

Minutes GTR-7 IG Meeting 3, Geneva
17 May, 2010

1 Approval of the Agenda

1. Sled pulse, Injury criteria.
2. Progress of BioRID drawing package (Denton/FTSS).
3. BioRID Calibration and repeatability and reproducibility (Japan).
4. Seating procedure: Upright configuration (Japan).
5. Effective height proposal (Netherlands).
6. Review of working group timeline and progress report (Japan).

The Chairman welcomed the attendees to the third GTR-7 IWG Meeting and gave an overview of the objectives for the meeting. He noted that following this meeting work should start on the draft document for GTR-7 Phase 2, in order to identify what is complete, what gaps remain, and what the progress is expected to be.

The agenda was approved without changes.

The group was reminded of its Terms of Reference, agreed by WP.29, including evaluation of the injury reduction effects and the cost-effectiveness of the proposals.

The Chairman noted that VDA and the SAE are discussing the HPM machine calibration process at the moment, and suggested that the outcome of these discussions should be considered for inclusion in the proposals for the GTR.

2 Sled Pulse, Injury Criteria

2.1 Draft Status Report of the BioRID TEG

Presentation from Bernd Lorenz, Germany:

Mr Lorenz noted that the last official GBUM meeting was on the 22 January 2010, Chaired by Mike Beebe of Denton; thereafter the BioRID update effort has transferred to the TEG, which he was honoured to chair. The TEG met in February, March, and April by Webex, and the next webex meeting will be on the 22 June.

Mr Lorenz gave an overview of the recent progress of the TEG:

Neck forces (GM, Denton)

Rising neck forces were observed during a test series with a single dummy. It was found that a standard Hybrid III skull cap was fitted to the BioRID used for the tests. Once a correct BioRID skull cap was fitted the problem was resolved. Denton have developed a modification to the dummy such that the wrong skull cap part cannot be

fitted. It is expected that a Tech Note will be issued to notify all users of this issue and of the modification made to resolve it.

Harmonised drawings (Denton, FTSS)

Most parts have been analysed and discussed, and agreement reached on tolerances. It is expected that this task will be completed by the end of June 2010.

Improved certification test procedure corridors (Denton, FTSS, et al.)

The existing certification test does not discriminate between dummies, and has no head restraint (HR) to limit head rotation and check neck forces during HR contact. Repeatability and reproducibility (R&R) problems were also observed with the foam used to control the certification pulse.

Progress on new certification procedure(s):

- New sled designed, built and tested
- Foam replaced by a spring-damper system
- Artificial head restraint added
- First draft of certification corridors proposed by Denton on the basis of a number of tested BioRIDs
- Further testing / improvement in progress

Spine set-up for different seat back angles (Japan, PDB)

Current BioRID is typically used with torso angle of ~25°. However, there is an argument for using the design torso angle and may be steeper, particularly for vans.

Progress

- New spine adjustment tool provided by Denton
- Tests performed by PDB and Japan
- At steeper torso angle there is interaction with the standard jacket
- Further work is needed to resolve the issues observed in the tests

2.2 Upright Design Torso Angle Seating Trial

Presentation from Mr Asada, Japan:

Background information on the Japanese car and light commercial vehicle fleet was presented (from HR-6-13), showing design torso angles from 11 to 25°. The design torso angles for different vehicles was grouped: typically 20-25° for cars, and 11-17° for light commercial vehicles. In more upright seats, the BioRID head cannot be levelled (which is required for the seating procedure). The backset is always too large c.f. the target backset from the HPM/HRMD.

Therefore, it was suggested to have a second torso spine comb to set the spine to a more upright posture. Japan has performed trials with the standard comb and the new, upright comb. The T2 angle was 37° with the standard comb, 52-53° with new comb.

The spine curvature was measured at each vertebra for both combs, each with and without the jacket. Fitting the jacket straightened the spine when set with the new comb and made it quite close to the standard spine curvature.

Seating trials were undertaken with the standard and upright combs/spines. The head was still tilted forward with the new spine configuration and could not be levelled for a 10° design torso angle seat. The backset was also too large (186 mm c.f. target of 112 mm). The head could be levelled for a 14° design torso angle seat, although backset was too small (96 mm c.f. target of 112 mm).

A similar trial has been undertaken by PDB with very similar results. PDB found that a design torso angle of 15° could be accommodated, but more upright design torso angles could not be accommodated by the modified dummy spine shape.

