CONFIRMED MINUTES

IHRA SIDE IMPACT WORKING GROUP

14th MEETING

MELBOURNE, AUSTRALIA

21 - 22 FEBRUARY 2002

1 ATTENDEES

Keith Seyer	(Chair)	Department of Transport & Regional Services, Australia
Craig Newland	(Secretary)	Department of Transport & Regional Services, Australia
Mark Terrell		Department of Transport & Regional Services, Australia
Dainius Dalmotas		Transport Canada
Richard Lowne		EEVC
Joseph Kanianthra		National Highway Traffic Safety Administration, USA
Stuart Southgate		OICA North America / AAM (proxy for Michael Leigh)
Minoru Sakurai		JASIC / JARI
Hideki Yonezawa		JMoT
Michiel van Ratingen		EEVC

APOLOGIES

Nobuhiko Takahashi (OICA Asia Pacific), Christoph Muller (OICA Europe) and Michael Leigh (OICA North America) all apologised for their inability to attend. Stuart Southgate attended on behalf of Mr Leigh to represent OICA North America.

2 MODIFICATIONS TO AGENDA

It was agreed to add "Discussion of the status of draft test procedures" as a standing item to the agenda for future meetings.

Several other items were also added to the agenda:

Item 9.4 A discussion on "Dimple Effects" [TC];

Comment: These 3 items renumbered to match text of minutes 09MAY02.

Item 10.4 ES-2 Test Results [NHTSA];

Item 10.5 IIHS Barrier discussion.

Mr Lowne intended to discuss EEVC MDB Tests under Item 7.1 and Interior Headform Tests as Item 7.2.

The following items were deleted from the agenda for this meeting:

Item 8.1 Door aperture and wheelbase measurements - inclusion of front/rear R-point separation [NHTSA, Australia, TC, Japan] was postponed.

Item 9.2 Japanese side impact fatal data – gender, age and seating position [Japan] was postponed;

Item 9.3 Non struck side injuries based on global data- single occupant vs occupant-to-occupant interaction [TC] was postponed;

Item 10.2 IIHS MDB to Megane and Freelander to Camry [TC] was postponed;

Item 10.3 Further analysis of full scale tests using IIHS barrier [Japan] was postponed;

The modified agenda has Document Number SIWG XXX Rev2.

3 MINUTES OF THE PREVIOUS MEETING

The draft minutes of the thirteenth meeting, held in Geneva were amended. Details of the Japanese representative based in Geneva and the dummies used in JMOT full scale tests using an SUV and the IIHS MDB were incorporated into the minutes. The details of the front structure of the new Ford Explorer were also clarified.
The amended minutes of the thirteenth meeting have document number SIWG 139 Rev 3.

4 REPORT FROM IHRA STEERING COMMITTEE

The next meeting of the IHRA Steering Committee is scheduled for 09-10 May 2002 in Washington D.C. A Status Report for the Side Impact Working Group is required for this meeting. Mr Seyer has undertaken to circulate a draft SIWG Status Report to members by early April.
Mr Kanianthra commented that it had been decided to hold a panel discussion on the last day of the ESV 2003 conference in Japan. This session would cover the work of the IHRA Side Impact and Pedestrian Safety working groups.
Mr Newland informed members that John Hinch from MHTSA had requested copies of IHRA SIWG documents for the IHRA website, specifically confirmed minutes, progress reports and terms of reference. These are to be available on the website accessible to the public. Documents had been previously provided in December 2000, however, these were subsequently found to be illegible after transmission to NHTSA. Mr Newland to provide relevant documents to date to Mr Hinch.
Mr Seyer to circulate a final version of the Vehicle Safety 2002 conference paper to members.

