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Item 16.3 of the provisional agenda
Progress on the development of new global technical regulations and of amendments to established global technical regulations – Gtr No. 7 (Head restraints)

Second progress report of the informal group on Phase 2 of gtr No. 7 (Head restraints)

Submitted by the representative of Japan*

This document contains the second progress report of the informal group on the development of Phase 2 of global technical regulation No. 7 (Head restraints) and amends the first progress report of the informal group on Phase 2 of the gtr (ECE/TRANS/WP.29/2010/136). It is based on the text of Informal document WP.29-153-29 distributed during the 153rd session of the World Forum for Harmonization of Vehicle Regulations (WP.29) (ECE/TRANS/WP.29/1089, para. 90). It is submitted to WP.29 and to the Executive Committee (AC.3) of the 1998 Agreement for consideration. This report should be appended to the amendment of the gtr in the Global Registry.

* In accordance with the programme of work of the Inland Transport Committee for 2010–2014 (ECE/TRANS/208/, para. 106 and ECE/TRANS/2010/8, programme activity 02.4), the World Forum will develop, harmonize and update Regulations in order to enhance the performance of vehicles. The present document is submitted in conformity with that mandate.

I. Objective of this proposal

1. The representative of Japan proposed developing Phase 2 of gtr No. 7. Additional amendments proposed by the United States of America were incorporated in the proposal.[1] He also proposed establishing an informal group for the development of this Phase. The informal group received the mandate to discuss appropriate methods for testing and evaluating injuries due to rear impact crashes.

II. Background

2 At its 143rd session in November 2007, the World Forum for Harmonization of Vehicle Regulations (WP.29) agreed to provide guidance to the Working Party on Passive Safety (GRSP) for the development of the draft gtr on head restraints (ECE/TRANS/WP.29/1064, para. 81) and that Phase 2 of the gtr should consider, as indicated in informal document No. WP.29-143-23-Rev.1, the following issues:

(a) The head restraint height of 850 mm;

(b) The appropriate dynamic test, including the test procedure, injury criteria and the associated corridors for the biofidelic rear impact dummy II (BioRID II).

3. At its 148th session, in June 2009, the Executive Committee of the 1998 Agreement (AC.3) agreed on the two-step approach suggested by the representative of the United Kingdom of Great Britain and Northern Ireland and of the United States of America. This approach considers whether BioRID II can more effectively address injuries occurring in low speed rear impact crashes and focus on reducing injuries in higher speed rear impact crashes as a second step. At its 149th session, in November 2009, Japan submitted to AC.3 a proposal for developing amendments to the gtr, prepared jointly with the United Kingdom and the United States of America, and the revised timetable. AC.3 agreed to develop the amendment to the gtr. As a first step, the amendment work will focus on developing a low speed dynamic test using the BioRID II dummy. Regarding the head restraint height, as a first step the procedures for defining the effective height will be considered. Detailed discussions on dummies will be conducted by a Technical Evaluation Group (TEG), which is to be established under the auspices of the informal group. Drawings detailing the uniform specification of the test tools will be developed and provided to the secretariat as reference material.

4. To address minor neck injuries (maximum abbreviated injury scale 1 (MAIS)) that occur in low speed rear impact crashes, insurance industry groups, such as the International Insurance Whiplash Prevention Group (IIWPG), Insurance Institute for Highway Safety (IIHS) and Thatcham, have been conducting dynamic evaluations of seats. The European new car assessment programme (EuroNCAP) introduced dynamic evaluations of seats in 2008, and the Japanese new car assessment programme (JNCAP) introduced dynamic evaluations of seats in 2009. However, the testing and evaluation methods vary from one programme to another. Additionally, the European Enhanced Vehicle-safety Committee (EEVC) Working Group 12 has been investigating the appropriate dynamic test, to address minor injuries in low speed crashes, including the test procedure, injury criteria and the associated corridors for the BioRID II dummy.

