

UNECE GRSP Informal Working Group Deployable Pedestrian Protection Systems (IWG-DPPS)

1st meeting, 18 – 20 April 2018

Frankfurt, KIA Motors Deutschland GmbH
(Theodor-Heuss-Allee 11, 60486 Frankfurt am Main, Germany)

Planned meeting times:

1st day 11:00 a.m. – 5:30 p.m.

2nd day 9:00 a.m. – 5:30 p.m.

3rd day 9:00 a.m. – 5:00 p.m.

Minutes (Final)

Note: Documents of the former Task Force use the numbering TF-DPPS/x/xx, with the new status of the group the new numbering is IWG-DPPS/x/xx.

1. Welcome and introduction (Chair)

The meeting was chaired by Mr. Park (Republic of Korea); Dr. Kinsky (OICA/Opel) provided the secretariat.

The chair welcomed the attendees (see annex) and thanked KIA Motors Germany for kindly providing the meeting room at their Frankfurt offices.

In addition, the chair reported that WP.29 and AC.3 in their March 2018 sessions agreed to change the status of the group to an Informal Working Group.

2. Review and approval of the agenda (Chair/secretary)

The chair introduced the agenda. Questions came up on a revised version of document TF-DPPS/2/03 following the last meeting. The chair promised that this will be provided.

The chair also clarified that 6.1 indicates prerequisites and criteria.

The agenda was approved without changes.

3. Review and approval of the minutes of the 4th meeting of the TF-DPPS (Chair/secretary)

The minutes were approved without further changes.

4. Review and approval of the draft Terms of Reference for IWG-DPPS (Chair/secretary)

The chair introduced document IWG-DPPS/1/03.

Some slight amendments were agreed, see document IWG-DPPS/1/03.

Mr. Maurer (OICA/BMW) suggested to also consider that, if new requirements will be developed, sufficient leadtime will be needed. After some discussion it was recognized that this does not belong to the objectives of the IWG but that this of course should be addressed. The chair promised to keep this in mind for the further work and to note this for the amendments to the preamble of GTR No. 9.

Mr. Gehring (Boehme & Gehring) wondered whether the description of the DPPS is limited to systems in the headform test area. After some discussion it was agreed that the IWG should concentrate on currently existing systems such as pop-up bonnets or external airbags. Some further discussion on this came up, Mr. Zander proposed to also state this in the ToR. The secretary proposed to not limit the ToR from the beginning to certain technologies but to clearly state this in the preamble of a future GTR No. 9 amendment, if needed. This was agreed but it was also agreed that the group only should work on systems that are available on the market.

Following the discussion, it was agreed that the following content should be foreseen for the work of the group as proposed Mr. Zander:

“Since deployable bonnets and external airbags are the only systems currently on the market, the Informal Working Group will, for the time being, develop proposals only related to these passive safety systems. As soon as other passive safety systems, such as e.g. deployable bumpers or technologies based on non-contact based sensor systems, will be available, a further modification of the test procedures, implementing also provisions for these new technologies, will be taken into consideration within a further phase of GTR No. 9 and amendment of UN-R127 respectively.”

For the discussion on the schedule, the chair noted that this is quite tight. Mr. Maurer wondered whether meetings in addition to the already planned ones in between now and the end of 2018 will be effective since sufficient time for preparation will be needed. Mr. Zander (BAST/Germany) noted that there is a common understanding that the objectives cannot be

achieved within one further face-to-face meeting. Mr. Buenger (OICA/Opel) suggested to define clear tasks and milestones to speed-up the discussion. However, a necessary extension of the work seems likely. The chair agreed and noted that Korea is prepared to ask for an extension of the mandate of the IWG, if needed.

