

INTERNATIONAL HARMONIZED RESEARCH ACTIVITIES (IHRA) STATUS REPORT OF THE BIOMECHANICS WORKING GROUP

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ABSTRACT

A summary of the continued efforts of the Biomechanics Working Group to complete its original task given to it by the International Harmonized Research Activities Steering Committee, determining specifications for a Universal Side Impact Anthropomorphic Test Devices, is presented, as is a discussion of new **Terms of Reference** the working group proposed to the IHRA Steering Committee.

INTRODUCTION

This report summarizes the continued activities of the International Harmonized Research Activities (IHRA) Working Group on Biomechanics Research (BWG) for the period from its last report, given at the June 2001 in Amsterdam, Holland on the occasion of the 17th International Technical Conference on the Enhanced Safety of Vehicles, to the present. At the previous June 1998 IESV meeting in Windsor, Canada, the International Harmonized Research Activities Steering Committee specifically directed the Biomechanics Working Group to form a Government only, ad hoc group to determine specifications for a universal side impact Anthropomorphic Test Device (ATD). This task remains the primary focus of the Biomechanics Working Group though efforts in other areas have also been initiated. New initiatives that have been guided by the IHRA Steering Committee's reaction to the BWG's proposed new **Terms of Reference** are also discussed.

DISCUSSION

Terms of Reference

On May 9, 2002, the Chairman of the BWG presented to the IHRA Steering Committee the BWG's proposed new Terms of Reference that are to provide perspective for and guide the future efforts of the BWG. This proposal included the following concepts:

Mission & Objectives:

- Coordinate worldwide biomechanical research efforts

- Develop and document the technical bases for creating a world wide harmonized, family of anthropomorphic test devices with associated injury criteria and performance limits.
- Provide ad hoc biomechanical expertise to other IHRA groups as requested.

Scope:

The efforts of the Biomechanics Working Group shall entail but not be limited to efforts that:

- Analyze available worldwide crash data to quantify the type and severity of injuries resulting from each significant crash mode.
- Identify, analyze, and optimize meaningful injury functions that address the above-identified injuries.
- Review all available biomechanical impact response data to determine both necessary and sufficient specifications to appropriately characterize and verify a test device's biofidelity.
- Examine available tests devices with regard to their biofidelity and injury risk assessment capabilities and either recommend an existing device as appropriate or suggest and execute refinements necessary to upgrade performance to an acceptable level.
- Develop a strategic plan for future biomechanical research.

Action Plan:

- Complete current side impact efforts and provide draft final report to IHRA Steering Committee by December 2002.
- Initiate and pursue efforts to define and develop requirements for adult-sized world harmonized frontal anthropomorphic test devices. Work plan is to be developed by September 2002. Currently anticipated time requirement is approximately 2 years from definition and assignment of tasks.
- Review and prioritize future child dummy research efforts. Work plan is to be

developed by February 2003. Currently anticipated time requirement is approximately 2 years from definition and assignment of tasks.

- Initiate and pursue efforts to define and develop requirements for a world harmonized test device for rear impact injury evaluation and control. Work plan is to be developed by January 2003. Currently anticipated time requirement is approximately 3 years from definition and assignment of tasks.
- Develop a white paper discussing future biomechanical needs. Findings will be presented to the IHRA Steering Committee in the form of interim reports developed concurrently with committee activities. The intention is to create a living document that documents and to the extent possible prioritizes areas of biomechanical research requiring attention.

Meetings:

- Conduct quarterly meetings at various venues to allow participating experts ample and open discussions to arrive at technical consensus

Proposed Deliverables:

- Draft Final Report on Side Impact Test Dummy December 2002
- Draft Interim Report on Frontal Test Dummy - December, 2003
- Draft Interim Report on Child Test Dummies- March, 2004
- Draft Interim Report on Rear Impact Test Dummy - March, 2004
- Draft Interim white paper May 2003 (in time for ESV).

Steering Committee Recommendations:

The response of the Steering Committee to the BWG's ambitious proposal was to direct the BWG to concentrate its efforts on completing its side impact efforts and provide a draft report no later than the Committee's next meeting during the IESV meeting in Nagoya, Japan, May 2003. The Steering Committee also recommended that the BWG undertake and pursue its proposed efforts to define and develop requirements for adult-sized world harmonized frontal anthropomorphic test devices as well as its proposal to develop a white paper discussing future, world-wide biomechanical needs.

The Steering Committee agreed that the findings are to be in the form of a living document that identifies and to the extent possible, prioritizes areas of biomechanical areas of research requiring effort. The other proposals offered by the BWG are to be tabled until substantial progress is demonstrated with the existing assignments.

Because the BWG continues to not have specific financial resources to devote directly toward addressing and resolving technical issues associated with the above tasks, it considers the Steering Committee's decision to limit the number of tasks the BWG undertakes reasonable and that this should assure that current efforts can be completed on schedule. The financial limitations will also require the continuation of BWG's policy to utilize only information that is available either in the current literature or the result of efforts at any of the participating research institutions but will not initiate any separate efforts under its direction.

Emphasis of the BWG's Current Efforts:

The BWG is concentrating the majority of its efforts on the completion of its Side Impact Report. These efforts encompass four major research topics: Characterization of the Global Side Impact Problem (which seeks to identify the commonalities and differences of the side impact problem throughout the world), Anthropometric Characterization of Crash Victims (which investigates the size and mass attributes of the world's side impact population at risk and seeks to determine the necessary and sufficient type and number of test dummies necessary to effect broad safety benefits), Biofidelic Impact Response Specifications (which seeks to characterize and generalize human impact responses into dummy design requirements and provide a quantitative evaluation methodology for assessing the ability of various dummy designs to meet them), and Injury Criteria and Associated Performance Limits (which seeks, through thorough review and analysis, appropriate injury criteria for the various body areas at risk that link features of an occupant's impact response with estimations of the extent and severity of expected injuries. Performance limit recommendations that would provide sufficient reduction of the current side impact injury situation will also be proposed).

Substantial progress has been achieved in each of the four major research areas with early versions of the final report having been drafted. Developing and

reaching consensus in the area of Biofidelic Impact Response Specifications area is and will remain the most difficult technical challenge to the BWG. However, recent technical publications in this area appear to provide a reasonable basis upon which group agreement should be able to be reached.

Efforts to develop Biofidelic Impact Response Specifications for a family of frontal test dummies have also been initiated and are using, as the initial bases, the response specifications derived and used for the design and development of NHTSA's advanced frontal test dummies, the 50th percentile male and the 5th percentile female THOR dummies. Evaluation of the appropriateness, adequateness, and sufficiency of these and other existing requirements will most certainly become a major discussion topics for the BWG group.

SUMMARY

To accomplish its task of developing and providing necessary and sufficient specifications to develop a universal side impact anthropomorphic test device(s) with associated injury criteria and performance limits, the BWG continues to review crash data, anthropometrical data, biomechanical response and injury data. The current consensus among the BWG's participants is that the world side impact problem possesses sufficient significant similarities to allow a definition of a single family of dummy test devices to be made. This single family should be able to appropriately represent the diversity of the world's nationalities as well as be able to monitor and/or control all significant injury and crash modes they experience. The BWG also believes that sufficient information exists for it to accomplish this undertaking and that they can be accomplished within the time frame that the Steering Committee has requested.