[1] ECE/TRANS/WP.29/2008/115, ECE/TRANS/WP.29/2009/47 and ECE/TRANS/WP.29/2009/48

5. A deeper review of United States of America's initial data shows that while there are a number of AIS 2 and AIS 3 injuries occurring in rear impact crashes greater than 18 km/h, most of the neck injuries, which are the focus of this gtr and which can be evaluated by a rear impact dummy, are AIS 1. For AIS 1 injuries, there are approximately an equal number of occurrences below 18 km/h as there are above 18 km/h. Research from Japan shows similar trends, with a significant number of long term minor neck injuries occurring in the range of 16 – 25 km/h (www.unece.org/trans/doc/2010/wp29grsp/GTR7-02-16e.pdf). An evaluation of research titled "Recommendations for a Low-speed Rear Impact Sled Test Pulse" conducted by the EEVC concluded that most long term minor neck injuries (greater than one month) are sustained at speeds between 16 km/h and 25 km/h (www.eevc.org/publicdocs/EEVC_WG20_Pulse_Recommendations_Sept_2007.pdf). The USA is currently evaluating several dummies and comparing them to cadaver testing at 24 km/h which can be used to help address these long term minor neck injuries.

6. Although previous discussions have differentiated between "low speed" and "high speed", all the research being conducted is at speeds that could be considered to "low speed" with respect to short-term and long-term minor neck injuries. Instead of focusing on test speed, the informal working group should take a comprehensive approach to determining the most appropriate test pulse or test pulses to mitigate minor neck injuries and provide a comparable level of benefits as in the existing gtr No.7 requirements. The group may consider options which would provide additional benefits for focussing long term injuries during the time frame of the work schedule, but if this work was not completed, any discussion of further work in this area would take place at a future date.

III. Subjects for review and tasks to be undertaken (Terms of Reference)

7. With regard to head restraint height, the informal group should decide:

   (a) How to define the effective height;

   (b) The height requirements.

8. With regard to mitigating long-term and short-term minor neck injuries with a dynamic test, the informal group should:

   (a) Define test conditions that reflect accidents in the real world, including the performance of seat backs and head restraints as a system:

      (i) Tests conducted on the whole vehicle as available on the market, and/or on production seats mounted on sleds;

      (ii) Number and conditions of sled pulses.

   (b) Working within the accepted knowledge concerning the mechanism of minor neck injury and other rear impact injuries, identify parameters that may be used to advance developments in occupant protection through, for example:

      (i) Analyzing accidents;

      (ii) Performing volunteer tests (low speed only) and simulations with human body finite elements (FE) models.

   (c) Evaluate dummies that reflect the above mechanism with high fidelity to the human body and which demonstrate an acceptable level of perfection as a measuring instrument:

(i) In particular, the dummy evaluations shall include an assessment of their biofidelity in the critical areas associated with the safety technology under review, their repeatability and their reproducibility;

(ii) Define the dummy sitting conditions to minimize variation in test results;

(iii) Harmonize the test dummy and calibration test.

(d) Evaluate indicators of human body injury that reflect the minor neck and other rear impact injury mechanisms:

(i) For example, measure the relative movement between the upper and lower parts of the neck and the forces applied to each of these parts.

(e) Define reference values which should be based on the results of injury risk analysis and feasibility studies.

9. With regard to evaluation, the informal group should evaluate the effects on reduction of injury and cost-effectiveness of the proposals.

IV History of the discussions

A. Head Restraint Height

10. The Netherlands proposed measuring the height by combining it with the backset to ensure the effectiveness of head restraints for tall occupants. At the second informal group meeting, the Netherlands pointed out that the backset is not considered under the methods of the current Regulation No. 17, EuroNCAP, and IIWPG and proposed a new evaluation method that combines the height and backset. In this evaluation method, measurements are performed at the center only. Measurements according to this evaluation method would require the height to be raised by about 40 mm. Some methodological issues were pointed out, such as remaining uncertainties, reproducibility/repeatability, and hindrance to rear visibility. At the fourth informal group meeting, the Netherlands explained the status of their consideration of new head restraint height requirements. The head restraint height will be considered by measuring the backset based on the 95 percentile HRMD template proposed by the Netherlands. The evaluation of effectiveness had been reported in the accident analysis by EEVC (HR-10-6). Japan pointed out that the evaluation method for active head restraints is necessary and that the timing of its delivery was important. The Chair noted that this topic could run in parallel to the principal issue of developing a procedure for the BioRid dummy. He encouraged the Netherlands to define their proposal as soon as possible and asked that they consider the effect that the most recent changes to regulatory requirements had regarding taller occupants. He also welcomed the cooperation between International Organization of Motor Vehicle Manufacturers (OICA) and the Netherlands to collect data on the head position according to the RAMSIS system by June 2011.

