

<b>Minutes of the 1st meeting of the Informal Group on Global Technical Regulation No. 9 – Phase 2 (IG GTR9-PH2)</b>	
Venue	Palais des Nations (United Nations facilities), Avenue de la Paix 8 - 14, 1211 Geneva (Switzerland), Room IV
Date	01 Dec. 2011, 1 p.m. – 5:30 p.m. and 02 Dec. 2011, 9:30 a.m. – 1:45 p.m.
Status: <b>Final</b>	

### A) List of Attendees

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**B) List of Actions**

<b>ID</b>	<b>Action Items</b>	<b>Responsibility</b>	<b>Due</b>
A-1-01	Submit final draft document on ToR (GTR9-C-07r1) to GRSP	Chair	50 <sup>th</sup> GRSP
A-1-02	Submit draft progress report of const. and 1 <sup>st</sup> meeting to GRSP	Chair, Vice-Chair, Secretary	50 <sup>th</sup> GRSP
A-1-03	Humanetics to provide detailed information regarding the build level of the individual impactors produced	Humanetics	2 <sup>nd</sup> meeting
A-1-04	Prepare information on test data showing the performance of the FlexPLI over time due to wearing (e.g. cracks in the bone core material)	Bertrandt, BAST	2 <sup>nd</sup> meeting
A-1-05	Prepare information on the Euro NCAP activities related to bumper test area of the pedestrian protection test procedure	BAST	2 <sup>nd</sup> meeting
A-1-06	Inform about the position of the European Commission on the re-assessment of the bumper test area	European Commission	2 <sup>nd</sup> meeting
A-1-07	Check differences in the test data of tibia bending moments using different filter classes	BAST, OICA, Bertrandt, Humanetics	2 <sup>nd</sup> meeting
A-1-08	Provide updated user manual for FlexPLI	Humanetics	2 <sup>nd</sup> meeting
A-1-09	Provide information and recommendations on certification tests (type of tests and corridors to be used)	TF-RUCC	2 <sup>nd</sup> meeting
A-1-10	Decision on certification tests used for the FlexPLI	IG GTR9-PH2	
A-1-11	Ask participants of GRSP for pedestrian accident data, especially related to lower leg injuries	Chair	50 <sup>th</sup> GRSP
A-1-12	US will check whether they can supply accident statistics data related to pedestrian accidents and lower leg injuries	NHTSA	2 <sup>nd</sup> meeting
A-1-13	Provide information on the status of development of FEM models of the FlexPLI	All	2 <sup>nd</sup> meeting
A-1-14	Present data on testing with the FlexPLI	NHTSA, OICA	2 <sup>nd</sup> meeting

**C) List of Meeting Documents**

- GTR9-C-02 Minutes of the Constitutional Meeting of the Informal Group on Global Technical Regulation No. 9 – Phase 2 (IG GTR9-PH2) - Draft
- GTR9-C-02r1 Minutes of the Constitutional Meeting of the Informal Group on Global Technical Regulation No. 9 – Phase 2 (IG GTR9-PH2) - Final
- GTR9-C-04 (Japan) History of Development of the FlexPLI
- GTR9-C-04r1 (Japan) History of Development of the FlexPLI (Revision)
- GTR9-C-05 (Japan) Review of the Flexible Pedestrian Legform Impactor Technical Evaluation Group (Flex-TEG) Activity - Summary
- 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) – Draft
- 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) – Final
- GTR9-1-02 (Reserved for the minutes/this document)
- GTR9-1-03 (Japan) Document TF-RUCC-K-03: Work plan of Task Force Review and Update of Certification Corridors (TF-RUCC)
- GTR9-1-03r1 (Japan) Document TF-RUCC-K-03-Rev.1: Work plan of Task Force Review and Update of Certification Corridors (TF-RUCC) (Revision)
- 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 (Revision)
- GTR9-1-06 (JASIC) Technical Discussion – Injury Criteria
- GTR9-1-06r1 (JASIC) Technical Discussion – Injury Criteria (Revision)
- GTR9-1-07 (JASIC) Technical Discussion – Benefit
- GTR9-1-07r1 (JASIC) Technical Discussion – Benefit (Revision)
- GTR9-1-08 (Humanetics) FlexPLI GTR Status, 1 – 2 December 2011
- GTR9-1-08r1 (Humanetics) FlexPLI GTR Status, 1 – 2 December 2011 (Revision)
- 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
- GTR9-1-10 (Humanetics) Changes to Flex PLI GTR Since Prototype Build, Status Dec. 2010
- GTR9-1-11 (Bertrandt) Scatter of pendulum test results, 09.11.2010
- GTR9-1-12 (NHTSA) Informal document **GRSP-49-23**: Update on Pedestrian Leg Testing

