

Transmitted by the chairman of the
informal working group GTR9-PH2

Informal document **WP.29-157-21**
(157th WP.29, 26 - 29 June 2012,
agenda item 16.4.)

Second progress report of the informal group on Phase 2 of gtr No. 9 (IG GTR9 - PH2)

The text reproduced below was submitted by the chairman of the informal group on phase 2 of gtr No. 9 and proposes the 2nd progress report on the activities and work of this informal group (ECE/TRANS/WP.29/AC.3/24).

I. Objective of this proposal

1. The representatives of Japan and Germany proposed the development of Phase 2 of gtr No. 9. The main objective is the development of a draft proposal to amend the UN global technical regulation No. 9 - Phase 2 on pedestrian safety by introducing the flexible pedestrian legform impactor (FlexPLI) as a single harmonized test tool in order to enhance the level of protection for lower legs of pedestrians.

The work of the informal group shall not be limited to draft proposals to amend Gtr No. 9, but shall cover the development of a complementary draft proposal to amend the draft UN Regulation on pedestrian safety.

The group may also review proposals to improve and / or clarify aspects of the legform test procedure.

II. Background

2. At the 154th session of the World Forum for Harmonization of Vehicle Regulations and the 32nd session of the Executive Committee of the 1998 Agreement it was agreed to set up an informal group to solve the pending issues for the incorporation of the FlexPLI in Phase 2 of the UN Gtr No. 9 and in the draft UN Regulation on pedestrian safety, subject to the submission to WP.29 and to AC.3 of appropriate terms of references (document ECE/TRANS/WP.29/1091, paras. 36 and 100).

Japan and Germany have informed the World Forum for Harmonization of Vehicle Regulations and the Executive Committee of the 1998 Agreement that this informal group named IG GTR9 - Phase 2 will be co-sponsored by Japan and Germany.

3. The informal group has started its work on 03 November 2011 with a Constitutional Meeting in Bonn, Germany, to draft a document on the terms of references, the operating principles, the schedule and the work plan. At this occasion the participants agreed to the proposal of Japan and Germany that the informal group will be managed by Germany (chair), Japan (vice-chair) and OICA (secretary).

4. At the 155th session of the World Forum for Harmonization of Vehicle Regulations and the 33rd session of the Executive Committee of the 1998 Agreement Japan and Germany have informed delegates about the ongoing activities of the informal group on UN Gtr No. 9 Phase 2 (document WP.29-155-35). The delegates were informed about the constitutional meeting and the management of the group. The information was given that the first meeting was planned for 01 and 02 December 2011 to start the technical discussion and to finalize the draft terms of references as well as the work plan for submission to GRSP in December 2011.

5. The first meeting of the informal group was held on 01 and 02 December 2011 in Geneva, Switzerland. The technical discussion was started and the draft document on the terms of references, the operating principles, the schedule and the work plan for submission to GRSP in December 2011 was finalised. The first progress report was submitted to GRSP in December 2011 and to the World Forum for Harmonization of Vehicle Regulations for the 156th session and to the Executive Committee of the 1998 Agreement for its 34th

session in March 2012. At the 156th session the World Forum endorsed in principle the above mentioned terms of references, pending the adoption of the report of the December 2011 session of GRSP. AC.3 endorsed in principle the terms of reference of the informal working group and requested the secretariat to distribute document ECE/TRANS/WP.29-156-11 with an official symbol for June 2012.

6. The second meeting of the informal group took place on 28 and 29 March 2012 in Osaka, Japan. The discussion was focused on the technical aspects including the accident and benefit analysis. Main priority was also given to discuss the activities on the further development of the certification procedures. For one further work item a task force was initiated to work on the bumper test area for the lower legform impact. The second progress report is planned to be submitted to the World Forum for Harmonization of Vehicle Regulations for the 158th session and to the Executive Committee of the 1998 Agreement for its 36th session in November 2012.