B. Dynamic Evaluation Method

11. Number and conditions of sled pulses for the low speed dynamic test

12. A study on accident analysis and accident simulation tests, conducted by Japan, indicates that, for reducing permanent disabilities, it is appropriate to set the sled pulse at EuroNCAP's medium waveform between ΔV = 16 km/h and 25 km/h. However, Japan found that in the repeatability tests at 20 km/h the results showed large variations due

mainly to variations in the seat deformation. In the future, improvements in reproducibility and repeatability will be studied using a new dummy calibration method.

13. A discussion of appropriate test speeds to evaluate protection against both long-term and short-term injuries was held at the fourth informal group meeting. Evaluation indicators were also discussed. While some countries preferred to set the speeds now, other countries argued that it was difficult to set the test speed until a decision was made on the evaluation indicators and a benefits analysis could be conducted.

C. Accident analysis

14. In Japan, rear impact crashes account for 31 per cent of all traffic collisions, and 92 percent of these result in minor neck injuries based on all accident macro analyses. The accidents occur most frequently (about 60 percent) at a crash speed of ΔV=15 km/h and below. Even at ΔV=20km/h and above, AIS2+ neck injuries account for only 2 per cent, and most of the resulting injuries (60 per cent or more) are AIS1 neck injuries. In recent years, the number of permanent disabilities has increased, and they occur most frequently at ΔV=16-22 km/h, however, these ΔV analyses are based on small accident numbers micro analyses.

15. Evaluation Indicator and Reference Value

(a) Japan gave a presentation at the "meeting of interested experts" held before establishing the informal group. Past studies on neck injuries and volunteer tests have shown correlations between neck strains/strain rates and occurrences of injuries. Risk curves for each case were created based on the results of accident analysis and simulations. Injury indicators that have high correlations with strain rates and can be measured using dummies were extracted. As a result, relationships between strain rates and NIC and between neck strain and neck force (Upper & Lower Fx, Fz, My) were shown, and their risk curves were created. Japan proposes that these be used as the basis for injury criteria. For some indicators, no risk curve could be drawn and other alternative indicators were used.

(b) In addition to the Japanese proposal, EEVC presented another proposal for evaluation indicators on "Dynamic backset", that was submitted during the discussions for Phase 1 of gtr No. 7.

16. At the fourth informal group meeting, Partnership for Dummy (PDB) reported on the evaluation of reproducibility of eight dummies, first presented to the ESV conference in 2009. The reproducibility was poor in the neck force (Fx, Fz, My), while acceptable in acceleration (but cv>10% for NIC) and kinematic behaviour (cv<10% for dynamic backset). However, standard evaluation method for dynamic backset should be prescribed since variability is inherent in video analysis.

D. Dummies

17. Discussions on dummies had been conducted as part of the Global BioRID Users Meetings (GBUM) activities up to the first informal meeting. However, starting with the second meeting, the GBUM activities were incorporated into those of the Informal Group's TEG (Technical Evaluation Group) who hold web meetings approximately once a month.

E. Biofidelity

18. At the "meeting of interested experts", the current status of the study by EEVC Working Group 12 (WG12) and WG20 and results of studies on the biofidelity of Hybrid III, RID3D, and BioRID II were reported on. The biofidelity in volunteer tests at 7-9 km/h was verified using qualitative procedures and quantitative core method, and BioRID II presented the best results.

19. The United States of America reported on the progress of its studies on the biofidelity of dummies and injury mechanisms for the evaluation of AIS3+ injuries in mid- and high-speed rear impact crashes. Based on their results, a seat for sled tests was created. In addition, the biofidelity was compared with data from post-mortem human surrogate (PMHS) experiments, BioRID, RID3D and Hybrid III to determine the most appropriate dummy. The injury mechanisms were also examined to determine and verify the instrumentation to the spine and to define the injury behaviour.