**D) Summary of Meeting****1. Welcome and roll call of participants**

The chair, Mr. Damm (German Ministry of Transport), welcomed the attendees at the Palais des Nations in Geneva. The attendees introduced themselves in a tour de table.

**2. Adoption of the agenda**

The agenda (GTR9-1-01) was updated following the documents that were handed in for the meeting. Unfortunately documents GTR9-1-07, GTR9-1-08 and -09 had not been uploaded to the GRSP website but electronic and / or hard copies were provided by the secretary, Mr. Kinsky (OICA), for the meeting.

The revised agenda was finally agreed as document GTR9-1-01r1.

**3. Review of the Minutes of the Constitutional Meeting (document GTR9-C-02)**

Document GTR9-C-02 was reviewed. Comments were received from Mr. Zander (BAST) and Dr. Ries (OICA) and were incorporated accordingly. The final minutes were agreed and will be made available as document GTR9-C-02r1.

**4. Finalization of Terms of Reference and Operating Principles for submission to the 50<sup>th</sup> GRSP session (documents GTR9-C-07r1 and GTR9-1-09)**

The chair presented both documents: document GTR9-C-07r1 that represents the ToR etc. of this group as well as document GTR9-1-09 containing the information regarding the IG GTR9-PH2 given to the November 2011 session of WP.29 and AC.3 (informal document WP.29-155-35). No comments were received on the documents. The document GTR9-C-07r1 will be submitted for the 50<sup>th</sup> session of GRSP as final draft version of the ToR etc. After approval by GRSP, it is planned to submit the ToR document to WP.29 and AC.3 for approval at their March 2012 session. The UNECE secretariat will be contacted on this.

**5. Brief review of FlexPLI History (document GTR9-C-04)**

The vice-chair, Dr. Konosu (JARI), presented document GTR9-C-04 on the history of the Flexible Legform Impactor. The presentation was well received. Mr. Martin (DTS) however noted a slight mistake that was corrected. A revised version of the document will be provided as document GTR9-C-04r1.

**6. Review of the TEG document matrix provided at the Constitutional Meeting (document GTR9-C-08)**

The document was presented by the secretary, Mr. Kinsky. No comments were received for the time being. The secretary mentioned that it is planned to also add a similar table for the documents of the IG GTR9-PH2. This table will be provided at the end of the work of this group. Attendees wishing to receive a preliminary version may contact the secretary.

**7. Detailed review of the past activities of the FlexPLI Technical Evaluation Group (TEG) (document GTR9-C-05)**

Dr. Konosu (JARI), who also served as chair of the Technical Evaluation Group (TEG), presented document GTR9-C-05 summarizing the work of this group. The presentation was welcomed.

Mr. Martin (DTS) asked why the certification of the components just mentions 325 Nm for the bone cores but 340 Nm for the legform assembly. Mr. Been (Humanetics) explained that the injury criterion was finally decided during the work of the TEG to be 340 Nm and the bone in the latest version is certified with 400 Nm at component level. This has not yet been reflected in the document shown but will be considered accordingly in all future FlexPLI activities.

**8. Update on the FlexPLI version GTR status (GTR9-1-08)**

Mr. Been (Humanetics) presented document GTR9-1-08 on the status of the FlexPLI development. He mentioned that slight changes have already been made to the presentation and that a revised version will be shared (document GTR9-1-08r1).

Mr. Been concluded his presentation stating that Humanetics is working to find a final solution to meet both certification procedures - especially the inverse test corridors are not always met - with the same FlexPLI assembly. Mr. Been finally requested all attendees of the IG GTR9-PH2 to support Humanetics with providing test capacity and legforms that have already been delivered to the costumers.