For the next steps, a milestone plan was drafted by Mr. Buenger and revised by the IWG:

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|--|----------------------------------|
| <ul style="list-style-type: none"> • Agreement on technical requirements: <ul style="list-style-type: none"> ○ DPPS-2-03-Rev.3 <ul style="list-style-type: none"> ▪ Prerequisites ▪ Verification ▪ Headform tests ○ Generating performance requirements ○ Deciding on marking procedure | 2 nd IWG-DPPS meeting |
| <ul style="list-style-type: none"> • Agreement on test execution procedural details | 3 rd IWG-DPPS meeting |
| <ul style="list-style-type: none"> • Decision on open IWG items in GRSP | May 2019 GRSP |
| <ul style="list-style-type: none"> • Documentation: <ul style="list-style-type: none"> ○ outline of the document ○ draft wording ○ finalized IWG wording proposal to GRSP ○ Recommendation of transitional period | 4 th IWG-DPPS meeting |
| <hr/> | |
| <ul style="list-style-type: none"> • Informal document in GRSP | May 2019 GRSP |
| <ul style="list-style-type: none"> • Formal document to be voted on in GRSP | Dec. 2019 GRSP |
| <ul style="list-style-type: none"> • Adoption by WP.29 | June 2020 WP.29 and AC.3 |

Mr. Zander commented that several of the details can be worked with in parallel. Specifically, he suggests that items, where no agreement can be achieved, should be given to GRSP for guidance as soon as possible. The chair noted that he will take up several details during his next discussion with the Contracting Parties and that he finally can – and will – ask for guidance during the December 2018 GRSP sessions, if this still is needed. Also, open issues will be highlighted in the status report.

5. Presentation and Discussion (All)

5.1. Sensing width vs. headform test area

Mr. Buenger presented document IWG-DPPS/1/08 on behalf of ACEA.

In the discussion, it was noted that the sensing width must cover at least the width of the legform test area. However, physical testing must be in the bumper test area following the

same definition as for non-active systems, verification testing must not exceed the bumper test area even if the headform test area is wider. Manufacturers stated that they consider at least the same width for sensing as the width of legform test area when they design DPPS. Korea and Germany agreed on the idea that the test width for sensing performance is same as the width of legform test area. The chair will double-check with Japan, the European Commission and other Contracting Parties during the upcoming GRSP sessions in May 2018.

Mr. Zander noted that the positioning of the legform in the human body model simulation is different from the legform positioning

5.2. Sensing Impactor

Mr. Buenger presented document IWG-DPPS/1/07.

Discussion came up whether the conclusions from double-checking with one vehicle can be generalized. Mr. Zander noted that it would need to be checked with different vehicles or at least with a few different vehicle categories (sedan-type, SUV, sports car, etc.). In addition, he would have preferred to also check the data using the PDI-2 but Mr. Buenger responded that the PDI-2 had already been presented.

Finally, Mr. Zander doubted that the PDI-2 is always too conservative. Mr. Buenger asked Mr. Zander whether data is available where the PDI-2 solves issues that could not have been solved with the other legforms presented in the document. Dr. Pauer (Altran/Concept) explained that indeed the PDI-2 had been developed with a very conservative approach and that the use may be very challenging for legislation purposes.

After some further discussion the chair concluded that the issue of the sensing impactor is obviously very sensitive and that he wished to also get the positions of other Contracting Parties. He will discuss this during the upcoming GRSP session in May 2018 in the side meeting.

On request of the IWG, Dr. Pauer offered to also run some additional simulations with the generic vehicle models of the sedan type vehicle, the SUV and the sports car using the FlexPLI and the EEVC LFI at a speed of 25 km/h, comparing to human body models. The data could be used to prove that these impactors are also usable for the sensing.

Mr. Zander presented document IWG-DPPS/1/10 which will be discussed during the next meeting since it was handed in late. (**Note:** The preliminary version of the presentation was withdrawn.)

5.3. Practical experiences on dynamic testing

Mr. Harvey (OICA/Jaguar Land Rover) presented document IWG-DPPS/1/06.

In the discussion, a number of details were clarified on request. Mr. Park pointed out that Korea disagrees that the Total Response Time (TRT) is not needed in case of dynamic testing. However, further discussion on this is foreseen.

5.4. Deploy height of the bonnet (deployed position vs. fully deployed position)

Mr. Maurer presented document IWG-DPPS/1/05.