20 At the fourth informal group meeting, NHTSA reported on the results of repeatability/reproducibility and biofidelity research. NHTSA conducted dynamic tests at 17.6 km/h and 24 km/h. They also conducted tests comparing PMHS with Hybrid III, BioRID, and RID3D. Those dummies showed different biofidelity in head displacement and rotation during tests for reproducibility, repeatability, and biofidelity. The ramping-up behaviour was quite different between PMHS and dummies. The evaluation of biofidelity and repeatability will be completed by the end of October and December of 2010 respectively. NHTSA is also conducting tests to compare the sensitivity and reproducibility among dummies. They are comparing results using BioRID II and Hybrid III in seats with large and small backset and waveforms specified in FMVSS 202a and Regulation No. 17 proposal to incorporate a BioRID (Annex 9) to evaluate if the tests rank the severity of backset in the same manner. The testing will be completed in November 2010 and the results will be presented in February 2011. OICA has requested that a biofidelity assessment be done on the rear impact dummy chosen for this gtr, over the range of potential seatback angles.

21 One of the original tasks of the informal group was to develop a low-speed dynamic test, including the test procedure, compliance criteria and the associated corridors for the biofidelic rear impact dummy (BioRID II). As a possible later phase, depending upon the direction of WP.29, the group would consider the possibility of a higher-speed dynamic test.

22. At the fourth meeting, the Chair recalled that the Informal Group was tasked with reporting to WP.29 at its 152nd session (November 2010) and, in particular, to confirm the timetable for the delivery of a proposal for the adoption of the BioRID II dummy into gtr No. 7. He suggested recommending to WP.29 that the period of Phase 2 consideration would be approximately 2 years, aiming for adoption at GRSP in December 2012, with a proposal to WP.29 in June 2013. The suggestion was based on the understanding that research being conducted by Japan and the United States, and scheduled to be completed by the end of 2011, would be successful in establishing injury criteria suitable for evaluation in a regulatory test procedure.

23. Japan commented that BioRID II should be added to the gtr in May 2011 as specified in the original Terms of Reference (ToR), since neck injury is a serious problem needing to be addressed in the regulation immediately. Two options were proposed:

(a) Option 1: A proposal to amend gtr No. 7 will be submitted to GRSP in May 2011 to specify dynamic backset evaluations using either Hybrid III or BioRID II, as a Contracting Party option. Then, as a second step, harmonization of dummy,

evaluation of upright postures, tests at higher speed and mid speed will be considered in 2014 and later.

(b) Option 2: Extend the work schedule of the informal group to require a proposal to amend gtr No. 7 be submitted to GRSP in December 2012, in anticipation that a harmonized dynamic backset evaluation proposal would be made based on the injury criteria using BioRID II only. Then, as a second step, harmonization of dummy, evaluation of upright postures, tests at higher speed and mid speed will be considered in 2014 and later.

24. OICA expressed strong concerns that both of these options would result in a gtr with Contracting Party options.

25. At the 152nd session of WP.29, Japan presented a proposed revision of the ToR to AC.3 to establish the timeline of the group until 2012. This schedule should allow the completion of the injury criteria analysis, but pointed out that if the work was not complete, a detailed BioRID II test would be added to the gtr as an alternative to the existing test (the option already exists as a placeholder). The United States presented an alternative proposal to revise the ToR to allow the group to take a comprehensive approach to address both long-term and short-term minor neck injuries. AC.3 returned the proposals to GRSP, noting that it anticipated a revised proposal to revise the ToR at the 153rd session.

26. At the fifth meeting of the information group it was confirmed that the preference was to deliver a new proposal that could be adopted into the gtr as a single procedure to assess the protection against neck injury. The group also agreed with the recommendation of the United States that the injury criteria that emerge from the ongoing research effort in the US and Japan should guide the development of the final procedure.

27. Japan had associated lower speed tests with injuries at AIS1 level and expressed concerns that any change to address more severe injury levels would take longer than December 2012. It was agreed that AIS1 injuries remain the focus but that, if possible, consideration be given to long term as well as short term injuries.

28. As a result, the group is recommending that GRSP propose amending the ToR to specify that the primary focus of the informal group should be the development of a proposal for the BioRID II that would provide benefits equivalent or better than the benefits provided by the existing option in gtr No. 7. If the group was able to provide additional benefits within the specified time frame it would be permitted to do so, but if this work was not completed, any discussion of further work in this area would take place at a future date.

