

Transmitted by the expert from the United States of America

~~Transmitted by the representative of the United States of America~~

Informal document No. GRSP-48-12  
(48th GRSP, 7 - 10 December 2010, agenda item 3)

~~Informal document No. WP.29-152-16  
(152nd WP.29, 9-12 November 2010, agenda item 17.2)~~

Amendments to the proposal to develop Phase II of gtr No. 7  
and to establish an informal group for its development

Gtr No. 7 (Head restraints)

The text reproduced below was submitted by the representative of the United States of America and proposes amendments to the proposal to develop amendments to global technical regulation (gtr) No. 7 (ECE/TRANS/WP.29/AC.3/25). The proposed amendments are marked in bold and in strikethrough characters.

## A. PROPOSAL

Delete paragraph 5 and add two new paragraphs, to read:

~~5. — At higher speed rear impact crashes ( $\Delta V \geq 18$  km/h), there are as many minor injuries as recorded in the low speed crashes and there are a significant number of more severe injuries (MAIS 2 and MAIS 3) occurring in some countries. The United States of America is currently evaluating several dummies and a dynamic test that could address these injuries. As a second step, AC.3 will resume consideration of development of a high speed test at its November 2010 session.~~

**5. A deeper review of United States of America's (USA) initial data shows that while there are a significant number of AIS 2 and AIS 3 injuries occurring in rear impact crashes greater than 18 km/h, most of the neck injuries, which can be evaluated by a rear impact dummy, are AIS 1 and AIS 2. 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 injuries occurring in the range of 15 – 25 km/h.**

**(<http://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 whiplash injuries are sustained at speeds between 16 km/h and 25 km/h.**

**([http://www.eevc.org/publicdocs/EEVC\\_WG20\\_Pulse\\_Recommendations\\_Sept\\_2007.pdf](http://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 whiplash injuries.**

**6. Although previous discussion 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 whiplash 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 both short term and long term whiplash injuries. This determination should be based on a benefits assessment once injury criteria and corridors have been established.**

Paragraph 7., amend to read:

7. With regard to ~~low-speed~~ **mitigating long-term and short-term whiplash injuries with a** dynamic test, the informal group should:

Paragraph 9., amend to read:

9. In a first step (under the chairmanship of the United Kingdom and with the technical sponsorship by Japan)

- (d) In the year **2012** ~~2011~~
- (i) **December** ~~Low speed~~ - gtr formal document submitted to GRSP
- (ii) ~~Low speed~~ - gtr will be presented for vote to the ~~WP.29~~

**(e) In the year 2013**

- (i) June -Low speed requirements will be presented for vote to the WP.29**

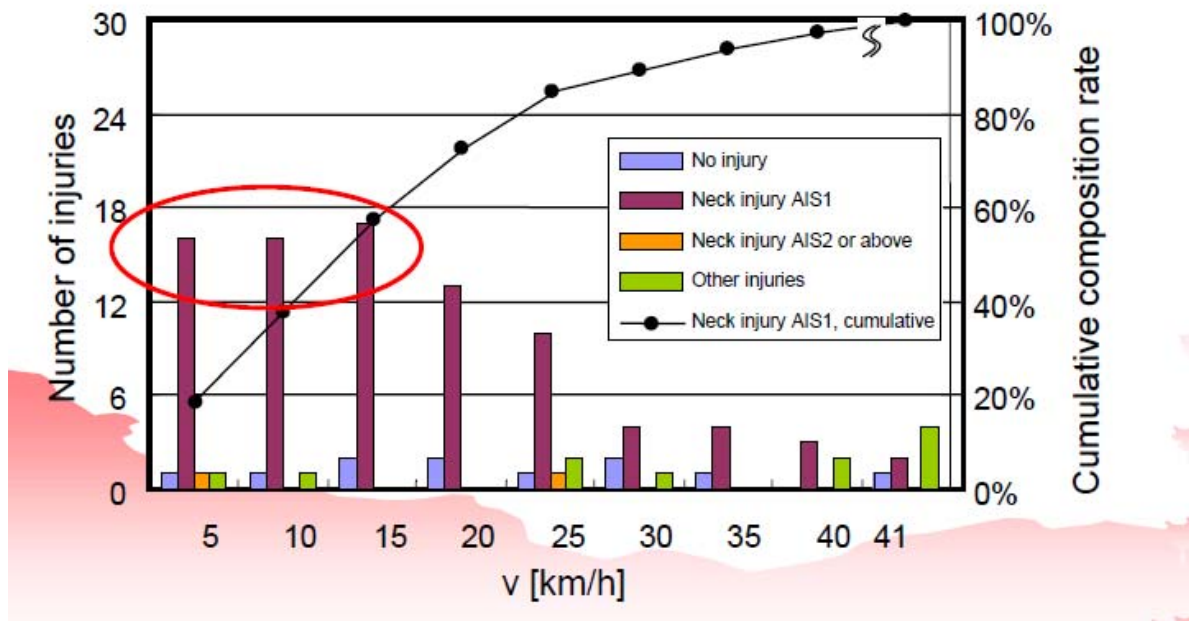
- ~~10. In a further step (discuss on high speed under [to be determined].)~~

- ~~(a) [To be determined]~~

- ~~(i) Higher speed - Dynamic test requirement draft submitted to GRSP~~
- ~~(ii) Higher speed - gtr formal document submitted to GRSP~~
- ~~(iii) Higher speed - gtr will be presented for vote to the WP.29~~

## **B. JUSTIFICATION**

A deeper review of United States of America's (USA) initial data shows that while there are a significant number of AIS 2 and AIS 3 injuries occurring in rear impact crashes greater than 18 km/h, most of the neck injuries, which can be evaluated by rear impact dummies, are AIS 1 and AIS 2. 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 injuries occurring in the range of 15 – 25 km/h.