Discussion came up on the correct intended height. Mr. Buenger and Mr. Maurer explained that this is a question of the vehicle design and the components used. However, in case of open questions labs could conduct dynamic testing. Dynamic testing anyway would be used if this intended position is not reached before the head impacts this position (meaning that head impact time HIT < total response time TRT of the deployable system).

Mr. Gehring wondered whether the upwards movement of the bonnet is critical (with regard to the loads) for the head impacting the bonnet. Mr. Maurer confirmed that his company limits the lifting speed to avoid negative effects. Mr. Zander wondered whether Mr. Maurer could provide some evidence that this is effective. This should preferably also include some discussion whether impact angle and speed are affected. Mr. Gehring added that the still moving bonnet may also create questions regarding the correct mark-up of the headform test area (in case this is marked in the partly opened position (the intended position)).

5.5. Summary of Compliance Test Procedure for Pedestrian Protection (Korea)

Mr. Park (Republic of Korea) presented document IWG-DPPS/1/09.

In the discussion, it was noted that obviously the self-certification does not work without co-operation of the vehicle manufacturer. Mr. Zander wondered whether this is the same for the US but no common understanding on this was available. Mr. Bilkhu added that no information is available so far from NHTSA on this since their plans on pedestrian safety testing have not yet been published.

5.6. HBM simulation validation

Ms. Klug (TU Graz) presented document IWG-DPPS/1/04. She provided an overview on Euro NCAP's CoHerent project dealing with different solvers, human body models (HBMs) and their statures. The assessment is based on Generic Vehicle Models and harmonized simulation protocols including pre- and post-processing. This project was supported by global OEMs verifying the details. Aim of the project is to have a verification procedure for the simulation models, which are used for the vehicle design and where the corresponding data are provided for the vehicle assessment in Euro NCAP. Ms. Klug finalized her presentation stating the project is ongoing with a monitoring of the results and the development of verification corridors for further statures (6-years old child, 5th percentile female) that have not yet been included.

Mr. Buenger stated that the posture comparisons and contact settings (e.g. on page 10) are displayed in charts that may be misleading as only the top of the values are shown. Considering the overall results, the differences are only minor.

In addition, Mr. Buenger noted that, according to the Euro NCAP protocol, it is possible to deviate from the verification corridors. Differences than can be discussed with Euro NCAP and they may accept this – a procedure that will not be possible for legislation.

Mr. Yanaoka (JASIC) asked if the procedure was replacing HBM validation. Ms. Klug replied this is not the case.

Mr. Yanaoka also asked why the sorting of the HBMs was not considering statistical methods. Ms. Klug replied the outliers were obvious, even without applying statistics.

Finally, Mr. Yanaoka asked why THUMS and GHBM were considered as basis models and not also others or more. Ms. Klug responded that the corridors are not only based on these two models: 18 different results were analysed and were grouped into "consistent" and "inconsistent" results. Consistent models were showing comparable results as THUMS v4 and GHBM PS models. These two models are accepted to represent the "state of the art" of Human Body Models and they were the ones where all validation information is publically available. Licenses for the models are available to all parties and they are well accepted within the scientific community. To avoid problems due to future updates of the models, the responses of the models are monitored and corridors can get updated if a clear need is identified.

The chair wondered how the procedure could be used for legislation and whether there are issues with the copyrights. He also wondered how the data including generic vehicle models and files can be incorporated with GTR No.9. Ms. Klug explained that the intellectual property rights (IPRs) of the protocols and the template belong to TU Graz and Euro NCAP. A formal request from the chair or from GRSP probably will be needed to get the support of Euro NCAP.

Mr. Zander noted that Euro NCAP will most likely agree to the application but this needs to be confirmed. The intellectual properties of all of the work parts are spread between Altair, Euro NCAP, ACEA and TU Graz. This may or may not be an issue. Ms. Klug clarified that the IPRs of the vehicle models are spread between ACEA, Euro NCAP and TU Graz. The code houses

(Altair, Dassault Systemes and ESI) translated the original LS-DYNA models into the other codes, so they will also have to be contacted if it is planned to use the models for legislation.