5 REPORT FROM WORLDSID TASK GROUP

Mr Dalmotas and Mr Sakurai provided a brief update on activities of the WorldSID Task Group.
At the ESV 2001 conference in Amsterdam, 2 papers were presented and the dummy was publicly displayed. Two papers were also presented at the 2001 Stapp conference.
Biofidelity testing has indicated the following overall biofidelity ratings according to ISO TR9790:

Head	Excellent
Neck	Marginal
Shoulder	Fair
Thorax	Good
Abdomen	Fair
Pelvis	Marginal

The shoulder appears to be too soft, and design modifications are likely to comprise additional damping and a stiffer shoulder plug. The half-arm will be modified to fit the UMTRI shell.
The pelvis force is too high. The bone will be softened, trimmed and thinned and the upper thigh mass will be redistributed.
The neck still requires flexion/extension evaluation.
Mr Dalmotas commented that design modifications to one body part may have an effect on the biofidelity performance of other body parts due to a redistribution of loads. For this reason, the biofidelity rating of the neck may be influenced by the shoulder modifications.

A total of 8 WorldSID dummies are to be purchased with 64 channels. Approximately USD$300,000 for a WorldSID dummy with 64 channels of instrumentation and data acquisition. Three dummies are to be purchased by the Asia Pacific, 2 by Europe (a 3rd is pending) and 4 for the Americas. Upgrades to final specification are included in the purchase price.

Mr Southgate questioned whether the dummy manufacturing tolerances would affect biofidelity. He stated that the EuroSID pelvis loading was highly variable from dummy to dummy. Mr van Ratingen said that this effect was compounded by certifying the dummy at a severity that was to low, but did concede that some variability would arise due to manufacturing tolerances. It was too early to predict the size of this variability or to comment further.

The WorldSID is scheduled for SIBER tests (Europe) 1st/2nd Quarter 2002, focussing on angle sensitivity (off axis loading). JAMA tests are scheduled for 2nd/3rd Quarter 2002, with NHTSA tests also planned for this period.
Pre-production prototypes should be available October 2002.
Production dummies (regulation ready) are anticipated to be available 1st Quarter 2004.

Mr Kanianthra asked whether the planned testing included new biofidelity requirements, such as those of the NHTSA. Mr van Ratingen stated that SIBER was planing to test against the IHRA biofidelity requirements, which would include the NHTSA tests.

5.1 Chairman's comments to WorldSID Task Group regarding shoulder load cell

Mr Seyer advised members that he had conveyed the IHRA SIWG's view on the shoulder load cell to the WorldSID Task Group. This document has reference number SIWG 154.

5.2 OICA position on 5th percentile WorldSID funding.

OICA provided a response to the suggestion at the previous IHRA SIWG meeting that it may be appropriate for industry to fund the development of a 5th percentile WorldSID as the industry would gain the most benefit by harmonisation of this dummy. This response has document number SIWG 155.
OICA Comments on 5th percentile WorldSID.

- Proposed to ISO WG5 May 2001 by Mr Seyer.
- Approved by ISO WG5 Committee
- Needs further approval to become a work item
- Then a method to develop the dummy would be defined
- Packaging issues: DAS; instruments
- Pelvis & femur different to 50th male
- OICA to discuss funding after project definition
- SIDIIs (good biofidelity) may make it difficult to gain OICA funding approval

6 REPORT FROM IHRA BIOMECHANICS WORKING GROUP

No report. Next meeting scheduled to be held 06-07 March 2002.

7 REPORT FROM EEVC

7.1 EEVC MDB

Mr Lowne provided an update on the EEVC proposal for a new MDB face (document SIWG 156).
The proposed EEVC honeycomb now has the following characteristics:
Keep existing block 4 stiffness.
Blocks 5 and 6 now have same stiffness as the current block 4, but a different size and profile.
Blocks now labelled A-F not 1-6.
Bottom outer blocks stiffened considerably. Centre bottom block softened.

7.2 EEVC Headform

Mr Lowne provided an update on the development of an EEVC interior headform test (document SIWG 157). The EEVC drafting is responsible for drafting the headform test for IHRA SIWG.
This work has been conducted in 4 phases.

