GRSP INFORMAL GROUP ON HEAD RESTRAINTS

1st Meeting

Paris, 1-2 February 2005

Draft Summary Report

Attendees:

Susan Meyerson (chair)	USA/NHTSA
Lori Summers	USA/NHTSA
Patrice Chanrond	PSA Peugeot Citroen/OICA
Pierre Castaing	France/UTAC
Yves Van Der Straaten	OICA
Kris Van der Plas	Honda/OICA
Peter Davis	S.M.M.T
Cristina Brianso	Faurecia/CLEPA
Bernard Favrot	Renault/OICA
Francis Jumel	Renault/OICA
Jose M. Martinez	IDIADA
Eric Bergevin	Canada
Peter Horn	DaimlerChrysler, Germany/OICA
Jens Schenkenberger	Adam Opel AG (Germany)/OICA
Schmitt Winfried	BMW Group AG, Germany/OICA
Raimondo Sferco	Ford/OICA
Bernd Lorenz	BAST/Germany MOT
Hans Ammerlaan	RDW/Netherlands MOT
Masao Notsu	Japan
Hiroyuki Asada	Japan
Herbert Wagner	Mitsubishi-JAMA/OICA
Tadashi Toya	JAMA-Europe/OICA

1. Welcome and Introductions

The chairperson, Ms. Susan Meyerson, opened the meeting and welcomed everyone. Individual introductions were made by each attendee.

2. Approval of Agenda

The agenda was adopted without amendment.

3. Review of Comparison Table

The following information was discussed over the course of the 2-day meeting.

3.1 Height of the Head Restraint

3.1.1 Front Outboard

Both ECE 17 and the FMVSS No. 202 Final Rule require front outboard head restraints with a minimum height of 800 mm above the R-point/H-point, respectively. The Netherlands expressed an interest in raising the minimum height to 850 mm, citing taller citizens. It noted that the sitting height of the 95th percentile Dutch male is 996 mm on average, whereas the sitting height of the 95th percentile European is 977 mm on average. The U.S. noted that according to the U.S. Regulatory Analysis, an 800 mm height and 55 mm backset is estimated to protect 99.7% of the male population and 100% of the female population[1]. There was concern expressed that the US statistics are based on older anthropomorphic data and that the height of the U.S. population has increased. The U.S. will provide the source of this

[1] "Final Regulatory Impact Analysis, FMVSS No. 202, Head Restraints for Passenger Vehicles," NHTSA, page 45.

data. It was requested that the Netherlands provide more information to justify raising the height to 850 mm.

3.1.2 Rear Outboard

Both ECE 17 and the FMVSS No. 202 Final Rule allow for optional rear outboard head restraints. If a vehicle has rear outboard head restraints, they are regulated and must have a minimum height of 750 mm. To determine if a vehicle has a rear head restraint, the U.S. tests for seat structure 700 mm above the H-point. European manufacturers simply declare whether a vehicle has a rear head restraint or not. It was recommended that the global technical regulation (gtr) further clarify the 700 mm requirement.

3.1.3 Front Center/Rear Center

ECE 17 regulates head restraints in front and rear center seats, if they are present. The FMVSS No. 202 Final Rule does not regulate front/rear center head restraints, due to concerns about rearward visibility. ECE 17 indirectly specifies that front center head restraints must have a minimum height of 750 mm, but there was discussion on whether this is actually implemented. It was suggested that the group spend more time thinking about whether to regulate front center head restraints, and at what height. Some countries wish to include in the gtr the ECE 17 requirement that rear center head restraints, if present, must have a minimum height of 700 mm.

3.1.4 Seat Set Up and Measuring Procedure for Height

The seat set up in the FMVSS No. 202 Final Rule positions the seat in the highest position of adjustment and a seat back angle of 25 degrees for measuring height. ECE 17 uses the R-point and seat back angle provided by the manufacturer. The U.S. explained that its seating position was intended to represent a worst case for measuring height. It also provides a consistent head restraint height that could be compared from vehicle to vehicle.