III. Subjects for review and tasks to be undertaken (terms of reference)

7. The informal group has set up an activity list to address remaining items for the introduction of the FlexPLI:

1. Review and consideration of remaining items
 - a) Review of Flex-TEG activities → to reach common understanding
 - b) Assessment of biofidelity (comparison of FlexPLI and EEVC lower legform impactor)
 - c) Assessment of benefit and costs (injury reduction, additional benefit compared to EEVC lower legform impactor)
 - d) Technical specifications (drawings) and PADI (user manual)
 - e) Evaluation of durability
 - f) Test procedure (rebound phase, best practice, velocity measurement etc.)
 - g) Certification tests
 - h) Review and exchange of test results
 - i) Evaluation of reproducibility and repeatability
 - j) Evaluate and decide on performance / injury criteria and threshold values
 - k) Evaluation of vehicle countermeasures (assessment of technical feasibility)
2. Develop a draft proposal to amend UN Gtr No. 9 - Phase 2
3. Develop a complementary draft proposal to amend draft UN Regulation on Pedestrian Safety (including a recommendation for transitional provisions based on item 1).

IV History of the discussions

8. Benefit and costs

At the second meeting the experts reviewed again the information from JASIC on the benefit of the FlexPLI. The presentation of the first meeting has been updated by showing a significantly better biofidelity of the FlexPLI compared to the current legform impactor.

OICA explained that the US accident data used for the study may be processed in another way, as the current procedure in using AIS coding may not be correct for pedestrian injuries. JASIC admitted that for some cases the AIS coding used for the study was not correct. However during the meeting a modified version of the study was presented showing better results than the original document.

To give experts the opportunity of reconsideration this topic will stay on the agenda for the 3rd meeting of the informal group.

9. Biofidelity

JASIC showed once again the biofidelity study performed with data from Japan and the USA. Some concerns were raised by the Alliance of Automobile Manufacturers regarding the validity of the method used by JASIC in comparing the finite element models with human body models. These concerns were not shared by Japan.

The UK asked if the FlexPLI would have limitations in assessing knee injuries. Japan explained that both, knee injuries and tibia fractures can be assessed. But during the development it was given higher priority to tibia fractures as the knee injuries are less represented compared to tibia fractures according to the accident data analyses. The UK will check the accident statistics accordingly.

It was agreed to discuss the whole subject further at the next meeting of the informal group.

10. Accident analysis

NHTSA informed delegations about a research project in the USA to investigate the accident situation for pedestrians using the Pedestrian Crash Data Study (PCDS) and the German In-Depth Accident Study (GIDAS). The analyses only cover AIS 3-6 injuries, looking at disabling injuries according to the Functional Capacity Index (FCI) based on AIS.

According to both data sources, bumper-caused injuries represent up to 40% of all pedestrian injuries. Despite there are notable differences between the two sources regarding the number of injuries to the different body regions the number of injuries to lower extremities caused by the bumper is in both cases close to 100% (94% for PCDS and 99% for GIDAS). The presentation also showed the ranking of injured body regions for serious and disabling injuries.

Delegations were informed that these results are preliminary and the final results can be provided most likely at the 4th meeting of the informal group.

11. TF-RUCC (certification procedures)

Japan gave a status report of the activities of the task force reviewing and updating the certification corridors. Japan has not finalised the tests because of some delay of Humanetics in preparing the flexible legform impactors for the tests. However the first

results show a good and repeatable performance of the three flexible pedestrian legform impactors tested. Finalisation of the tests in Japan was planned for April. The second test lab (BAST) will receive the impactors afterwards.

Despite the extensive work of the task force, the progress was delayed and the current schedule is aiming at finalising the task to update the certification corridors, if necessary, till the 3rd meeting of the informal group. The task force will prepare a recommendation for the informal group on the certification procedures and the corridors to be used for the calibration of the FlexPLI.

12. Status of FlexPLI

The company Humanetics gave an update on the current status of the FlexPLI development. Information was provided on the quality assurance system used during the production and maintenance of the legform impactors. This includes the documentation of the different build level of the individual impactors. Humanetics explained in detail the changes of the build level during the development of the impactors.

13. Technical specifications and user manual

Humanetics presented the current version of the user manual that is distributed to the informal group. The manual will be updated with additional information for a visual inspection.