It was noted that Mr Davidsson has previously reported that the upright spine shape is not based on anthropometric data; it is a pragmatic shape to get the more upright posture. It was stated that the suitability of the spine shape needs to be verified, and that the jacket and calibration tool modification need to be studied further. If necessary, tentative alternative proposals may need to be studied, e.g. static backset option.

The Chairman recalled that Mr Davidsson had reported that the original design of the dummy allowed the option to have different spine postures. However, it is clear that the scientific background to the spine shape needs to be investigated. He noted that the jacket loads the spine when set to a different torso angle and questioned whether it will be necessary to develop a new jacket to go with the more upright spine configuration. The group will need to decide whether this should be treated as a second, later deliverable and who has resource to put towards solving this issue, before making a further proposal to WP.29.

Asada san noted that there is no formal position on this from Japan at this time, but it seems difficult to deliver the upright BioRID in the same timeframe as the standard dummy.

Mr Lorenz noted that the TEG is looking for advice on this in order to prioritise its activities. It seems clear that the TEG should prioritise the standard seating position - is this OK for the IWG?

Asada san commented that it would be useful to identify how many vehicles have seats in the 10-20° design torso range in order to understand what priority is needed for this issue. Mr Frost asked OICA if they could provide information on the number of vehicles with different seating angles. OICA confirmed that they would provide this information in time for the September meeting. **Action OICA** to collate information on design torso angles in the fleet, including cars and light commercial vehicles, and to present this information at the September meeting.

2.3 R&R Study with the new BioRID Calibration Method

Presentation from Asada San, Japan:

Four test types using three dummies

- Current certification method
- New certification method (no HR)
- New certification method (with HR, 70 mm backset)
- Sled tests with delta-*V* of 16 km/hr

The dummies used were number 02G (used for about 7 years, new jacket); 95G (used for about 1 year); 102G.

Certification test findings

Some difference between the dummies was observed regarding head rotation with the current certification method; similar magnitude of difference with the new sled (no HR). Very similar results were observed for other metrics with existing and new (no HR) certification tests.

With new certification test with HR, some differences in upper neck Fz were identified between dummies at ~100 ms. Lower neck Fz was quite different for the three dummies.

No damage was observed in any of the tests (in contrast to the results presented previously by Korea).

Sled test findings

Sled tests used the 16 km/hr Euro NCAP mid pulse. Normal, passive and reactive HR seats were used, and the same three dummies as in the certification study.

Normal seat. Peak values from sled test are much higher than either existing or new certification test (with or without HR). Upper neck Fz certification variation did not seem to influence this measure in the sled tests. For lower neck, peak values were also much higher than certification with HR. Lower neck Fz had much variation in certification with HR *and* in the sled tests. It seems that the HR contact phase is important at least for lower neck Fz. CVs good, except for upper neck My (CV=13.8 - but actually small peak value, so small variation - suggest a minor issue), and lower neck Fz (CV=10).

Passive seat. Very similar results. Not so much effect on lower neck Fz; some effect on lower neck Fz (matching the certification with HR results).

Active HR seat. Very similar results for lower neck Fz.

Summary:

- All peak values from sled tests are higher than certification tests (with or without HR)

- Upper and lower My have high CV, but the values are small so this is not a problem
- Upper neck Fz variation is smaller in sled tests than certification (with HR) tests
- Lower neck Fz variation is large, *and is also large* in certification tests with HR
- Therefore, some correlation between the new certification test with HR and sled test results, particularly around head restraint contact time, was identified

Mr Lorenz noted that it looks like all the loads in these seats are higher than the Euro NCAP capping limits. Asada san commented that the three seat types used are relatively old and lower loads may be expected for a new seat design. However, the results indicated a 5-29% risk of injury according to the thresholds suggested by Dr Ono at the Washington 2009 meeting. **Action Asada san** to compare the results with the Euro NCAP thresholds.

Mr Frost asked whether the TEG should be focussing on the certification with a head restraint, although the exact nature of the head restraint is yet to be finalised. It seems that the severity of the certification test may need to be higher. Mr Lorenz commented that this needs to be looked at more closely in the TEG, but the loads presented by Asada san seem higher than typical, so certification severity may be OK.

Mr Frost commented that the Group need to define the important part of the certification in terms of time, e.g. focussing on the time of head to head restraint contact. Mr Lorenz replied that this was raised in the TEG. BioRID, even in current form, has repeatable kinematics, but more variable kinetic measures. It would be useful for the TEG to have some guidance on the criteria that may be used. The dummy may already be OK for some criteria. Mr Frost noted that at the Washington meeting, Dr Ono presented some preliminary injury/performance criteria and these are the only ones proposed so far.