Mr. Zander (BAST) wondered why issues only occur with the inverse test but are not seen with the pendulum test. Mr. Been replied that there were further changes to the bone core material (change from polyester to vinyl ester material), to the rubber layers in front of the tibia (elongated to the full length of the tibia) as well as to the assembly of the rubber parts holding the tibia and femur segments on the bone core. These changes may affect the performance. In addition, the corridors had been defined with prototypes assembled with the old bone core material, using only three impactors for the inverse test procedure. Mr. Zander replied that, however, the changed properties of the impactors had already been considered within the activities of the TEG and that serial production legs previously had issues with both, the pendulum as well as the inverse certification test. In addition, for

defining the inverse test corridors three legforms had been tested in two labs while just two impactors were tested in one lab for definition of the pendulum corridors. So, for him further deviations are hard to understand.

Mr. Kolb wondered what will happen if an impactor does not meet the pendulum test requirements already after its final assembly. Mr. Been responded was not aware of related issues. As worst case, Humanetics would need to disassemble and reassemble the impactor, maybe replacing parts for the impactor.

Mr. Knotz (Concept Technologies) asked how it is assured that the overall impactor assembly still meets all criteria when just one single part (specifically one bone part) is replaced. Mr. Been answered that replacing parts is common and that also other dummy assemblies have to be regularly certified. Mr. Knotz however wondered whether it influences the final performance of the impactor. Mr. Been said that there should not be a risk with this but customers can double check the re-assembled legform at their test lab to assure that the performance is still okay. Customers would be able to directly compare the performance before and after any modification. Dr. Konosu added that according to the experience collected in Japan there also are no issues with replacement of the bones and the impactor performance after this.

Mr. Bilku (OICA) asked whether there are experiences with the glass fiber material on how many scratches, how many wear marks can be accepted until the bone core needs to be replaced. Mr. Been pointed to the presentation announced for agenda item 9.1 that may provide some answers for this. Later, Mr. Bilkhu also wondered whether the production process due to machining could also influence the performance of the bone core material (or the impactor respectively) but this is not seen by Humanetics.

Some further discussion came up on the build levels of the impactors. Mr. Hohmann (OICA) as well Dr. Ries (OICA) wondered whether all impactors have the same build level: According to the document TEG-138 it was distinguished between FlexPLI's produced "before" and "after" April 2010 when comparing the certification test results. Mr. Been replied that besides the prototypes all legforms were equipped with bone cores made of vinyl ester and therefore should have the same performance. The only difference was the kind of data acquisition system used including the number of channels. However, he also noted that the bone core material from the 22 currently available serial production legforms was taken from four different batches.

The secretary Mr. Kinsky reminded the group that Humanetics had supplied for an earlier meeting of the former Technical Evaluation Group (TEG) a table with all modifications to the legform that were brought in during the production. This table mentions amongst others the change of the glue to affix the strain gauges as a possible source of major deviations. Mr. Been will double check this together with his colleagues. The document mentioned above

will be added to the documentation of this meeting as document GTR9-1-10.

According to the explanation of the chair, detailed information on the current build level of impactors will provide evidence to the participants of the IG and the user of the impactor. This information is also needed and important to be known as the tests planned within this informal group in future shall be performed with several impactors of the same build level. The discussion was finally concluded for the time being with the request to Humanetics to provide detailed information regarding the build level of the individual impactors produced. Humanetics will prepare this information.

Mr. Yamakawa (OICA) asked whether there are issues with the recyclability of the FlexPLI since this was on the agenda during the last WP.29 session to be a potential problem for the WorldSID dummy (also produced by Humanetics). Mr. Been answered that this is a specific WorldSID issue since one of the components contains mercury. He can of course not guarantee that the environmental friendliness is not an issue in 10 years or so but currently no problems are seen by Humanetics for the materials used for producing the flexible legform impactor.