OICA asked for a more transparent documentation of the setup of the flexible pedestrian legform impactor. Humanetics confirmed that all documentation will be available as soon as the FlexPLI will become part of legislation.

The UK informed the participants about the on-going activity at WP.29 to set up a Special Resolution No. 2 in the future that will form a kind of library for dummies and other test devices used in regulations. The UK and the USA are currently preparing the wording of such a resolution. The idea is to differentiate between information that is needed for test laboratories only, which should be put into the S.R.2, and information that is needed for the test procedure, which should be put into the respective piece of legislation. The intention is to draft the S.R.2 in a way that allows the application for both legislation frameworks of the UNECE regulations, the 1958 and the 1998 agreement.

During the discussion at the informal group GTR7 Phase II on the BioRID it was already agreed that engineering drawings of dummies and dummy parts will be shared but not manufacturing drawings. The current proposal foresees that drawings will be made available during the discussion period only for information purposes covering a disclaimer that it may not be used for commercial purposes. After dummies and dummy parts will have been finally agreed the disclaimers on the drawings will be removed and the engineering drawings will be made available.

Humanetics will provide information if the documentation for the FlexPLI can be made available for the informal group with a disclaimer that it may not be used for commercial purposes.

14. Review and exchange of test results

OICA introduced results of impactor to vehicle tests. The results are quite promising but for some peak values a deviation of up to 20 % was observed. A discussion took place if the impactors as well as the vehicles would really be comparable as the test results presented were generated during a period of several years (2009 to 2011), while the impactors and the

vehicles may have undergone some changes. OICA will clarify if the vehicles tested were still comparable.

15. Durability

Certification test data on the long term performance of the FlexPLI was shown by BAST. OICA had some questions with regard to the differences in some of the results. It was agreed to discuss this subject at the next meeting as soon as further data is available on the build level of the impactor. Data of a second impactor will also be provided by BAST.

16. Test procedure

On request of the European Commission a discussion on the current bumper test area for the lower legform impact was started. The day before the 2nd informal group meeting a meeting took place to discuss this subject separately. The necessity of improvements to the test procedure for the lower legform test was shown, as the area of the bumper tested is quite limited due to some design features on the front of some vehicles that interact with the current test procedure. The decision was to discuss the whole subject in detail in a specific task force on the bumper test area.

The informal group agreed to install such a task force. However it was agreed, that depending on the progress of the task force on the bumper test area, it may be needed at a later stage to separate the discussion on this subject from the discussion on the FlexPLI. Currently the discussion on the bumper test area will be part of the informal group but it will finally not delay any decision on the main subject of the group, the introduction of the new legform impactor.

17. Finite element models

Humanetics informed participants about the status of the work to develop an finite element model for the FlexPLI. Currently a model is available for purchase. The further development of the model is currently stopped and will be restarted as soon as the final status of the impactor is known.

18. Activity list and schedule

The informal group is planning to start the vehicle testing with several impactors after the finalisation of the work on the certification procedure. According to the progress of the task force a discussion of the work schedule will take place at the 3rd meeting of the informal group.

V. Work schedule

19. Work schedule

Overall Schedule

P.R.: Progress Report

| Year | 2011 | | | 2012 | | | | | | | | 2013 | | | | | | | | | | | | | | | |
|-------------|------|----|----|------|---|---|---|---|---|---|---|------|----|----|----|---|---|---|---|---|---|---|---|---|----|----|--|
| Month | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| WP29 | | ○ | | | | | | | | | | | | | | | | | | | | | | | | | |
| GRSP | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IG-GTR9-PH2 | | ○ | ○ | | | ○ | | ○ | | | | | ○ | | | | | | | | | | | | | | |