F. New Head Restraint Measurement Device (HRMD) drawing

29. The current H-point machine is defined in Society of Automotive Engineers (SAE) SAE J826, and the HRMD was developed in the 1990s. For either machine, there are large variations in products available on the market, resulting in variations in the backset measurements.

30. At the second informal meeting, the result of research conducted by the German manufacturer's association (VDA) was introduced. VDA developed a new H-point machine and a testing jig called Dilemma by taking the average of many H-point machines and harmonizing it with the SAE standard. For this, it is scheduled to issue the VDA specifications in February 2010 and to propose it to the SAE as a revision to the standard.

31. At the fourth informal group meeting, it was reported that the draft of 3D CAD data of SAE HADD J826 H-Point manikin was proposed at SAE meeting on October 20. When this proposal will be agreed to at a SAE conference, it will be possible to release 3D CAD

to the public. The measuring method with HRMD is under consideration and will be suggested by March 2011.

G. Dummy drawings (2D & 3D)

32. At the first and second informal meetings, the progress of the drawing harmonization by Denton and First Technology Safety Systems (FTSS) was reported on. The 2D drawing (PDF form), 3D drawing (STEP form) and user's manual are scheduled to be created jointly between the two manufacturers.

33. At the fourth informal group meeting, Humanetics (a company formed by the merger of FTSS and Denton) reported that the drawings had been posted on GRSP website. They also reported that 3D data is ready, but PADI is under revision. They are preparing the list to be included in PADI for checking most recent dummy. The Chair pointed out that a method to clarify the appropriateness of the build level of BioRID II is necessary. The suggestion from Japan to provide PADI along with drawings in a same website was agreed.

H. Certification procedures

34. At the "meeting of interested experts", the history of discussions on the new certification test at GBUM and the summary of those discussions were presented. As regards the new certification test, tests were completed in Japan, the Republic of Korea, the United States of America and Europe. The sled waveform has become flater, showing good reproducibility. At the second informal meeting, it was proposed to change the calibration waveform to match that of the EuroNCAP medium pulse and dummy input. However, the Chair commented that since the Terms of Reference (ToR) of the informal group states that our objective is to specify the uniform method for evaluating low speed impacts and the low speed is defined as V18 km/h or below, we should aim the sled waveform at around 16-18 km/h and discuss the calibration waveform based on the current proposal (GBUM2009).

35. At the third meeting, the BioRID TEG reported on the new certification test method with the head restraint. While the development is heading in the right direction, there are concerns that the head to head restraint contact time is a little too short (10-20 ms). Regarding the presence of head restraint in the new sled, Humanetics will develop a draft of detailed method. It will be evaluated by PDB, Japan, Ford and General Motors (GM).

36. Jacket impact assessment was adopted as another improvement to dummy performance, while pelvis impact assessment was not considered to affect the dummy's effectiveness. The optional Skull CAP switch is to be included in the drawing package.

I. Repeatability and reproducibility

37. In testing, good repeatability is obtained if the same dummy is used. However, there are problems with reproducibility among different dummies. Work to establish a common build level for the BioRID IIg, together with dummy improvements and revised certification tests are being discussed to improve their repeatability and reproducibility.

38. At the third meeting, Japan reported the results of the new dummy calibration methods and sled tests. The same variations in LowerFz that had been seen in the new certification test method with the simulated head restraint were also observed in the sled tests. Accordingly, it is considered effective to use the head restraint in the certification test, especially to minimise variations around the contact time. However, there are differences in

absolute values between certification and sled tests, so will be discussed further September 2010.

39. At the fourth informal group meeting, it was reported that the there was a quite large difference between sled types when one seat was tested for evaluating the reproducibility using acceleration and deceleration sleds. It was difficult to keep the pulse within the corridor when using the deceleration sled. It was also pointed out that the backset changed due to the movement of dummy head during approach. These issues are kept as items to be monitored.

J. Dummy seating conditions

40. At the "meeting of interested experts" and at the first informal meeting, regarding the seating procedures of IWPG and EuroNCAP, Japan made proposals on:

(a) Design reference torso angle,

(b) Reduction of backset tolerance, and

(c) Special adjustment in the case of smaller torso angle (more upright) seats typically used in small N_1 vehicles (especially those with forward control), and explained the reasons for the proposals (GTR7-01-09e).