## **9. Discussion of items of the activity list**

### **9.1. Evaluation of the durability (activity list item 1.e) (doc. GTR9-1-04)**

Dr. Ries presented doc. GTR9-1-04 on behalf of OICA reporting about the long-time durability of one of the prototypes (number SN-02) of the FlexPLI. The respective impactor was used for more than 300 tests in different configurations. It was highlighted that this impactor obviously is the last one in its original state including the bone core made of polyester. Dr. Ries concluded that the impactor is still working properly despite of its frequent usage but that some further guidance will be needed to further guarantee this after a longer period of time.

After finalization of the presentation, Mr. Bilkhu asked again whether there are experiences with how much damage to the bone core (as shown in the presentation) is acceptable. Manufacturers would be concerned using an impactor that shows so clear damages. Dr. Konosu added that the certification procedure is done for these purposes. Mr. Knotz added that the certification test may be met but it is unclear what the damages mean for the performance of the impactor when it comes to high test results close to the injury criteria. Mr. Zander mentioned that the purpose of introducing the inverse certification test was that the performance of the assembled impactor is checked against realistic vehicle impact conditions. Mr. Been stressed that the impactor does not look too bad when considering that the impactor has been frequently used and that it was used to collect first experiences which may include overloading and poor handling. European OICA members replied that the agreed criteria were slightly exceeded in very few cases only.. In addition, they would prefer

to go on with their round robin testing with this impactor as unmodified prototype status, as long as no major failure occurs. This could finally provide also indications on when impactors need to have comprehensive maintenance or even to be replaced.

Mr. Kolb added that his company had similar experiences with their legform regarding the wear as described in the presentation. On request he clarified that the Bertrandt legform is already equipped with vinyl ester bones and that around 60 pendulum tests as well as 30 inverse tests (but just around 10 vehicle tests) had been conducted before the bone core was replaced. Mr. Kolb presented a diagram showing how the performance of the impactor was worsening (more scatter) during an extensive pendulum test series (document GTR9-1-11) which finally led to the decision to exchange the bone core. Dr. Konosu added that obviously the certification tests give a clear indication on whether issues with components are occurring; Mr. Been agreed to this.

Dr. Ries clarified that the main issue seems to be that detailed guidelines are needed on how and when to conduct a disassembly. Mr. Been responded that there are guidelines for the certification tests procedures and following these should assure that no impactor malfunction should be overseen. However, Humanetics will think over whether more details should be provided for this. Mr. Hohmann requested to have checklists for these purposes that would ease the processes in test labs.

Mr. Zander mentioned that BAST conducted a large number of certification tests with impactor SN-02 but, by now, the performance of the impactors seems not to be significantly influenced by impactor wear. Mr. Zander promised to present more details on the impactor performance of a certain (longer) period of time.

Finally it was announced that BAST as well as Bertrandt will provide more detailed information regarding the long time performance at the 2<sup>nd</sup> meeting of the informal group.

Mr. Been provided some further comments on the presentation of OICA:

- Regarding the loose screws, Humanetics could foresee some holes that allow the checking of screws. Dr. Konosu added that the holes in any case should be very small to avoid damages during the testing and possible influences on the test results especially in cases as shown were the screw is at the struck side of the impactor.
- Regarding the shown bending of a string potentiometer's steel string, Mr. Been was wondering whether the potentiometer should already have been replaced. This will be further investigated. However, Mr. Kinsky mentioned that initially it will not influence the performance since all measuring channels are zeroed before the test. However, it is unclear whether the bended string will stretch during the testing and therefore may influence (decrease) the test result.
- The steel cables representing the ligaments show considerable wearing. However, it seems to be unavoidable and it does not seem to influence the test results.



- The design of connector block showing the scratch in the connector socket has already been changed. Due to this, such damages are no longer possible.
- The availability of spare parts is also seen as a problem at Humanetics and it was promised to improve soon.
- Finally, the prices for spare parts will be checked at Humanetics. However, some of the prices are caused by the fact that parts are hand-made parts at a very small volume.

Ms. Versailles (NHTSA, US) mentioned that their test labs also recognized some durability issues that were reported to GRSP in the May 2011 session (see GRSP informal document no GRSP-49-23; added as document GTR9-1-12). Ms. Versailles concluded that durability has improved with the Flex-GTR legform impactor compared to earlier versions of the impactor and therefore did not see any further issues related to durability. Mr. Been thanked NHTSA for this and stated that the results of the testing at NHTSA were used to further improve the legform durability.