**Whiplash Injuries in Japan (GTR7-02-16e, pg 6)**

(<http://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 whiplash injuries are sustained at speeds between 16 km/h and 25 km/h.

“Real-world low-speed rear impact pulses are very variable and the available data is limited. It is currently not possible to correlate detailed pulse shape with injury risk, and the evidence for a link between pulse characteristics (such as  $\Delta v$  and mean or peak acceleration) and injury (or claims) is weak. However, within these limitations it is recommended that the following pulse is used to target longer-term whiplash injuries:

- $\Delta v$  of 20 km/h, with mean acceleration of 5-6 g, either
  - Bimodal, with a steep rise and large first peak, followed by a smaller second peak and more gradual drop-off in acceleration, or

- Triangular, with a steeper initial rise in acceleration and more gradual drop-off in acceleration.
- 20 km/h is approximately the mean  $\Delta v$  indicated in the literature for long-term injuries, with a typical range of 16 to 25 km/h.”

([http://www.eevc.org/publicdocs/EEVC\\_WG20\\_Pulse\\_Recommendations\\_Sept\\_2007.pdf](http://www.eevc.org/publicdocs/EEVC_WG20_Pulse_Recommendations_Sept_2007.pdf), page iii)

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 whiplash injuries.

Although previous discussion 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 whiplash injuries. This issue of raising the test speed of the rear impact dynamic test has already been raised by the Japanese at the 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> informal working group meetings with the intent to address long term whiplash injuries. The USA agrees that if we can succeed in developing a dummy with injury criteria based on biofidelic responses, than we should take this opportunity to make a comprehensive assessment at determining the most appropriate test pulse or test pulses to mitigate both short term and long term whiplash injuries.

A full discussion of the most appropriate test pulse cannot occur until the injury criteria and corridors are established. This analysis should be part of the normal discussions of the group in the development of the GTR and therefore, the timeline of the overall effort should be unaffected.

(Reference) Full document of new ToR

## **I. OBJECTIVE OF THE PROPOSAL**

1. The representative of Japan proposes the development of Phase 2 of gtr No. 7 and has incorporated the amendments proposed by the United State of America. <sup>1/</sup> He also proposes the establishment of an informal group for the development of this Phase. The informal group will discuss appropriate methods for testing and evaluating injuries due to rear impact crashes.

## **II. BACKGROUND**

2. At its one-hundred-and-forty-third 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 one-hundred-and-forty-eighth session, in June 2009, the Executive Committee of the 1998 Agreement (AC.3) agreed on the two-step approach suggested by the representatives of the United Kingdom and of the United States of America. This approach will consider 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.

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

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<sup>1/</sup> ECE/TRANS/WP.29/2008/115, ECE/TRANS/WP.29/2009/47 and ECE/TRANS/WP.29/2009/48

(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. At its June 2009 session, AC.3 gave its consent to establish the informal group, under the chairmanship of the United Kingdom and with the technical sponsorship by Japan, to evaluate whether the BioRID II dummy can be used to develop an amendment to gtr 7 to reduce low speed rear impact injuries.

~~5. At higher speed rear impact crashes ( $\Delta V \geq 18$  km/h), there are as many minor injuries as recorded in the low speed crashes and there are a significant number of more severe injuries (MAIS 2 and MAIS 3) occurring in some countries. The United States of America is currently evaluating several dummies and a dynamic test that could address these injuries. As a second step, AC.3 will resume consideration of development of a high speed test at its November 2010 session.~~

**5. A deeper review of United States of America's (USA) initial data shows that while there are a significant number of AIS 2 and AIS 3 injuries occurring in rear impact crashes greater than 18 km/h, most of the neck injuries, which can be evaluated by rear impact dummy, are AIS 1 and AIS 2. 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 injuries occurring in the range of 15 – 25 km/h.**

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**6. Although previous discussion 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 whiplash 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 both short term and long term whiplash injuries. This determination should be based on a benefits assessment once injury criteria and corridors have been established.**

### **III. SUBJECTS FOR REVIEW AND TASKS TO BE UNDERTAKEN**

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

- (a) How to define the effective height;
- (b) The height requirements.

78. With regard to ~~low speed~~ **mitigating long-term and short-term whiplash 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 minimise 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) E.g. 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.

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

#### **IV. WORK SCHEDULE**

910. In a first step (under the chairmanship of the United Kingdom and with the technical sponsorship by Japan)

- (a) In the year 2008
  - (i) June – Submission of the official proposal from the representative of Japan for the development of the Head Restraint grt Phase 2 at the one-hundred-and-forty-fifth session of WP.29.
- (b) In the year 2009
  - (i) June – Approval by WP29/AC.3

- (ii) December – 1<sup>st</sup> informal group meeting
  
- (c) In the year 2010
  - (i) February - 2<sup>nd</sup> informal group meeting,
  - (ii) **May - 3<sup>rd</sup> informal group meeting, 1<sup>st</sup> progress report submitted to GRSP.**
  - (iii) **September - 4<sup>th</sup> informal group meeting**
  - (iv) November – Report progress and resume consideration of the development of a high speed test at WP.29 AC.3
  
- (d) In the year ~~2012~~ 2011
  - (i) **December** ~~Low speed - gtr formal document submitted to GRSP~~
  - (ii) ~~Low speed - gtr will be presented for vote to the WP.29~~
  
- (e) In the year 2013**
  - (i) June – GTR Amendment will be presented for vote to the WP.29**

~~10. In a further step (discuss on high speed under [to be determined].)~~

- ~~(a) [To be determined]~~
  - ~~(i) Higher speed – Dynamic test requirement draft submitted to GRSP~~
  - ~~(ii) Higher speed – gtr formal document submitted to GRSP~~
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