamic, injury risk assessment test procedure, to encourage more advanced and effective solutions than just good geometry

Static Geometric Test Procedure

WG20 has developed a draft test procedure based on the RCAR insurance test procedure, using a 3-D H machine and HRMD. This test procedure has been evaluated for repeatability and reproducibility and a report was published last year by the EEVC (Hynd *et al.*, 2006). It was found that the seat was the most important source of variability and that a reduced torso angle requirement of $25 \pm 0.5^\circ$ (from $\pm 1^\circ$) would have a beneficial effect on reproducibility. Improved certification of the 3-D H machine was also recommended, as the exact geometry of the seat pan and back pan of 3-D H machine is not well specified and is therefore not well controlled. The tool appears to be adequate for determining an H-point, within the tolerance allowed, but this uncontrolled geometry makes repeatable backset measurement more difficult.

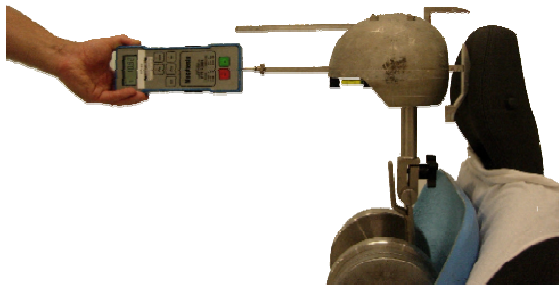


Figure 1: Static backset measurement according to the draft WG20 test procedure.

The selection of height and backset requirements will be derived from a cost-benefit study and are due to be reported in June 2007. Since the draft WG20 static geometry test procedure was evaluated, a number of alternative methods for making height and backset measurements have been proposed to the WG and at the GTR Informal Group on Head Restraints. WG20 is currently evaluating the potential of these proposals.

Dynamic Geometric Test Procedure

The development of this test procedure was adopted as a new task for the WG in October 2006. The aim is to develop a test procedure to measure backset in a dynamic seat test, which is potentially less design restrictive and of benefit for testing active head restraints. It is expected that the test procedure will need to use a biofidelic dummy to ensure correct head-neck movement and seat-back interaction. The test procedure should be a dynamic equivalent of the static geometric test procedure, with no

additional cost-benefit necessary and no assessment of injury risk. It is expected that the procedure will use information from the dynamic injury assessment test procedure programme, such as the pulse, adjustment of the seat and head restraint, and the same dummy.

An initial review of the issues and proposed backset measurement methods is due in the first half of 2007.

Dynamic Injury Assessment Test Procedure

The key tasks for WG20 in the development of a dynamic injury assessment test procedure are:

- Selection of pulse or pulses
- Selection of scope (e.g. seat test, seat and restraint system, or full vehicle buck)
- Definition of adjustment of seat and head restraint

A draft test procedure is due by the end June 2007, which will then be evaluated with the WG12-recommended dummy and injury criteria.

Accident studies

The Working Group dealing with accident studies is aimed at supporting the research activities of other working groups by the provision of accident data and analysis. It has developed links with other working groups and has supplied many sets of data analysis. Principle areas of activity are listed below and a more complete report on activities is given in EEVC¹.

1. Audit of available databases – Summary details of the 46 accident databases available to the group have been prepared.
2. Side airbag effectiveness - A pilot study to explore the feasibility of combining datasets from France, UK and Germany was successfully conducted
3. Lower extremity analysis – An analysis of injury patterns, with special reference to lower extremity injuries was conducted on behalf of WG 12 using data from Sweden, UK and France.
4. Neck injury analysis – An analysis of the circumstances of neck injury was conducted on behalf of WG 20 using data from UK, Germany and Sweden
5. Side impact analysis – a major analysis of side impacts is being conducted on behalf of WG 13 using data from UK, Germany, Sweden, and France.

¹ P. Thomas, Y. Page, G. Vallet, D. Otte, R. Sferco, G. Della Valle, M. Giunti, B. Hoogvelt, J. Paez, P. Magnusson, R. Cuerden. Status report of EEVC WG 21 Accident Studies. Paper 07-416

Enhanced Safety of Vehicles Conference, Lyon 2007.