The chair concluded that currently a task force on review and update of certification corridors (TF-RUCC) is working on the issues with the certification as mentioned above and will come up with recommendations on the type of certification tests needed for the impactor. Based on the recommendations, the informal group has to decide if the pendulum and inverse certification tests are sufficient, or if certification tests at component level have to be implemented either in the regulatory text or the user manual. Dr. Konosu will report on the TF-RUCC activities under agenda item 9.5.

## **9.2. Assessment of benefit and costs (activity list item 1.c) (doc. GTR9-1-07)**

Mr. Takahashi (JASIC) presented document GTR9-1-07 on the possible benefit of the introduction of the FlexPLI.

After finalization of the presentation the chair asked whether other gtr signatories would be able to also provide accident data related to pedestrian accidents and specifically focusing on lower limb injuries (tibia, femur and ligament injuries). The US promised to check whether they can perform a study on their accident statistics and provide the respective data.

Mr. Hand (UK) asked for clarification whether the estimated cost reductions are to be seen as absolute figures. Mr. Takahashi responded that the figures represent a potential reduction in pedestrian leg injuries with the application of the FlexPLI relative to the EEVC LFI. In relation to US accident data this would mean an even higher benefit as stated in the presentation due to the fact that legform protection is currently not covered by US legislation for vehicle certification (to be discussed again at 2nd meeting). As shown by the distribution of AIS 2+ pedestrian lower limb injuries from a Japanese in-depth accident data,

most of the injuries are leg fractures. The FlexPLI evaluates leg fractures at four locations along the entire leg while the EEVC LFI that evaluates leg fractures at one location just below the knee joint. So, most of the benefit should come from the enhancement of the leg fracture evaluation.

Mr. Bilkhu mentioned that knee injuries are more difficult to repair than tibia fractures in terms of long-term consequences as e.g. the lost work time and asked whether it would be possible to also extract the figures for knee injuries using different medical cost estimates between knee ligament failure and tibia fracture. Mr. Takahashi responded that the data were derived from Japanese insurance companies' data and they are just average medical cost by AIS level. This investigation ignored the improvements in the assessment of knee ligament failure, although some improvements are expected due to the difference in the structure of the knee joint and the injury measures. This is because knee ligament failures account for only a small part of the lower limb injuries. Even if the difference in the medical cost is taken into account, most part of the benefit should still come from the reduction in tibia fractures. Even a very comprehensive study may or may not be able to split the medical cost for the knee joint appropriately.

The chair asked Mr. Takahashi whether further studies on the benefit are planned for the knee area. Mr. Takahashi responded that currently no such activities are planned in Japan. However, the chair will also ask GRSP delegates at the 50<sup>th</sup> GRSP session for data on pedestrian accidents related to knee and leg injuries.

Finally, Mr. Takahashi promised to provide an updated version of the presentation since some slight corrections were found to be necessary (see doc. GTR9-1-07r1).

### **9.3. Assessment of biofidelity (activity list item 1.b) (doc. GTR9-1-05)**

Mr. Takahashi also presented the document on the biofidelity issues. He concluded that, compared to the EEVC LFI, biofidelity has improved significantly. First, the risk of bone fracture is evaluated over the entire length of the tibia. As the peak stress of the bone is generally located below the impact point, the injury risk could not be addressed using the EEVC LFI accordingly. Second, an elongation of the cruciate ligaments is caused by both shear and valgus bending which is addressed accordingly by the FlexPLI while the EEVC LFI is using two separate thresholds for the knee shear displacement and the knee bending angle. For the tibia fracture prediction, Mr. Takahashi had presented results for three different vehicle front ends (passenger car, SUV with low lower bumper reference line and SUV with high lower bumper reference line) in their original state as well as in a modified state. Mr. Zander wondered why for vehicles A and B the performance with the EEVC LFI was worse while it improved for vehicle C. Mr. Takahashi explained that vehicles A and B had relatively soft front ends and were modified to be stiffer while vehicle C already had a stiff front end and was modified to become softer. This explains the different results.