2.4 Draft Status Report of the BioRID TEG (Continued...)

Presentation from Bernd Lorenz, Germany:

R&R (Denton, Ford, PDB, et al.)

Denton are currently examining a number of issues that may influence reproducibility:

- Jacket stiffness
- Cable exit at the head
- Friction of steel ropes
- Lower spine

Differences might be identified by new certification procedures for components, such as are already used e.g. for the knee sliders on the Hybrid III. Need to make clear

what the build level is for all results that are presented. **Action All** to identify clearly the build level of dummy for all results presentations.

Outlook

Attendance at the webex meetings is good. The discussions have been fruitful and support from the participants is good. Testing and further research is in progress. Mr Lorenz reported that he expects the TEG to be able to propose a schedule/timeline to make BioRID ready for regulation by Autumn this year.

3 Effective Height Proposal (Netherlands)

Mr Ammerlaan (NL) was unable to attend due to transport difficulties caused by the volcanic ash cloud, so this item was postponed until the next meeting.

4 Review of Working Group Timeline and Progress Report (Japan)

Presentation from Asada san, Japan:

Mr Asada presented a list of open items and suggested timescales for their completion. The table of items and timescales was updated to reflect the discussion of the group.

Regulatory text for lower speed testing to be delivered May 2011 (Step 1).

Text for higher speed testing will follow, perhaps by 2012, subject to confirmation of the schedule for Step 2. Mrs Meyerson noted that NHTSA have completed dummy sled tests, and hope to finish the PMHS tests for presentation at the September meeting.

New height method. Aim to close by September 2010. Mr Frost noted that Mr Ammerlaan has confirmed that the Netherlands has research underway on this, but he was not sure of the timeline. It was agreed to put September as the schedule, but it was noted that this may need to be revised on the basis of advice from Mr Ammerlaan.

Sled pulse. Delta-v 16 or 18 km/hr proposed by Japan for general injury; 20 km/hr proposed by Japan and EEVC for long-term injury. The IWG should decide by September which speed will be chosen for Step 1 (standard torso angle tests). Mr Frost asked if the US will be ready in September to give input on the moderate speed - if others are prepared to propose 18 km/hr and the US wanted 18 km/hr for a moderate speed, could we harmonise on one test? Mrs Meyerson commented that the US will provide information on this at the next meeting, but noted that currently the US proposal is for moderate speed at 24 km/hr and low speed at 16.7 km/hr (the FMVSS 202a pulse). **Action US** to finalise US position on delta-v for low and moderate speed tests.

Evaluation indicators. NIC, upper and lower neck Fx, Fz and My proposed by Japan. Finalise selection in September 2010. Dynamic backset recommended [in draft form] by EEVC, and proposed by Japan as an update to UNECE Regulation 17. Finalise by September 2010.

Reference value. Dynamic backset criteria proposed by Japan. Put forward firm proposals for reference values by September.

Drawing package and calibration of HPM/HRMD. VDA proposal completed. Draft expected by May 2010, but subject to ongoing discussion between VDA and SAE on implementing/finalising the VDA proposal. **Action OICA** to distribute an update on progress with VDA/SAE discussions on finalising HPM/HRMD ahead of the September meeting.

Drawing package for BioRID. Update expected at the June 22 TEG meeting. Target July for completion.

Certification procedure. Denton proposal completed. Target September for a draft document.

Durability. No problems except those reported by Korea. **Action Korea** to update the IWG about these durability concerns. **Action All** to report any durability concerns. Mr Frost reminded the Group that Ford had identified the use of the body block on the sled to prevent damage to the lumbar spine of the dummy. Target July to finalise this.

R&R. Japan has reported its recent findings, but it was noted that further trials will undoubtedly be needed once the dummy and certification procedures are finalised. Mr Lorenz commented that the TEG should understand by September where the remaining issues are, but finalisation of this task will not be until 2011 - exactly when depends on the position identified in September.

Biofidelity. Japan and EEVC completed. US biofidelity assessment is under discussion. Asada san asked if the US would be in a position to agree/disagree with the EEVC/Japan biofidelity findings in September? Mrs Meyerson commented that the testing should be finished by September, but that the complete biofidelity ranking may take until October. The US will also compare the Annex 9 dynamic geometric test and the 202a test to see if the two approaches rank seats in the same way. Mr Frost noted that if the seat rankings are inconsistent both procedures may need to be reviewed. Mrs Meyerson commented that preliminary results suggest that the is ranking similar. OICA commented that the biofidelity assessment applies to the dummy used for 25° seating position and asked if further work needed to be done for the more upright version of the dummy? **Decision:** It was agreed that the upright version may require further evaluation of biofidelity, R&R etc.