Virtual Testing

The Working Group dealing with virtual testing has recently drafted a report aimed at describing the current status and knowledge, and making proposals for work extension.

The main contents of the report are:

Chapter 1: State of the art on VT use in safety development

The following subtopics are included in this chapter:

- scope of VT and different tools
- VT for regulation/rating
- checking and managing reliability of results (tools, procedures, ...)
- state of the art in related fields (aircraft, railway,...)
- existing regulation allowing VT
- quality management (definition of the responsibilities and limits of the qualifications)

Chapter 2 : Expected benefits

It is a really ambitious topic to achieve. Expected benefits for the society can be described but cost-benefit analysis is out of reach in this first period.

A presentation was made by the German representative on "Welfare of VT". He pointed that VT can provide stochastic dimensions to testing that physical test cannot do with one crash. The scope extension could be really simple (e.g. small barrier overlap) but always have to be justified by accident data and cost benefits.

The 3 main points discussed are :

- improvement of crash test reliability
- increase of crash tests configurations
- human models instead of more and more complex and expensive test dummies.

The VITES project already found some scenarii not covered by regulation and that could be addressed by VT. A request will be sent to the Accident Study group on accidentology to provide some input on such accident configurations not well covered by physical tests.

New regulatory testing is not always required in case of simple modifications. This is up to the approval authority based on an engineering judgement of the effects of the modifications.

Introducing VT would lead to the possibility to provide an objective base for such a judgement and for harmonisation from one type approval authority to the others. Benefits for the industry are obvious

in the process of vehicle developments. But it is not sure that introducing VT would decrease the number of physical full scale tests to be realized.. For society, governments or customers the benefits are difficult to evaluate.

Chapter 3 : EU funded projects dealing with VT

A review of EU funded programs VITES, ADVANCE, PRISM, RISER, ROBUST, APROSYS (SP4 Motorcycle accidents, SP6 Intelligent Safety System, SP7 Virtual Testing), STORHY, HELISAFE TA involving VT activity is done in this chapter. The review is completed by other known projects (Whiplash, HUMOS, ...) analysis.

Chapter 4 : Relationship with work performed by other group/bodies

The main contact is with ISO WG4. The group stopped dealing with regulation as it seemed to be too complicated to incorporate governmental, certification administration in the process. There is a really good co-operation with this ISO group, which should continue as there are common interests.

Another contact was established with the CEN task group on road equipment. The CEN group chairman provided some input concerning the work this group performs. The questions they are looking at are really relevant to our topics and we intend to exchange in the future.

Chapter 5 : Proposal of terms of reference for a new 3 year mandate

A first list of possible topics to address in a future work period is proposed. For some parts, methodology is already covered by several projects and EEVC could use the results of those studies. The EEVC should consider many different scenarii for VT introduction and will discuss to define which is the most appropriate.

Future of EEVC

EEVC, which has contributed to IHRA activities from the beginning; is considering that there is a need for international cooperation in the field of vehicle safety research. to comply with those thoughts, EEVC took the initiative to set up the Vehicle Safety Research Forum.

It is proposed that a round table forum is created comprising of those Nation States as permanent members, that collaborate through shared resources to research in the field of vehicle safety. At this

time, it would involve the National members of the former IHRA and the individual full members of EEVC - 14 governments in total. Separately, the European Enhanced safety Vehicle Committee continues research in this area and is therefore well placed to share experience and expertise with the Forum. We therefore propose that the EEVC would also have permanent member status at the forum.

A fundamental principle of collaborative research is that the programme is agreeable to those who provide the resource for its delivery: it is not appropriate for third parties to dictate how an individual Nation State's research budget is allocated or managed. Therefore, under the proposed arrangement, the forum would have an advisory rather than controlling function. The forum could not impose research requirements upon the individual members, nor could it veto a research activity that had sufficient member support for it to be undertaken. Similarly, while WP29 would be influential in the decision making process, it would not have a controlling position.