Also, Mr. Zander asked which simulation models were used. Mr. Takahashi stated that the human model was developed jointly by Honda and JARI. Detailed information on the human model is available in the references listed in the document GTR9-1-05. The vehicle models are simplified vehicle models and the derivation is described in detail in the reference paper (see list of references at the end of document GTR9-1-05) of Konosu et al. from the IRCOBI 2009 conference.

Mr. Bilkhu added that the EEVC LFI had been developed to address knee injuries. So, one should not be surprised that the performance regarding tibia injuries is limited. However, also with the FlexPLI the correlation of the knee response with the human model is not yet perfect compared to that of the tibia. Mr. Takahashi replied that they are aware of this and plan to study this in more detail in the future. On request he confirmed that this should not affect the design of the current impactor.

Besides, Mr. Bilkhu stated that both impactors do not seem to be very good for knee injury prediction (r value below .8) Mr. Takahashi answered this being one of the limitations of the legform only representing the isolated human leg. He stated that JARI is currently working on a study to incorporate the upper body mass effect. However, the study is at a too early stage for conclusions.

Ms. Versailles added that the US also had shown in their document GTR9-1-12 that the performance had been improved. Mr. Kinsky stated that however the presentation of the US may cover a mistake in its conclusions: due to the fact that the FlexPLI has an overload protection device (the steel cables along the long bones) and the EEVC LFI does not have such a device it is not possible to compare test results well above the limits. This was confirmed by Mr. Been (Humanetics).

Mr. Takahashi promised to also provide an updated version of this presentation that will include some slight corrections (see doc. GTR9-1-05r1).

#### **9.4. Evaluation and decision of performance/injury criteria (activity list item 1.j) (doc. GTR9-1-06)**

Document GTR9-1-06 was also presented by Mr. Takahashi. He explained that the injury criteria for the FlexPLI were derived from different studies and that the thresholds proposed by the Flex-TEG were validated from a biomechanical viewpoint.

Ms. Versailles stated on request that the US had raised some concerns during the May 2011 GRSP session regarding the injury thresholds that were chosen for the FlexPLI. With the abilities of the impactor it may be possible to achieve better protection with more stringent criteria. The US does not see a necessity to just achieve a protection level that is comparable

to the EEVC LFI. However, NHTSA will investigate this in more detail.

Mr. Knotz wondered whether it is possible to derive injury criteria from results of two PMHS tests as it was done in the study for the ACL criterion. Mr. Takahashi replied that this unfortunately is the only available information and thus it is not possible to analyze the data in the same way as that used for tibia fracture.

Mr. Takahashi will finally also provide an updated version of this presentation that includes some slight corrections (see doc. GTR9-1-06r1).

#### **9.5. Report of the Task Force Review and Update of Certification Corridors (TF-RUCC) (activity list item 1.g) (doc. GTR9-1-03r1)**

As chair of the task force, Dr. Konosu presented the revision 1 of document GTR9-1-03 containing the Terms of Reference for the TF-RUCC. He also presented document TF-RUCC-K-04-Rev.1 regarding the derivation of certification corridors and on the future action plan of the TF. He finalized that the group would like to finish its work by end of March 2012 in time for the 2<sup>nd</sup> meeting of the informal group.

Mr. Hohmann mentioned that the time schedule seems very tough. Mr. Been replied that it is tough but not impossible to achieve and that Humanetics would need the support of this group, specifically regarding the availability of impactors and maybe also regarding test capacity. Currently, five prototype legforms and 22 serial production legforms exist; additional 12 legforms currently are ordered but not yet delivered to the customers. Mr. Hohmann stressed that, however, Humanetics first need to provide some impactors with an identical build level to produce new data and to assure that the data are comparable. With these data, discussion on the certification corridors can be restarted but keeping in mind that industry would refuse the corridors being widened up. Dr. Ries underlined again that from the OEM's point of view the corridors need to be as tight as possible but that shifting the corridors could be acceptable. The chair of the task force promised that the comments above will be considered accordingly.