European manufacturers desired to maintain the use of the R-point to measure height and to allow manufacturers to specify a seat back angle. Concerns were expressed about the repeatability of using the J826 manikin to measure height, and the associated variability if the design point is not used.[2] It was mentioned that the R-point is a fixed point in the vehicle for which the vehicle is designed around. Some vehicle manufacturers also mentioned that 25 degrees might be the most upright position in some sports cars.

3.2 Backset

The FMVSS No. 202 Final Rule requires a backset of 55 mm for front outboard head restraints. ECE 17 does not have this requirement. The U.S. gave a presentation on the backset requirement adopted in the FMVSS No. 202 Final Rule. There was general consensus that regulating backset is a good idea, but there was concern that the 55 mm requirement in the FMVSS No. 202 Final Rule was too stringent due to repeatability issues with the use of the Head Restraint Measuring Device (HRMD), as a measuring tool. Other concerns included manufacturing variability observed when ten HRMDs were placed on a table and compared and the variability between polished and unpolished HRMDs. OICA gave a presentation that showed repeatability/reproducibility problems with the test device and with using different technicians to measure the backset. The variability was shown to be approximately 20-30 mm. It was mentioned that this material would be presented in a paper at the ESV Conference in June. There was also concern expressed about comfort issues with a 55 mm backset. The U.S. presented the results of a study[3] that showed that a 55 mm backset would accommodate approximately 90 percent of preferred head positions. Japan requested that the comfort be determined not only based on head positions but also by taking into account a necessary hair margin. The U.S. acknowledged that the Alliance had petitioned for an 80 mm backset requirement in the FMVSS No. 202 Final Rule.

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[2] ECE 17 requires a check that the measured H-point is the same as the R-point by verifying that the H-point is within a specific zone surrounding the R-point.

[3] University of Michigan Transportation Research Institute, Comments to Docket No. NHTSA-2000-8570-20.

3.3 Head Restraint Width

The FMVSS No. 202 Final Rule is different than ECE 17 in that it requires that head restraints in the front outboard positions on bench seats to have a minimum width of 254 mm. A question was raised about the width of head restraints on vehicles with three front bucket seats. In the FMVSS No. 202 Final Rule, if there are three front bucket seats, the outboard seating positions would be required to have 254 mm wide head restraints. It was noted that there are European vehicles that have 3 front single seats. Several vehicle manufacturers suggested they would be arriving in the U.S. market soon. It was recommended that the gtr consider the ECE definition of bench seats. There was also a request for justification for the 254 mm width bench seat requirement, considering the increased use of seat belts.

3.4 Adjustable Head Restraint Front Surface Height

ECE 17 requires that the height of the head restraint face be a minimum of 100 mm to ensure sufficient surface for the head to contact. The FMVSS No. 202 Final Rule did not adopt this requirement. Although not specified in the ECE 17 regulation, in practice, it is measured in the same manner as the overall height of the head restraint.

The Netherlands suggested this requirement is needed to prevent extremely rounded head restraints. Since the measuring technique used in practice does not evaluate the front curvature of the head restraint, it was requested that the Netherlands propose a measurement technique to evaluate this. One manufacturer commented that they would not likely develop head restraints with extremely rounded faces since the contour would make it difficult to pass some of the other tests required for head restraints.

3.5 Gaps

In the FMVSS No. 202 Final Rule, all gaps in the head restraint are measured using a 165 mm sphere. Concern was expressed about using this method to measure the gap between the bottom of a head restraint and the top of the seat. The ECE 17 requirement is a maximum gap of 25 mm, measured in the same manner as the overall height of the seat. It was noted that because of seat contours, there was concern that using the sphere to measure this gap could result in failure of gaps that would normally pass the ECE 17 requirement. The U.S. acknowledged this was a petition issue under consideration for the FMVSS No. 202 Final Rule.

In addition, ECE 17 requires that if a gap is greater than 60 mm, it must pass the displacement test. The FMVSS No. 202 Final Rule does not have this provision. Discussion followed on how the gap and displacement test are related. The desire to consider this requirement for inclusion in the gtr was expressed. However, the U.S. was concerned that the displacement test was not an equivalent alternative for the 165 mm sphere measurement.