Phase 1 Selection of Headform.
Options:

- EEVC adult pedestrian headform (spherical)
- AAMA spherical headform
- FMVSS201 (Hybrid III head without nose)

Spherical headforms were initially assumed to be more repeatable, but this was found to be an incorrect assumption. The free motion headform was found to be superior at identifying hard spots behind padding. Additionally, in the interests of harmonisation, the FMVSS201 headform was adopted.

Phase 2 Guided or Free Flight?
A guided impactor has problems with transverse loading, with the response dependent on guide/control system. Free flight is better.

Phase 3 Develop draft test procedure.
Accident analysis was conducted to determine contact zones.
The test vehicle is to be rigidly supported off its wheels. There is also a requirement to support vehicle structure behind the struck area. Maximum displacement of vehicle exterior must be less than or equal to 30mm. Additional support can be added to achieve this.
A calibration of the FMH with EuroSID response was conducted. FMVSS201 correlates with forehead strikes on Hybrid III head. EEVC wanted a similar procedure for side impact. The EEVC has adopted FMVSS 201 correlation equations.
The EEVC has been investigating the determination of worst case location within a given area. No conclusions yet.
There is potential for subsystems (component) tests for development, but regulation would require a full vehicle to be tested.
The suitability of EuroSID for pole testing (investigation of deployable devices) is being investigated.
The identification of target points is based on FMVSS201. Points are limited to those struck in side impacts ±45° of perpendicular. Exclusions of target points is as per FMVSS 201.
The EEVC has also investigated rotational effects by conducting tests with and without the CoG aligned with impact location.

Mr Dalmotas asked if testing exemptions apply e.g for the area covered by a head curtain. Mr Lowne was not sure. Mr Southgate commented that this issue had been raised at the EEVC. The stowed location would be tested at a reduced velocity, but there was no decision yet on the area covered.
EEVC is only considering struck side tests (no non-struck side impacts). IHRA may wish to consider non-struck side impacts.

Phase 4 Validate draft test procedure.
No work yet.

8 GEOMETRIC STUDIES OF THE FLEET

No new data were provided under this item.

8.1 Door aperture and wheelbase measurements - inclusion of front/rear R-point separation [NHTSA, Australia, TC, Japan]

This item postponed.

8.2 Compilation into single database [EEVC]

Mr van Ratingen presented an early draft of the compilation of global vehicle geometric data (document SIWG 158).
The Japanese and European measurement parameters appear to be similar, however, the US has reported different parameters.
Mr van Ratingen presented some graphs of compartment width versus wheelbase. This showed that cars with a longer wheelbase tend to have a larger passenger compartment. North American vehicles were generally larger, but the compartment size seems to taper off to a limiting value and not continue to increase in proportion to wheelbase. This would suggest that wheelbase is not a good surrogate for compartment size. Furthermore, occupants could be seated in different locations in different vehicles with the same compartment size. Therefore, H-Point locations relative to the wheelbase may be the most useful information for the alignment of the MDB, although the worst case structural interaction may also need to be considered.
Mr Dalmotas requested that the data be presented as H-points relative to mid wheelbase to correlate with existing TC accident and test data plotted this way.

Mr Lowne also asked members if they had any information regarding seating position ("How people sit in cars"). He suggested that occupants actually sit further forward than predicted by the 5th percentile female dummy.

9 ACCIDENT STUDIES

9.1 NHTSA - Relative frequency of males to females in serious & fatal side impacts

Mr Kanianthra presented an analysis of non-rollover tow-away side crashes, based on 1991-2000 NASS weighted data (document SIWG 159). The data was not filtered for single vehicle or vehicle-vehicle crashes or belt use.
The study concluded that injuries to small statured occupants are a small part of the side impact problem. The 50th percentile occupant is still the primary issue and the NHTSA would be unwilling to sacrifice safety for the 50th by using only the 5th percentile dummy. NHTSA is considering tests with the 5th and 50th in both MDB and pole configurations.
In response to a question, Mr Kanianthra commented that it was not likely that LINCAP would use ES-2 before ES-2 was in FMVSS214. He also indicated that LINCAP would probably use a 50th percentile dummy in the front and a 5th percentile dummy in the rear.