PADI. Denton manual completed. Target September to include new certification test(s).

Seating procedure for standard seat. Japan proposed procedure with design torso angle. Complete. **Decision:** the use of the design torso angle, not a fixed angle such as 25° in consumer information testing, was agreed. Target December GRSP for finalising procedure.

Seating procedure for upright seat. PDB and Japan are studying upright torso tool but that this may take longer to resolve; it may be necessary to move this to Step 2. The EC noted that this may depend on the volume of vehicles, based on the information to be provided by OICA in September. It was noted that, independent of the size of the affected fleet, there may still have to be a second step in order to avoid slowing down progress with the "typical" seat tests. Mrs Meyerson asked what range of design torso angles can be accommodated by the standard dummy torso shape? Asada san noted 20° is the lowest angle to be confident that the head can be

levelled, but it can be as low as 18° for some seat structures. **Action IWG** to define the design torso angle range over which the standard BioRID can be used. Consideration may have to be given to specifying that seats outside this range are tested at the nearest torso angle, with the provision that the head can be levelled. **Decision:** The text will give a range of design torso angles, with the caveat that it must be possible to level the head.

Moderate or high-speed test. It was noted that the US is studying candidate dummies. Target preliminary results by September, for final decision at November WP.29. Mrs Meyerson noted that there is no US position on the timescale for moderate-speed tests at this time, but that the US should be able to make a statement in September.

5 GTR-7 Items in the GRSP Session

The GRSP session was Chaired by Mrs Meyerson, US.

Mr Hynd presented an overview of the main discussion points, decisions and actions arising from the IWG meeting in the morning.

Asada san presented an overview of the draft Phase 2 progress report.

The next meeting of the GTR-7 IWG was confirmed as being on the 21-22 September in Berlin. The meeting will be held jointly with the BioRID TEG. BioRID TEG webex meetings are held every month, with the next meeting on the 22 June.

Asada san asked the Chair for advice on how to get drawings controlled by UNECE. The Secretary noted that an area has been set aside on the UNECE web site for drawings (www.unece.org/trans/main/wp29/wp29_dummyspec.html). There is a disclaimer to account for copyright issues (*'Any proprietary rights by companies in relation to the dummies listed on this website remain unaffected.'*); nevertheless, the IWG should ensure that there are no copyright issues outstanding before sending drawings to the Secretariat for uploading. Mr Frost noted that the GTR will reference the UNECE drawings as the reference for a qualifying tool, probably the first time this has been done. It will be necessary to address version control, authorisation to modify or update the drawings etc., as well as controls to ensure that proposed updates are referred to the GR Group that prepared the drawings.

The US noted that it is not clear that current systems are suitable for adopting dummies under the 1998 Agreement. Mrs Meyerson commented that dummies may have to be adopted by special resolution. Mr Frost noted that issues regarding the adoption of dummies applies to the 1958 Agreement, also.

6 Decisions and Actions

Action OICA to collate information on design torso angles in the fleet, including cars and light commercial vehicles to establish proportion of fleet with upright seats, and to present this information at the September meeting.

Action Asada san to compare the new sled test results from Japan with the Euro NCAP thresholds (the seat test results appeared high compared with Euro NCAP capping levels, so may be outside range of regulatory need).

Decision: TEG to focus on all proposed seat performance criteria at this stage (NIC, Fx, Fz, My for upper and lower neck). Progress to be reviewed in September.

Action All to identify clearly the build level of dummy for all results presentations.

Action US to finalise US position on delta-v for low and moderate speed tests.

Action OICA to distribute an update on progress with VDA/SAE discussions on finalising HPM/HRMD ahead of the September meeting.

Action Korea to update the IWG about their durability concerns.

Action All to report any durability concerns.

Decision: It was agreed that the upright BioRID version may require delivery on a separate timeline and may require further evaluation of biofidelity, R&R etc.

Decision: the use of the design torso angle, not a fixed angle such as 25° in consumer information testing, was agreed.

Action All to define the design torso angle range over which the standard BioRID can be used and from that define the torso angle to be used in regulation

Decision: The text will give a range of design torso angles, with the caveat that it must be possible to level the head