3.6 Head Restraint Adjustment Retention Devices (Locks)

The FMVSS No. 202 Final Rule requires that a downward force of 500 N be applied to the top of an adjustable head restraint to ensure the integrity of the lock. ECE 17 requires a locking system on adjustable restraints, but does not have a test procedure to verify the performance of the lock. Justification for the 500 N load was requested. The U.S. explained that the force levels were representative of those likely to be encountered in moderate to severe rear impacts. The U.S. reviewed dummy responses from FMVSS No. 301 rear impact tests to arrive at these levels. Concern was expressed that this load was overly severe, the forces were being applied in the wrong direction, and that such a requirement might negatively affect active head restraint system design.

Concern was also expressed about the force-deflection requirements for the position retention test in the FMVSS No. 202 Final Rule. It was stated that the 13 mm deflection requirement was unreasonable due to hysteresis properties of conventional adjustable head restraint designs. The U.S. acknowledged that the Alliance had petitioned for reconsideration of the 13 mm deflection requirement in the FMVSS No. 202 Final Rule.

3.7 Removability
It was the intent of the FMVSS No. 202 Final Rule to harmonize with ECE 17 on this requirement. However, the FMVSS No. 202 Final Rule does not specify that the action to remove the head restraint be in the "upward" direction. It was requested that the ECE 17 language (paragraph 5.13) be used in the gtr.

3.8 Clearance Exemption
The language in the FMVSS No. 202 Final Rule was more stringent on this issue than ECE 17. The FMVSS No. 202 Final Rule allows a 25 mm clearance exemption for the "roofline or backlight." ECE 17 allows the 25 mm clearance exemption for vehicle structure. Japan suggested that a specification of the minimum height of the rear seat, i.e., 700 mm, be included in the gtr. There was consensus to include the FMVSS No. 202 Final Rule language in the gtr as long as there was a definition of "backlight" (i.e., "rear window"). It was requested by a representative that the working group consider convertible roofs as they are retracted. There was also a request to include padding in the roofline definition. The U.S. acknowledged that convertible roofs are a petition issue under consideration for the FMVSS No. 202 Final Rule.

3.9 Non-use Positions
Prior to the meeting, Japan expressed concern that the FMVSS No. 202a requirements were too design restrictive.

3.9.1 Front Seats
The FMVSS No. 202 Final Rule does not allow non-use positions in the front seat. ECE 17 does, as long as they automatically return to the proper position when the seat is occupied. There are several vehicles in Europe that use non-use positions in the front seat (i.e. the front passenger seat can fold down flat to allow for storage). These included the Opel Omega station wagon, Ford Fussion, and other smaller vehicles. There was interest to have this requirement in the gtr. However, since there is no formal test procedure for this requirement in Europe, the laboratories use people. It was therefore decided that using the 5th percentile female Hybrid III dummy would be an acceptable solution.

3.9.2 Rear Seats
ECE 17 allows non-use positions as long as the position is "clearly recognizable to the occupant." The FMVSS No. 202 Final Rule harmonized with ECE 17, but defined "clearly recognizable" as being able to rotate the head restraint 60 degrees forward or aft. At the meeting, some felt that this definition was too design restrictive. OICA is drafting a requirement/test procedure that is more encompassing of the head restraint systems that are currently on the market. It was requested that this be provided to the chairperson before the next meeting.

3.10 Radius of Curvature
After undergoing the energy absorption test, ECE 17 requires that designated parts of the front and the rear of the head restraint shall not exhibit areas with a radius of curvature less than 5 mm. This was not adopted in the FMVSS No. 202 Final Rule due to enforcement concerns, and the lack of a safety need justification. France agreed to provide test procedures for this requirement and the U.S. agreed to query its crash databases to determine whether injuries are being caused by sharp edges of a damaged head restraint. The group was asked to consider whether we need a radius of curvature test, and how do we assess it? It was noted that we would need to get some safety justification data to suggest that it reduces loads and/or data to suggest that the head restraint shape is very important in that capacity.