9.2 Japanese side impact fatal data – gender, age and seating position

Item postponed.

9.3 Non struck side injuries based on global data- single occupant vs occupant-to-occupant interaction [TC]

Item postponed.

9.4 Dimple Effects [TC]

Mr Dalmotas presented some information collected by crash investigators regarding the deformation of the side structure of the struck vehicle, in particular, trying to identify any "dimple effects", where the door intrusions greatly exceed the B-Pillar intrusion at the same height off the ground (document SIWG 160). Mr Dalmotas was unable to identify any instances of dimple effect in the cases studied. This was noted to be contrary to the evidence reported from Europe.
It was speculated that the different designs of front bumper beams in Europe and North America (driven by requirements such as repairability tests) may be influencing the formation of dimples.

10 TEST RESULTS AND TEST MATRICES

10.1 Non-struck side test using WorldSID [Australia]

Brian Fildes and Ola Bostrom presented the results of a non-struck side impact study. A hardcopy of Monash University Accident Research Centre Report No 147, August 2001, "Improved Side Impact Protection: A Review of Injury patterns, Injury Tolerance and Dummy Measurement Capabilities" was distributed to all attendees. This report has document reference number SIWG 161.
Professor Fildes and Dr Bostrom also presented the results of a crash test study investigating non-struck side injuries (Document SIWG 162). The study included a full scale non-struck side crash test with a PMHS, followed by an identical crash test using BioSID. A sled simulation was then constructed and comparative tests using BioSID, EuroSID and ROD (RollOver Dummy) were conducted. Additionally tests with a modified BioSID (modified spine to make it more flexible) were conducted. The new spine design is a spring that can shear, elongate or bend. The PMHS and modified BioSID both achieved a glancing head contact to the struck side door.
A full scale crash test conducted using WorldSID did not yield a head contact as the dummy became caught and stuck on the struck side seat.

10.2 IIHS MDB to Megane and Freelander to Camry [TC]

Item postponed.

10.3 Further analysis of full scale tests using IIHS barrier [Japan]

Item postponed.

10.4 ES-2 Results from NHTSA

Mr Kanianthra presented results from ES-2 tests conducted by NHTSA (document 163).
20 Crash tests have been conducted, with 3 more planned.

Tests included high severity MDB tests using the IIHS barrier; FMVSS201 pole tests and LINCAP tests.
Component tests have also been conducted - pendulum and rib drop tests as well as seat back pressure maps.
Biofidelity tests have been performed - 19 sled tests with abdomen offset and 10 impactor tests.
No parts were changed during this series, indicating excellent durability of this dummy.
NHTSA is now acquiring shoulder foams, pelvic foam plugs and spare ribs.
A total of 87 rib deflection measurements were recorded during vehicle tests.
There were 2 instances of minor flat-topping - one in a pole test and one in a IIHS MDB test.
No flat tops were observed in oblique pendulum or drop tests.
A total of 57 rib deflections were recorded during sled tests. One flat top was observed.
Mr Kanianthra noted that back plate loads may be a problem. NHTSA are considering limiting back plate loads to prevent off-loading the thorax, or developing a shield to prevent backplate interaction.
Mr Southgate commented that industry would prefer the shield option as they did not wish to redesign vehicle seats to avoid backplate interaction as this was an artefact introduced by the dummy and seat redesign would have no real-world benefit.
Mr van Ratingen said that a shield to protect the back plate (fitted inside the jacket) would need to protect the back plate and follow the thorax contour, but deform and move out of the way as the ribs intrude, without affecting rib deflection responses.

The NHTSA concluded from the tests that ES-2 is capable of discriminating head protection in pole tests. The head/neck/shoulder kinematics were comparable with SID-H3, as were the head loading and timing. ES-2 predicts higher thoracic injury than SID-H3 (ES-2 thorax injury assessment based on ECE R95 criteria; SID-H3 thorax injury assessment based on TTI).
In IIHS and SUV tests, ES-2 rib deflections did not exceed the maximum range, and ES-2 is able to detect loads from the armrest.
In LINCAP tests, 3 of the 3 passenger cars tested recorded ES-2 injury values that were above the permissible limits, whereas the SID-H3 results for these vehicles were all within the limits.
Therefore, NHTSA would expect a nett improvement in safety by adopting ES-2.