41. At the second informal meeting, Japan reported that in general the torso angle is at about 15° in trucks and vans, and it proposed to specify an optional spine angle to accommodate these upright seats. Denton Inc. (a manufacturer of BioRID) presented a new spine comb to set the dummy for a more erect seating posture. The appropriateness of the dummy when set to this condition is being evaluated.

42. At the third meeting, regarding the standard seating posture, basic agreement was reached on adopting the design reference angle proposed by Japan.

43. Japan reported the influence of the difference of seating postures at design torso angle and 25 degrees on evaluation. They reported that there was no specific tendency in the difference between two same seat with conditions of JNCAP (design angle, 20 to 25 degrees) or IIHS (25 degrees).

44. Japan reported the results of tests that it had conducted to study the new tool for upright postures using a smaller torso angle (10°) for commercial vehicles. It was found that while the dummy spine could be set to the revised posture when the dummy is equipped with its jacket, its upright posture will tilt forward largely and it is unable to keep its head fully horizontal. For this reason, it was decided that, for applying the upright posture tool, development of the jacket, etc. will be undertaken as a second step.

45. Japan and OICA reported the ratio of seats with upright torso angle in the market. Japan reported that such seats account for 45 per cent of all seats in the Japanese market and pointed out the necessity of static backset option until the dummy representing upright posture is developed.

46. OICA reported that the overall world wide ratio (which includes the Japanese data) of seats with upright torso angle is 12 per cent.

47. It was agreed that work to define procedures to assess more upright seats would not be pursued as a priority at this time but that the static evaluation procedure is kept as an option for these seats until the dynamic evaluation is shown to be suitable for all seat angles.

K. Dummy Durability

48. The neck damper was only damaged in the Republic of Korea, when the new calibration test procedures were performed. Ford pointed out that it is necessary to add a body block to the calibration sled to prevent damage to dummies.

49. At the fourth informal group meeting, it was agreed that the issue experienced by the Republic of Korea had not been seen elsewhere and it was not considered to be a problem.

V. Work schedule

50. First step (under the chairmanship of the United Kingdom and with the technical sponsorship of Japan)

Working Groups	Dates	Venue
"meeting of interested experts"	6/11/2009	Washington D.C.
1st informal meeting	8/12/2009	Geneva, Switzerland
2nd informal meeting	2-3/2/2010	Tokyo, Japan
3rd informal meeting	17/52010	Geneva, Switzerland
4th informal meeting	21-22/92010	Germany
5th informal meeting	6/12/2010	Geneva, Switzerland
6th informal meeting	2/2011	Brussels, Belgium
7th informal meeting	5/2011	Geneva, Switzerland
8th informal meeting	6/2011	Washington DC
9th informal meeting	2011	
10th informal meeting	12/2011	Geneva, Switzerland
11th informal meeting	5/2012	Geneva, Switzerland
12th informal meeting	2012	
13th informal meeting	12/2012	Geneva, Switzerland

Step 1

Tasks	Dates
At the 145th session of WP.29, Japan officially proposed to set up Phase 2 of the Head Restraint gtr.	June 2008
At WP.29/AC.3, it was proposed to establish the informal group.	June 2009
At WP.29/AC.3,ToR was approved.	Nov. 2009
1st progress report to GRSP	May 2010
1st progress report to WP.29/AC.3	June 2010
2nd progress report to GRSP	Dec. 2010
2nd progress report to WP.29/AC.3	March 2011
3rd progress report to GRSP informal proposal requirements submitted	Dec. 2011
3rd progress report to WP.29/AC.3	March 2012
4th progress report to GRSP	May 2012
4th progress report to WP.29/AC.3	June 2012
Final progress report and official proposal for low-speed requirements submitted to GRSP	Dec.2012
Proposal for final progress report and requirements adopted at WP.29	June 2013