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| May 2011 | Proposal of Draft ToR to GRSP (informal document) |
| June 2011 | GRSP to seek consent of WP.29 and AC.3 to mandate new informal group on pedestrian protection |
| 03 November 2011 (Bonn, DE) | Constitutional meeting of the IG GTR9-PH2 |
| November 2011 | Report to WP.29 on activities of IG |
| 01/02 December 2011 (Geneva, CH) | First meeting of the IG GTR9-PH2 |
| December 2011 | Progress-Report to GRSP, submission of Draft ToR to WP.29 |
| March 2012 | Progress-Report to WP.29 and adoption of ToR by WP.29 / AC.3 |
| 28 and 29 March 2012 (Osaka, JP) | Second meeting of the IG GTR9-PH2 |
| May 2012 | Progress-Report to GRSP |
| 29 and 30 May 2012 (Paris, FR) | Third meeting of the IG GTR9-PH2 |
| 18 and 19 Sept. 2012 (Washington DC, USA) | Fourth meeting of the IG GTR9-PH2 |
| November 2012 | Progress-Report to WP.29 |
| December 2012 | Fifth meeting of the IG GTR9-PH2 |
| December 2012 | Progress report and submission of informal draft documents to GRSP |
| March 2013 | Sixth meeting of the IG GTR9-PH2 |
| May 2013 | Submit formal proposal to GRSP, adoption by GRSP, submit formal proposal to WP.29 |
| November 2013 | Adoption by WP.29 |

VI. Documents

20. Documents for the meetings

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| ECE/TRANS/WP.29/ GRSP/2011/13 | Japan | Proposal for Amendment 2 to global technical regulation No. 9 (Pedestrian safety) |
| GRSP-49-38 | Japan and Germany | Draft terms of reference for the informal group on pedestrian safety phase 2 (IG PS2) |
| ECE/TRANS/WP.29/ 1091 | | Reports of the World Forum for Harmonization of Vehicle Regulations on its 154th session, Administrative Committee of the 1958 Agreement on its forty-eighth session, Executive Committee of the 1998 Agreement on its thirty-second session, Administrative Committee of the 1997 Agreement on its eighth session |
| GTR9-C-01 | Chair | Agenda for the constitutional meeting of the Informal Group on Pedestrian Safety Phase 2 (IG PS2) |
| GTR9-C-01r1 | Chair | Agenda for the constitutional meeting of the Informal Group on Pedestrian Safety Phase 2 (IG PS2) |