10.5 IIHS Barrier Discussion

The ACEA position on the IIHS barrier was reported (a document forwarded by Mr Muller was tabled). This document has reference number SIWG 164.

It was noted that IIHS had made a decision to use a 1900 kg MDB with 400 mm ground clearance of the barrier face, testing at 50 km/h with a perpendicular impact.

Mr Southgate said that there had been to many changes in a short period of time in the development of the IIHS test. Industry would need to understand what this test will mean for the vehicle and then to deal with it.

Mr Lowne commented that the EEVC would like to see harmonisation, possibly with 2 MDB tests, where the more severe test would also ensure meeting the requirements of the less severe test. The EEVC do not consider that the IIHS test would ensure car-to-car crash requirements are met, because the IIHS face is too stiff and does not produce dimple effects and loads the thorax more and the pelvis less than a car-to-car test.

11 Status of Draft Test Procedures

Members positions with respect to aspects of the test procedures were added to the agenda and as a standing agenda item for future meetings.
Mr Southgate had generated a base document that was modified at the meeting, but is intended to be a living document, updated over time. This document has reference number SIWG 165 Rev1.

12 FUTURE WORK PROGRAM FOR IHRA SIWG

There was a discussion of issues to be investigated by the group and the types of tests that may provide information to resolve some of these issues.
Mr Southgate was asked about the differences between the Ford Focus in Europe and North America. He replied that the sheet metal was slightly thinner on the US variant, primarily due to the use of imperial gauge material instead of metric. The doors were the same in both Europe and North America, but the seats were different because Europe has more stringent seat requirements.
It was proposed that Daimler-Chrysler would be able to provide useful input to the group by conducting a computer simulation using an existing ECE R95 model and modifying this model to meet the proposed new MDB test requirements, such as the IIHS and EEVC MDB tests.
A test matrix to evaluate the EEVC proposal of 2 MDB tests, where the more severe would ensure meeting the requirements of the less severe test was discussed. The following was suggested:
Use the Renault Laguna II as the target vehicle (regarded as a good design for a passenger car)
1. IIHS barrier with SID IIs dummies front and rear.
2. ECE R95 test with SID IIs dummies front and rear.
3. New EEVC barrier (wider stiffer, chamfered) with ES-2 dummies front and rear.
4. New EEVC barrier (wider stiffer, chamfered) with SID IIs dummies front and rear.
5. IIHS barrier with ES-2 dummies front and rear.
Tests 1 and 2 were seen as the most essential.

Members reported on the progress of drafting of test procedures:

OOP (TC)
NHTSA found that some extra positions may be required for worst case. Suggested 4 or 5 variations may be needed (the current 12 tests would increase to

17 tests). Mr Dalmotas replied that some of this may be in the wording of worst case in the current IIHS specification. He suggested that 1 or 2 extra conditions may be needed, rather than the 4 or 5 suggested by NHTSA.

Headform Test (EEVC)

Mr Lowne requested TC to provide test film evidence of head contact to door below the belt line to be considered at the next EEVC WG meeting. This could modify the current proposal for test target zones. Current progress on this work reported under Item 7.2 at this meeting.

Pole Test (NHTSA)

Some modifications for the thorax, but a draft already exists.

MDB (Australia)

Not yet started as still too many issues with insufficient agreement.

13 NEXT MEETING

The next meeting will be held 20-21 May 2002 probably in Paris, (in between GRSP - Geneva and Vehicle Safety 2002 Conference in London). Mr Southgate was tasked to find a venue.

The following meeting is planned for 16-17 September 2002 in Munich (just before IRCOBI, also in Munich). Mr van Ratingen was tasked with finding a venue, possibly from BMW.

14 MEETING CLOSED.

CRAIG NEWLAND

12 March 2002.