Discussion came up whether other methods to represent the pedestrians – e.g. dummies – can be used for the purposes of testing DPPS. Mr. Yanaoka was asked whether a similar validation method exists for this for the POLAR-II dummy. Mr. Gehring added that there are dummies for accident reconstruction, which have been developed to represent typical injuries. It was agreed to come back to this in a later meeting.

Mr. Zander presented document INF-DPPS/1/11. The chair explained that the document had just been handed in shortly before the meeting and therefore will be discussed during the next meeting.

Regarding the differences in the head impact timing of PMHS tests and HBMs that had been identified by Mr. Zander in some of studies presented, Ms. Klug noted that further studies are available. Dr. Kinsky initially commented that differences of the PHMS test vs. HBM could be caused by the missing muscular strength. This had also been found to be an issue during the FlexPLI development, at the time the influence was assessed with around 10 percent deviation, which could explain the differences noted here. Ms. Klug added that there is one study available from Paas et al. which reported that the THUMS neck tends to better represent a tensed volunteer than a relaxed one. Generally, several studies highlighted that the HBMs have to be morphed to the anthropometry of the PMHS to allow a reasonable comparison. A further closer look is needed on the presented study to ensure that this was done.

6. Overview Deployable Pedestrian Protection Systems Discussion (All)

6.1. Requirements (All)

With regard to the prerequisites, Mr. Zander explained the following scenario: A vehicle is equipped with a DPPS but does not meet the prerequisites. It then will be tested with an undeployed DPPS. Mr. Zander wondered whether this would be okay or whether then the DPPS must be removed from the vehicle since it could cause additional risks. Mr. Buenger responded that usually performance requirements are defined that need to be met and it is the responsibility of the manufacturer to meet those and to guarantee that no further harm is caused by other equipment. As an example UN-R94 with referred to where vehicles may be equipped with front airbags but do not need this to comply with legislation and offer it therefore as optional equipment. After detailed discussion it was agreed that a kind of decision tree may be needed to assure that testing follows a certain procedure. Mr. Buenger will draft a flow chart for this decision tree.

For the requirements overview and the prerequisites originally proposed by BAST (documents TF-DPPS/2/03 Rev.3 and TF-DPPS/2/04), it was suggested that a small subgroup could prepare the discussion in the IWG. Mr. Bihler and Mr. Zander were asked to organize this. Intention is to accelerate the discussion in the IWG with preparing a common understanding and a joint approach, the subgroup will not make any decisions. The chair and Mr. Buenger proposed to concentrate on the following items of document TF-DPPS/2/03 Rev. 3:

- lower threshold deployment test (items 13, 14 and 15),
- protection below lower threshold (items 6, 16 and 17),
- high-speed protection (items 7, 18, 19, 20 and 21),
- system timing (items 2, 3, 4 and 5 as well as 10, 11 and 12),
- bonnet deflection due to body loading (items 8 and 9).

The chair asks the subgroup to discuss those items under consideration of the results of his discussion with Contracting Parties in GRSP. Also, the results must be available well before the next IWG meeting.

In addition, Mr. Buenger promised to clean up the table in document TF-DPPS/2/03 Rev. 3, following the discussion in this meeting.

6.2. Verification and Testing (All)

See above, the small subgroup will also consider those items in their discussion.

6.3. Others (All)

None.