VI. Documents for the meetings

WM-0-1	First Dummy TEG Attendance list
WM-0-2	EEVC presentation
WM-0-3	(JASIC/Japan) BioRID seating position
WM-0-4	(Denton) BioRID II user's meeting
WM-0-5	(First technology) Whiplash updates
WM-0-6	(Japan) Neck injury criteria risk
WM-0-7	(NHTSA) VRTC rear impact
WM-0-8	Rear impact task definition
GTR7-01-02	(JASIC/Japan) Proposal for Bio RIID II dummy standardization activity for gtr No.7 – Phase 2
GTR7-01-03	(The Netherlands) Front contact surface
GTR7-01-04	Comparisons for different Spine adjustment
GTR7-01-05	(Japan) Schedule of Head Restraint gtr No. 7 – Phase 2 Informal Working Group
GTR7-01-06	(Denton) Global BioRID-II User's Meeting
GTR7-01-07	(Republic of Korea) Gtr No.7 – Phase 2 Research Results
GTR7-01-08	Terms of reference of the informal group on Head Restraints – Phase 2
GTR7-01-09	(JASIC/Japan) BioRID II seating proposal
GTR7-01-10	Draft minutes of the first Informal Working Group Meeting for gtr No. 7 – Head Restraints Phase 2
GTR7-02-01	Draft agenda of the second Informal Working Group Meeting for gtr No. 7 – Head Restraints – Phase 2
GTR7-02-02	(LEAR) HPM Variations
GTR7-02-03	(LEAR) HRMD Variations
GTR7-02-04	(AUDI) New HPM and HRMD Standards
GTR7-02-05	(VDA) Certification of the H-Pt. and Backset measuring equipment and its calibration
GTR7-02-06	(First technology) Global BioRID-II User's Meeting
GTR7-02-07	(First technology) Seat/Head Restraint Test Sled Pulse Summary
GTR7-02-08	(NHTSA) Rear Impact Dummy Biofidelity
GTR7-02-09	(First technology) BioRID II Drawing Harmonization
GTR7-02-10	(First technology) Seat/Head Restraint Test Sled Pulse Summary
GTR7-02-11	(Chalmers) BioRID new certification procedure
GTR7-02-12	(Denton) Background of GBUM certification test
GTR7-02-13	(Denton) Pulse feasibility investigation

GTR7-02-14	(Denton) New dummy head
GTR7-02-15	(The Netherlands) Head Restraints Static Height and Backset Measurement
GTR7-02-16	(JASIC/Japan) Crash pulse research status based on Japan accident research and vehicle rear impact test
GTR7-02-17	(JASIC/Japan) Japan research activities for new BIORID II calibration method in the gtr No. 7 – Phase 2 iwg
GTR7-02-18	(The Netherlands) Head Restraints Static Height and Backset Measurement
GTR7-03-01/Rev.1	Minutes of the meeting
GTR7-03-02	BioRID II Smaller Design Torso Angle seat seating trial
GTR7-03-03	(Japan) Repeatability and Reproducibility study with new BioRID II calibration method
GTR7-03-04	Third Meeting of the IWG gtr No. 7 - Draft Status Report of the BioRID TEG
GTR7-03-05	Gtr No. 7 IWG Meeting 3 – Summary of Decisions and Actions
GTR7-04-01	BioRID II Drawing package - 7/23/10 version
GTR7-04-02/Rev.1	Agenda of the meeting
GTR7-04-03	(The Netherlands) Head Restraints - Static Height Requirements
GTR7-04-04	(Japan) Gtr No.7 – Phase 2 Dynamic Evaluate Condition and Criteria Proposal
GTR7-04-05	(JARI) Influence on Cervical Vertebral Motion of the Interaction between Occupant and Head Restraint/Seat, based on the Reconstruction of Rear-End Collision Using Finite Element Human Model
GTR7-04-06	(PDB) Summary of the BioRID III Test Program
GTR7-04-07	(Faurecia) Whiplash Criteria Repeatability with different dummies & sleds
GTR7-04-08	(Humanetics) Drawing and PADI status and a Checklist for Evaluating Dummy Acceptability for Use
GTR7-04-09	(Humanetics) Results of the latest test series on the effect of lateral tilton the headrest test results
GTR7-04-10	(Humanetics) A Summary of Current Known Sources of Dummy to Dummy Variation
GTR7-04-11	(Humantics) Review and Approval of Recommended Certification Tests for BioRID II
GTR7-04-12	(Humanetics) BIORID II design evaluation checklist - Draft 9/21//2010
GTR7-04-13	(Humanetics) BIORID II design evaluation checklist - Draft 9/21/2010
GTR7-04-14	(USA) BioRID II Preliminary Repeatability Assessment & Biofidelity Assessment

