Transmitted by the representative of the United States of America

Informal document No. **WP.29-150-04**
(150th WP.29, 9-12 March 2010,
agenda item 18.5)

WorldSID Proposal

Objective of the Proposal

Currently, there are several side impact dummies in world-wide use for regulatory and consumer information purposes. In North America, the ES-2re male dummy and the SID-IIs small female dummy are being used to evaluate the crashworthiness of vehicles in side impact crashes. Countries that follow the ECE R.95 Side Impact testing regulation are using the ES-2 side impact dummy. The ES-2 dummies were intended as interim dummies until the WorldSID dummies were completed.[1] The development of the WorldSID 50th and 5th percentile dummies is now at a point in which international collaboration is necessary to ensure that the final product is a pair of harmonized dummies and associated injury measures that can be used in testing regimes throughout the world.

The United States proposes the creation of an informal working group to fully develop the WorldSID 50th and 5th dummies under the Side Impact topic on the Program of Work. This working group would complete the tasks necessary for these dummies to be incorporated into existing and new regulations. These tasks include finalizing the drawing packages, developing and validating certification procedures, evaluating biofidelity, evaluating durability, ensuring good repeatability and reproducibility, and developing injury measures and criteria for each dummy.

History, Description, and Status of the WorldSID dummies

<u>WorldSID 50th Male</u>
Development of the WorldSID 50th Male began in June 1997 with a resolution by the International Standards Organization (ISO) ISO/TC22/SC12/WG5 to establish a task group. This task group consisted of many government and industry organizations worldwide. Through this collaboration, the group conducted extensive testing and evaluation, and prepared the drawings and users manual. In 2008, the group finished the biofidelity assessment. They are currently working on risk curves for the injury measures and a practical seating procedure.

The WorldSID 50th Male dummy has a standing height of 1753 mm, seating height of 911 mm, and a mass of 77.3 kg. It has symmetrical response (left/right) and is able to be used in side impacts up to ±30° from the pure lateral impact direction. The dummy biofidelity was evaluated using both the ISO TR9790 method and the National Highway Traffic Safety Administration (NHTSA) BioRank method[2]. In both cases, the WorldSID dummy was shown to have considerably better biofidelity than the ES-2re. NHTSA's preliminary evaluation of the

[1] Wisman, Jac, "EEVC WG12 WorldSID Presentation," presented in Washington, D.C, November 5, 2009.
[2] Rhule, H.H.; Maltese, M.R.; Donnelly, B.R.; Eppinger, R.H.; Brunner, J.K.; Bolte IV, J.H, "Development of a New Biofidelity Ranking System for Anthropomorphic Test Devices," Paper No. 2002-22-0024, Stapp Car Crash Journal, Vol. 46, 2002.

dummy's durability, repeatability, and reproducibility indicate that the dummy appears to be suitable for regulatory testing.[3]

WorldSID 5th Female

The development of the WorldSID 5th female dummy began in 2004 and was coordinated under the Advanced Protection Systems project (APROSYS). This group was a consortium of 51 partners, including automobile manufacturers, suppliers, research organizations, and universities, and led by TNO. This group developed a working prototype of the dummy and conducted biofidelity, reproducibility, repeatability tests, and preliminary injury criteria. The group effort was completed in March 2009. Additional durability and component and system testing will be necessary.

The WorldSID 5th female dummy was designed to the anthropometric specifications defined in a study conducted for NHTSA[4] and has a total weight of 48.3 kg. The biofidelic responses of the dummy female dummy were scaled from the WorldSID 50th male dummy. In biofidelity testing conducted by APROSYS, the WorldSID 5th female was found to have a similar biofidelity rating to that of the WorldSID male and superior biofidelity when compared to the SID-IIs.[5] A series of tests conducted on three dummies showed the results to be repeatable and reproducible. Additional pole tests conducted suggest the dummy is suitably robust.

Benefits

In addition to the benefits gained from having harmonized side impact dummies, both WorldSID 50th male and 5th female dummies have demonstrated improved overall biofidelity, when compared to the current test tools. The WorldSID 50th 's expanded capability includes an improved shoulder range of motion and displacement measurement, more human-like shoulder and thorax motion, improved external oblique biofidelic response, and abdominal displacement measurement capability. With over 130 possible data channels, these dummies also offer onboard data acquisition capability. Finally, it will be possible to do a more thorough analysis of benefits once there is consensus on the injury criteria and the associated risk curves for both dummies.