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|-------------|------------------|---|
| GTR9-C-02 | Chair/Secretary | Minutes of the Constitutional Meeting of the Informal Group on Global Technical Regulation No. 9 – Phase 2 (IG GTR9-PH2) |
| GTR9-C-02r1 | Chair/Secretary | Minutes of the Constitutional Meeting of the Informal Group on Global Technical Regulation No. 9 – Phase 2 (IG GTR9-PH2) |
| GTR9-C-03 | Japan/Germany | Informal document GRSP-49-38: Draft Terms of Reference for the Informal Group on Pedestrian Safety Phase 2 (IG PS2) |
| GTR9-C-04 | Japan | History of Development of the FlexPLI |
| GTR9-C-05 | Japan | Review of the FlexPLI TEG Activities |
| GTR9-C-06 | OICA | Comments on the Draft Terms of Reference for the Informal Group on Pedestrian Safety Phase 2 (28/10/2011) |
| GTR9-C-07 | Chair | Final Operating Principles and Terms of Reference for the IG GTR9-PH2 |
| GTR9-C-07r1 | Chair | Final Operating Principles and Terms of Reference for the IG GTR9-PH2 |
| GTR9-C-08 | Secretary | TEG document matrix |
| GTR9-1-01 | Chair/ Secretary | Agenda for the 1st meeting of the Informal Group on Global Technical Regulation No. 9 - Phase 2 (IG GTR9-PH2) |
| GTR9-1-01r1 | Chair/Secretary | Agenda for the 1st meeting of the Informal Group on Global Technical Regulation No. 9 - Phase 2 (IG GTR9-PH2) |
| GTR9-1-02 | Chair/ Secretary | Minutes of the 1st meeting of the Informal Group on Global Technical Regulation No. 9 - Phase 2 (IG GTR9-PH2) – Draft |
| GTR9-1-02r1 | Chair/ Secretary | Minutes of the 1st meeting of the Informal Group on Global Technical Regulation No. 9 - Phase 2 (IG GTR9-PH2) – Final |
| GTR9-1-03 | Japan | Work plan of Task Force Review and Update of Certification Corridors (TF-RUCC) |
| GTR9-1-03r1 | Japan | Work plan of Task Force Review and Update of Certification Corridors (TF-RUCC) |
| GTR9-1-04 | OICA | FlexPLI Version GTR Prototype SN-02 - Durability Assessment |
| GTR9-1-05 | JASIC | Technical Discussion - Biofidelity |
| GTR9-1-05r1 | JASIC | Technical Discussion – Biofidelity (revised) |
| GTR9-1-06 | JASIC | Technical Discussion - Injury Criteria |
| GTR9-1-06r1 | JASIC | Technical Discussion - Injury Criteria (revised) |
| GTR9-1-07 | JASIC | Technical Discussion - Benefit |
| GTR9-1-07r1 | JASIC | Technical Discussion – Benefit (revised) |
| GTR9-1-08 | Humanetics | FlexPLI GTR status 1 / 2 December 2011 |
| GTR9-1-08r1 | Humanetics | FlexPLI GTR status 1 / 2 December 2011 |
| GTR9-1-09 | Japan/ Germany | Informal document WP.29-155-35: Report to the November session of WP.29 on the activities of the IG GTR9-PH2 |
| GTR9-1-10c1 | Humanetics | Flex-GTR changes list since prototype built, status 02 Dec. 2010 (corrected) |
| GTR9-1-11 | Bertrandt | Pendulum Test Scatter |
| GTR9-1-12 | United States | Informal document GRSP-49-23: Update on Pedestrian Leg Testing |
| GTR9-2-01 | Chair/ Secretary | Agenda for the 2nd meeting of the Informal Group on Global Technical Regulation No. 9 - Phase 2 (IG GTR9-PH2) – Draft |
| GTR9-2-01r1 | Chair/ Secretary | Agenda for the 2nd meeting of the Informal Group on Global Technical Regulation No. 9 - Phase 2 (IG GTR9-PH2) – Final |
| GTR9-2-02 | Chair/ Secretary | Minutes of the 2nd meeting of the Informal Group on Global Technical Regulation No. 9 - Phase 2 (IG GTR9-PH2) – Draft |
| GTR9-2-03 | BAST | Proposal for a Modification of the Bumper Test Area for Lower and Upper Legform to Bumper Tests |
| GTR9-2-04 | BAST | Robustness of SN02 prototype test results |
| GTR9-2-05 | BAST | Comparison of Filter Classes for FlexPLI |
| GTR9-2-06 | OICA | Technical Specification and PADI |
| GTR9-2-07 | JASIC | Technical Discussion – Benefit; Updated Version of Document GTR9-1-07r1 (Note: The document was not presented since a revision 1 of the document was already available for the meeting) |
| GTR9-2-07r1 | JASIC | Technical Discussion – Benefit; Updated Version of Document GTR9-1-07r1 |
| GTR9-2-08 | Humanetics | Flex PLI GTR meeting actions |
| GTR9-2-09 | Humanetics | FLEX PLI GTR –FE v2.OIG FLEX GTR9-PH2 |

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| GTR9-2-10 | OICA | FlexPLI Comparison (Impactors: SN02, SN04, IND-Impactor - Test experiences) |
| GTR9-2-11 | Chair | Informal document WP.29-156-11: First progress report of the informal group on Phase 2 of gtr No. 9 |
| GTR9-2-12 | JASIC | Re-examination of Number of Pedestrians by Injury Severity |
| GTR9-2-13 | Humanetics | FLEX PLI Update for Alliance of Automobile Manufacturers |
| GTR9-2-14 | JARI | Updated Japan Progress Report: Review and Update Certification Test Corridors and Test Methods (added pendulum Test data) |
| TF-RUCC-2-03 | BAST | FlexPLI Inverse Certification Corridors-Further Test Results |
| TF-RUCC-2-04 | ACEA | Comments on Inverse Certification Test Procedure |
| TF-RUCC-2-05 | Humanetics | Humanetics Inverse and Round Robin Leg Preparation |
| TF-RUCC-2-06 | BGS Boehme & Gehring | Status of the FlexPLI – Inverse Certification |
| TF-RUCC-2-07r1 | TF-RUCC chair | Japan Progress Report: Review and Update Certification Test Corridors and Test Methods |