3.11 Energy Absorption
Both the FMVSS No. 202 Final Rule and ECE 17 have an energy absorption test; however, the FMVSS No. 202 Final Rule uses a linear impactor and ECE 17 requires a pendulum impactor. The energy absorption test requirements otherwise appear to be functionally equivalent. It was noted that the U.S. test procedure could modify the vehicle to conduct the test in the vehicle; whereas the European procedures conduct the test outside of the vehicle. There was general consensus to allow either type of impactor to be used in the GTR. The U.S. agreed to do testing to determine that the two impactors are functionally equivalent. It was also mentioned that Europe has a mix of energy absorption requirements in Regulations 21 and 17. (Regulation 21 is a standard for head restraints and interior parts, including the

whole seat). The European representatives were tasked to verify which aspects need to be included in the gtr.

3.12 Displacement Test Procedures/Adjustable Backset Locking Test
The FMVSS No. 202 Final Rule and ECE 17 have the same load and displacement requirements, but the test procedures are different. There were question about the need for the pre-load and justification for the loads. There was also concern about fixing the seatback while testing. It was mentioned that no ECE tests are done with the seat braced. The U.S. agreed to give a presentation on the FMVSS No. 202 Final Rule test procedure at the next meeting.

3.13 Active Head Restraint Systems
There was also concern about how to measure active systems (either pyrotechnic or re-active/mechanical). It was questioned whether systems were allowed to be tested in their active states.

3.14 Dynamic Test
The U.S. made a presentation on the FMVSS No. 202 Final Rule optional dynamic test, utilizing a 50th percentile male Hybrid III dummy. Questions were raised about whether the study was based on injuries or injury claims, and the number of tests that were used to make up the whiplash probability curves. It was also requested that the U.S. find the reasoning behind the pulse in the dynamic test.

There was a great deal of concern expressed by some delegates and representatives with respect to using the Hybrid III dummy in a dynamic test. A presentation was made by BASt comparing the human skeleton to the Hybrid III and the BIORID dummies. The results showed that the BIORID exhibited a more humanlike pressure distribution on the seat back. Since the Hybrid III did not exert high loads on the top of the seat back, concern was expressed that this could have a negative effect on the design of automatic head restraint systems, and ultimately lead designs in the wrong direction. It was stated that the BioRID dummy is preferred in Europe for dynamic testing, but it was acknowledged that it was not ready for regulation. Consequently, it was suggested that the dynamic test be a second step to the GTR drafting process.

It was mentioned that the EEVC Working Group 12 has its next meeting on Feb. 13, 14 to discuss their next approach. However, this group meets every 6 months and is not likely to resolve its concerns with dummies and injury criteria in time for this GTR. It was also suggested by Japan that the GTR be coordinated with the IHRA and that such coordination be a second step to the GTR. In addition, it was requested that the justifications for the determined sled pulse as well as the correlation with accidents be clarified. It was also suggested that the GTR be coordinated with the IHRA Biomechanics Working Group.

It was also reported that there will be a meeting on February 14 and 15 where decisions will be made about the EuroNCAP final test procedure. By February 16th, they will reach a “go/no-go” decision. The Board will decide in May and testing will start in the middle of the year.

4. Next Meetings

The following schedule was agreed upon for the next meetings:

Paris, France (OICA) April 11-13, 2005
Washington, DC, USA (NHTSA) June 13-15, 2005
Cologne, Germany (BASt) September 7-9, 2005

5. Action Items

- Netherlands – justification for raising the head restraint height to 850 mm.
- All – consider whether to regulate front center head restraint height (and at what height).
- U.S. – further information on the 254 mm minimum head restraint width for bench seats.
- Netherlands – test procedure for the front surface height of head restraints.

- European representatives – safety justification for the 25 mm gap requirement.
- France – provide a test procedure for radius of curvature test.
- U.S. – query crash databases for injuries caused by sharp edges.
- All – consider whether we need a radius of curvature test.
- U.S. – conduct testing to establish functional equivalence for the energy absorption test.
- European representatives – determine which parts of Regulations 21 and 17 need to be included in the energy absorption test.
- U.S. – presentation on the FMVSS No. 202 displacement test procedure.
- BASt – provide an update on the EEVC Working Group 12 and Euro NCAP activities.