Next Steps & Timelines

The WorldSID 50th male dummy is closer to being finalized than the WorldSID 5th female. At a November 5, 2009 meeting of parties interested in a collaborative effort to finalize the development of these dummies, the group developed a list of issues to be resolved and tasks to be completed (See Attachment 1). An additional meeting is necessary to establish a proposed timeline for completion. It is recommend that the established working group provide progress reports to GRSP and necessary updates to WP.29 to ensure the effort is making progress at the necessary pace.

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[3] Rhule, D, "Status of WorldSID 50th Male and 5th Female ATDs", presented in Washington, D.C., November 5, 2009.

[4] Schneider, L.W.; Robbins, D.H.; Pflüg, M.A.; Snyder, R.G., "Anthropometry of motor Vehicle Occupants", Final Report DOT-HS-806-715 NHTSA, 1983.

[5] Eggers, Andre; Schnottale, Britta; Been, Bernard; Waagmeester, Kees; et al., "Biofidelity of the WorldSID Small Female Revision 1 Dummy," Paper Number 09-0420, Enhanced Safety of Vehicles Conference, Stuttgart, Germany, 2009.

Summary
The development of both the WorldSID 50th male and the WorldSID 5th female has progressed to the point that a collaborative effort among all regions of the world will result in the finalization of 2 harmonized side impact dummies. Everyone can benefit from the combined effort to complete these more biofidelic dummies. Governments gain by leveraging resources to produce a superior test tool to be used in regulations to decrease side impact crash injuries and fatalities. Manufacturers benefit from reducing the cost of development, testing, and fabrication of new vehicles. Finally, consumers benefit by having a better choice of vehicles built to higher, globally recognized standards providing a better level of safety at a lower price. Therefore, it is recommended to establish the informal working group to finalize the development of the WorldSID family of dummies.

ATTACHMENT 1 – Task Definitions

50th WorldSID:

1.) Drawing Package
    a. 2D and/or 3D
        i. 50th drawings available from ISO website
        ii. Need to clean up (define specs, etc.)
        iii. Specify on-board Data Acquisition System (DAS) (independent of vendor)
            1. modeling approach?
                a. FE or rigid body methods?
            2. inertial property tolerances
            3. comparison of on-board vs. umbilical equipped dummy response
    b. Location...UN/ECE website (globally)
        i. Issue of quality control/maintenance
2.) General
    a. Are all world regions interested in this dummy?
    b. What are potential benefits over existing technology?
    c. Debate in GRSP on these questions necessary and how to do this effort within the GR
3.) Injury Risk Functions
    a. Statistical method selection
        i. Cooperative effort under Petitjean ISO group
        ii. Need to define schedule and expertise
4.) Seating procedure
    a. Draft is complete. Need regions to give feedback. Spring 2010 document on WorldSID website.
5.) Advanced instrumentation
    a. Multi-axis deflection measurement
6.) Data
    a. Provide availability of NHTSA test data and report of WorldSID.
    b. Repository of test data (worldwide)
        i. Data quality issues need to be determined
7.) Testing
    a. Full vehicle

5th Female WorldSID

1.) Drawing Package
    a. Process of how/when of availability needs to be determined
    b. 2D and/or 3D?
    c. On-board DAS (issues same as 50th)
2.) Certification procedures
    a. Already in users manual
3.) Biofidelity
    a. Test plan needs to be determined
        i. APROSYS did 9790 tests
            1. Review tests completed and should others be done? High severity tests were not done, but need to be considered
        ii. NHTSA test plan similar to WorldSID 50th?
        iii. Additional PMHS tests for matched comparisons
4.) Durability
5.) Repeatability & Reproducibility
    a. Need more dummies and plan to test
6.) Other Action Items
    a. EEVC report (APROSYS report) on WorldSID5th needs to be completed and circulated.
    b. Transport Canada : Test plan presented at November 5, 2009 meeting
    c. JAMA testing: testing complete (biofidelity and car-to-car test). Get results.
    d. Manufacturers may interested in testing
        i. Process to get dummies for testing
    e. Need to develop overall action plan for dummy (Informal group item)
    f. ISO WG5 Preliminary Work Item agreed
    g. Consider a worldwide project manager (similar to WorldSID 50th)
    h. Review Petitjean document for testing that should be done and data required for risk curves

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