GTR7-04-15	(USA) Compatibility Between Two Rear Impact Dummies and Two Rear Impact Pulses
GTR7-04-16/Rev.1	(Japan) Japan Research Activities in the gtr No.7 – Phase 2 amendment BioRID II seating proposal 4
GTR7-04-17	(OICA) Gtr head restraints Torso angle ranges Distribution in vehicle categories
GTR7-04-18	(SAE) SAE HADD J826 3D CAD H-Point Manikin gtr No. 7 Update
GTR7-04-19	(Japan) gtr No.7 Regulation Flow Chart Proposal
GTR7-04-20	Draft Minutes fourth gtr No. 7 Rear Impact Meeting, Berlin September, 2010
GTR7-05-01	Draft Agenda gtr No. 7 (Phase 2) Informal Group Meeting 6 December 2010
GTR7-05-02	(Japan and UK) Amendments to the proposal to develop Phase 2 of gtr No. 7 and to establish an informal group for its development
GTR7-05-03	(USA) Amendments to the proposal to develop Phase 2 of gtr No. 7 and to establish an informal group for its development
GTR7-05-04	(Japan) 2nd progress report of the informal group on Phase 2 of gtr No. 7 (Head restraints gtr Phase 2)
TEGID-01	(First Technology) Seat/Head Restraint Test Sled Pulse Summary
TEGID-02	(Denton) Global BioRID-II User's Meeting
TEGID-03	(Denton) Welcome to TEG BioRID Meeting (15 March 2010)
TEGID-04	(First Technology) FTSS Harmonized BioRID Sled
TEGID-05	(PDB) BioRID Comparison upright vs. normal spine adjustment
TEGID-06	Second WebEX Meeting of the BioRID TEG Draft AGENDA
TEGID-07	(Ford) BioRIDII New Sled Evaluation
TEGID-08	(Denton) Denton ATD Update to BioRID II TEG
TEGID-09	Third Meeting of the IWG gtr No. 7 – Draft Status Report of the BioRID TEG
TEGID-10	(GM) GM BioRID Fx Data Issue Final Results - Report to GTR/TEG
TEGID-11	Fourth WebEX Meeting of the BioRID TEG
TEGID-12	Gtr No. 7 (Phase 2) Informal Group Meeting 21/22 September 2010
TEGID-13	Draft Minutes of third WebEX Meeting of the BioRID TEG on 13th of July 2010
TEGID-14	(Katri) BioRID II Neck Bumper
TEGID-15	(PDB) Possible causes for the poor reproducibility of neck forces and moments of the BioRID II First findings
TEGID-16	(PDB) Possible causes for the poor reproducibility of neck forces and moments of the BioRID II First findings
TEGID-17	Humanetics) update to BioRID II gtr No. 7/TEG
TEGID-18	(Faurecia) Influence of BioRID hip joint adjustment on BioRID results

TEGID-19	(Humanetics) Jaw / C4 Contact Issue
TEGID-20	(Humanetics) BioRID II Head/Neck Storage and Lifting Enhancement Kit
TEGID-21	Draft agenda of fifth WebEX Meeting of the BioRID TEG
TEGID-22	Certification Procedures for the BioRID II Crash Test Dummy
BioRID II Drawing package 7/23/10 version	
GRSP-47-16/Rev.1	(Japan) First progress report of the informal working group on gtr No.7 (Head Restraint) Phase 2
GRSP-47-17/Rev1	(Japan) Head restraint gtr Phase 2 Status and Open issues
GRSP-48-	
ECE/TRANS/WP29/2010/136	(Japan and UK) First progress report of the informal group on Phase 2 of gtr No. 7 (Head restraints)
WP29-152-13	(Japan & UK) Amendments to the proposal to develop Phase 2 of gtr No. 7 (Head restraints) and to establish an informal group for its development
WP29-152-16	(USA) Amendments to the proposal to develop Phase 2 of gtr No. 7 (Head restraints) and to establish an informal group for its development