7. Modified task list resulting from the 1st IWG meeting (All)

Task 4 (OEMs): Provide drawings/illustrations and eventually performance data to more clearly describe the background of deploy height vs. fully deployed – **closed**

Task 7 (OICA): Provide geometry data to highlight the differences between deployed and non-deployed marking (TF-DPPS/2/09) – **closed**

Task 8, 2nd part (Chair): Ask for guidance of GRSP on the definition of “appropriate simulation models”, GRSP had returned this back to the TF-DPPS – **closed**

Task 9 (Chair): Provide proposal for agreement process in the TF-DPPS (the minutes of the 3rd meeting); TF chair proposal: unclosed issues will be clarified and discussed in GRSP with all contracting parties – **closed**

Task 10 (Korea): Provide overview on KATRI procedure for self-certification data provision and timelines – **closed**

Task 11 (NHTSA): How to manage simulation (CAE or dummies) in US regulations? – **chair to clarify at GRSP with NHTSA representatives**

Task 12 (All): Is it acceptable using only simulation models for HIT definition? – **JASIC to provide information on using dummies for this; remains open**

Task 13 (Japan): Specify how the sensing area is determined (incl. differences between current NCAP and legislation proposal) (elaborate on TF-DPPS/3/03, discussed in the 4th meeting) – closed

Task 16 (Chair): Review requirements overview with Contracting Parties interested in this Task Force

Task 17 (All): Discuss higher impact speed in the next meeting after discussion of Mr. Park with the Contracting Parties

Task 18 (Japan): Review to use center position alone for HIT and TRT generation

Task 19 (Chair): Clarify with US how to provide manufacturers with an orientation of sufficient number of tests to sign-off the self-certification document

Task 20 (OEMs): Provide proposal to assess the 6-years old child detection – **closed**

Task 21 (All): Provide proposal to check impact accuracy in dynamic tests should be provided – **OICA and Japan proposal savailable**

Task 22 (All): Provide comments on the Generic HIT database proposal

Task 23 (OEMs): Provide proposal on how to provide repair procedures for succeeding tests to self-certification authorities

Task 24 (All): Prepare discussion and proposals for sensing width definition including rationale (worst cases) – **ACEA proposal available**

Task 25 (OEMs, Contracting Parties): Comment on HIT point-to-point stature connection, not linear interpolation

Task 26 (official Test Lab representatives): Provide information on usual dynamic test procedures including synchronization of test to vehicle deployment timing

Task 27 (OICA): Provide evidence that the deploying bonnet does not create additional risks for the pedestrian hitting the bonnet

Task 28 (Chair): Discuss a number of details as outlined in the meeting with other Contracting Parties during the May 2018 GRSP session

Task 29 (TU Graz): Contact Euro NCAP for permission to use CoHerent results

Task 30 (OICA/Mr. Buenger): Draft a flow chart for a decision tree on testing bonnets deployed or undeployed

Task 31 (Secretary): Include milestones agreed in ToR discussion into a timeline document

Task 32 (Messrs. Bihler and Zander): Organize small subgroup to prepare the discussion on requirements as indicated above

Task 33 (OICA/Mr. Buenger): Prepare a revised version of TF-DPPS/2/03 Rev.3 following the discussion in this meeting

Task 34 (OICA/Altran Concept – Dr. Pauer): Conduct the simulations with the three Generic Vehicle Front Ends with FlexPLI and EEVC legform at 25km/h and compare to the HBM data available

Task 35 (OICA): Provide clarification for HIT and TRT measurement

8. Date and place of the next meeting, expected outcome (All)

The chair noted that the next meeting is planned for the week of 3 – 7 Sept. 2018 in Brussels; the European Commission is prepared to host the meeting. **The chair will double check whether the meeting can be postponed by one week as requested by some attendees, the information will be provided as soon as possible.**

Annex: Attendance lists, 1st / 2nd / 3rd day

Attendees List

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Thomas KINSKY				
Jin Seop PARK				

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19 April 2018, Frankfurt/Germany, KIA Motors Europe

IWG-DPPS 1st meeting / 2nd day

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by phone


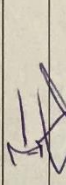
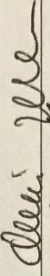
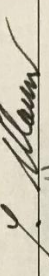
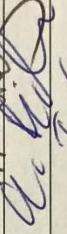
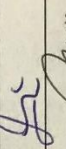
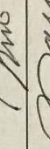
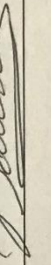
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IWG-DPPS 1st meeting

Date, Place

20 April 2018, Frankfurt/Germany, KIA Motors Europe

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