Mr. Been replied that Humanetics first needs an agreement that the corridors can be redefined. With the latest modifications to the impactor it is impossible to meet the certification corridors and that data shown by Humanetics from different tests underline this. He believes that different labs should provide their data from which new corridors could be derived. The chair of the informal group added that the corridors established by the TEG should serve as starting point for further analysis.

Mr. Zander added that the very first step needs to be tests being carried out in one experienced test lab with a limited number of legforms (later on it was clarified that preferably the legforms should be serial production legforms with bone core material from

different batches, as this will also occur in the future) to assure repeatability and reproducibility of the test results but excluding lab to lab variability. Starting from this point, involvement of further labs etc. can go on. Dr. Ries added that the production process of the FlexPLI must guarantee that impactors which will be sold in future will behave like those ones on which the possible new corridors will be derived from. Mr. Been replied that Humanetics will do their very best to do so but that sometimes changes are necessary due to circumstances that cannot be controlled by Humanetics, e.g. material availability. The chair added that this of course can happen. However, it needs to be well documented and then reported to a forum like this group. Therefore detailed information and documentation on the build levels of the impactors is a prerequisite. The respective forum then may decide to e.g. revise test procedures, corridors etc. Mr. Zander underlined the link of the different issues like repeatability, impactor output and possible shift of certification corridors. A changed performance would not only mean a possible shift of certification corridors but also a possible modification of the impactor threshold values. Mr. Hohmann requested that all changes to the legform need to be well documented. After some discussion on this Mr. Been stated to bring back all this information to his company's quality assurance group and that he will report on this.

Mr. Knotz mentioned that the informal group should also discuss the speed measurement for the FlexPLI: Currently, there is no procedure foreseen and this is also a potential issue. The chair wondered whether the PADI or the users' manual should cover such details. Humanetics will check if this can be incorporated.

After some discussion on all the details mentioned above it was agreed again that the task force will consider the discussion in this group in their future work.

#### **9.6. Consideration of activity list, work plan and identification of further open issues**

The chair started the discussion with summarizing items that have already been brought up:

- Mr. Broertjes (European Commission) had requested in writing to modify the legform test procedure in a way that makes it impossible to use styling elements to narrow the test areas;
- Mr. Borde (Faurecia) had requested information on the availability of simulation tools for the impactor;
- Mr. Martin (DTS) had brought up that there may be issues with the ISO coordinate system used for the FlexPLI;
- Mr. Martin also was wondering where the filter classes for the measurement equipment had been derived from and where this was stated.

Mr. Broertjes (who apologized for not being able to attend this meeting) had sent his request in advance:

## QUOTE

...

Could you please discuss, on behalf of the Commission, that the Terms of Reference should preferably include a statement that the legform test zone shall also be re-assessed? Currently, we see that more and more manufacturers are using small bumps and pointy edges to artificially make the bumper test area as narrow as possible. The European Commission would like to address such circumvention of the spirit of the legislation by addressing the 'misuse' of jumping reference points for the test area determination planes.

...

## UNQUOTE

The chair explained that the ToR already cover the possibility of modifying the pedestrian test procedures for the legform impact. This had been included on request of OICA and should also serve for the purpose of this request. Mr. Zander wondered which pieces of information are needed for this since e.g. Euro NCAP already discussed this and decided for a procedure that apparently is addressing this issue. The secretary noted that of course information like this should be shared and may serve the group as basis for the discussion.

Regarding Mr. Borde's (Faurecia) request to inform the group about the availability of simulation models Mr. Been promised to present some more details on this during the next meeting. Mr. Freyburger (OICA) added that a consortium of OEM's and Humanetics had been working on a simulation tool but recently stopped their work until the hardware issues are solved.

Mr. Knotz wondered how the simulation data presented in several documents during the meeting can be assessed. Mr. Freyburger replied that an early version of the FE model is already available but still has limitations. Therefore, assessments of all data need to consider this. Some discussion on this came up and Dr. Konosu added that Japan is using FE models and that different models are available: e.g. JAMA and JARI had developed an FE model. This model was validated on component level and therefore should also be acceptable on assembly level; the model is used in their work and shows good correlation. In addition, Japanese manufacturers in some cases use own models.

Mr. Been (Humanetics) added that it is very hard to develop a simulation model due to the complex behavior of the impactor.

Mr. Zander requested to get an overview on currently existing FE models, if possible.

The chair stated that this informal group will not work on the development of FE models of the FlexPLI but can serve as a platform for brief exchange of information of the current

activities to develop such models. It was finally mentioned that the IG GTR9-PH2 will take this up at the 2<sup>nd</sup> meeting. An item will be added to the agenda accordingly.

Mr. Martin explained that the ISO group has published the coding for the FlexPLI and that he sees potential issues with the coordinate system used: the EEVC LFI uses the vehicle coordinate system; the movement is coded in x-direction. In contradiction to this, the FlexPLI is coded in the direction of the human movement which is then the y-direction. He was wondering whether the group wishes to comment this. Mr. Been stated that he thinks the coding should follow the coding of other dummies (as it is currently used for the FlexPLI). However, he promised that Humanetics will specifically highlight this in the users' manuals for the FlexPLI to avoid difficulties due to this.

Mr. Martin had also asked why the CFC 180 filter classes were decided to be used. SAE J 211 foresees other filter classes (specifically CFC 600) and some DTS customers have issues with the consistency of their data. Dr. Konosu mentioned that the same filter classes were used as in the human models. Also, the EEVC LFI is using these filter classes for the tibia acceleration where the filter class used might have an influence on the results. On the other hand, it was expected that the filter classes have a marginal effect on ligament elongation and bending moment results.

Discussion came up whether it would be sufficient to just mention this in the users' manuals. However, Mr. Knotz was wondering whether this may be too easy: for a reliable assessment the differences between test results with CFC 180 and CFC 600 filtering should be compared. The chair asked whether someone could provide data on this. Mr. Been added that in fact all data are stored in raw data format and that it just is a re-processing of the data. BAST, OICA, Bertrandt as well as Humanetics promised to check the data available in their companies / organizations. It was finally agreed that the IG GTR9-PH2 will come back to this item during the next meeting.

Following the discussion above the chair requested Humanetics to provide the current version of the users' manual. The manual will most likely need further modification during the work of this group but so all attendees can start at the same level of knowledge. Mr. Been promised to share an updated version as soon as possible.

Regarding the specifications and drawings the chair explained that WP.29 discussed this during their last session: in general, such details need to be available for all dummies. However, it is clear that it does not make sense to share the information as long as the discussion is not finalized. Nevertheless, all details needs to be available before GRSP and WP.29 are going to decide on dummy items. Mr. Been stated that Humanetics is aware of this and that they will provide this as soon as the hardware status is finally agreed.

Mr. Zander was asking whether a preliminary version would help the group and it was

agreed after some discussion that a version will be shared later which then should be closer to the final version. However, it is clear that each version marked “preliminary” may need to be further modified.

As the informal group is planning to set up a first draft of matrix of tests to cover items of the activity list of document GTR9-C-07r1 to be started after the finalization of the work of the TF-RUCC, the chair finally asked which members of the IG would be interested in supporting the testing activities. OICA, BAST, Concept Technologies and Faurecia mentioned to be interested in this. However, details need to be clarified.

Also, on request of the chair OICA as well as NHTSA stated to plan presentations of test results during the next meetings. Ms. Versailles outlined that NHTSA has undertaken several activities regarding vehicle testing, impactor comparison etc. The reports are currently prepared and will be shared in detail as soon as they are available, preferably at the 2<sup>nd</sup> meeting of the informal group.

#### **10. Consideration of schedule**

The chair mentioned again that the schedule is considered to be quite challenging. However, he would prefer to stick to the schedule. If changes are seen to be necessary, these can be applied at a later stage of the work of this group. This was agreed for the time being.

#### **11. Next meetings**

The chair explained that the next meetings are already planned for 28 – 29 March 2012 to be held in Japan (Tokyo or Osaka) and for 29 – 30 May 2012 in Paris. The invitations will be sent out as soon as possible to allow all members of the Informal Group to prepare their travel accordingly. The agenda for the 2<sup>nd</sup> meeting will be provided in January 2012.

#### **12. A. O. B.**

None