Meeting Minutes
For the 10th experts meeting of IHRA pedestrian protection
19-21 Feb. 2001, ACEA, Brussels, Belgium

1. Opening of the meeting

The chairman, Mr Mizuno, opened the meeting and expressed his appreciation for the arrangements made by ACEA. In his opening remarks, the chairman noted the increased to establish proposals, not only from Japan but also from the EU and WP29. Japan is about to propose a regulation before the end of fiscal year 2002 and will need output from this group soon. The aim of IHRA is to produce an output, based on research projects, serving as basis for a GTR. It could be useful to split the research items in short and mid to long term plans although the chairman acknowledged that this would need approval of the IHRA SC. The chairman encouraged active participation from the meeting and asked for their positive contributions in finalizing the IHRA 2001 report.

2. Roll call of delegates

(See attached sheet Appendix 1)
The chairman welcomed Mr Bruce Donnelly who is the new US representative, Mr Oskar Ries who is the successor of Mr. Provensal, and Mr Van der Plas, who represents Mr Ishimaru taking care of the Secretariat.

3. Adoption of the meeting agenda

The draft agenda (IHRA/PS/201R1)was approved. The chairman explained that he would like to be informed on the issues around the impactors and WAD under the item 'others' under 6 (1).
Mr Ries asked to be informed about the voting system: who can vote and who can advise?
The chairman explained that he intends to work in consensus and prefers to hear all expert opinions. If there is a broad but not unanimous consensus on a topic, the different opinions will be reflected as such in the minutes.

4. Approval of draft minutes from the 9th meeting

- Page 2, middle of the page change "15 mm seconds" to "15 msec"
- Page 3, middle of the page change "Regarding the definition of …, industry delegates opposed this on the grounds that the internal structure prevented ready identified." was changed to "Regarding the definition of …, industry delegates opposed this on the grounds that the internal structure cannot be easily identified."
- Page 4, bottom of the page change "He recommended we adopt the simple test with narrow variations, and that average values would be acceptable." was changed to "He recommended we adopt the simple test with narrow variations, and that average values would be acceptable for the time being."
- Page 6-7, bottom of page 6 and top of page 7 replace the indent starting with " - Mr Lawrence expressed support for Option 1 …" by "- Mr Lawrence expressed support for Option 1, indicating that overlapping would occur when considering the entire range of car shapes and speed, but not when one car, one speed, and one pedestrian stance are assumed. So overlapping is caused by variations in speed, car shape and in stance. He said that if test authorities conduct tests with a velocity of 40 km/h, they will insure that protection for all to be secured up to 40 km/h."

IHRA/PS/202 was agreed with above changes.

5. IHRA Steering Committee meeting report

The chairman congratulated Mr Ishikawa and Mr Janssen with receiving a 'Safety Award' at ESV.
The new terms of reference (IHRA/PS/197R1) were approved during the SC of June 2001. During the next SC (scheduled for 9 and 10 May) each Working Group will have the opportunity to explain their activities. The Working Groups will once again receive suggestions and comments on their terms of reference.
The terms of reference (IHRA/PS/197R1) were reviewed and updated.
Following changes were made:
"(1) Summation of Global Pedestrian Accident Data" was changed to "(1) Summation of IHRA Pedestrian Accident Data"
"Japan, the US and Europe … global data." was changed to "Japan, the US, Europe and Australia have submitted their detailed accident information as global data."
"- Obtain improved PMHS data and improve model / validation, …" was changed to "- Obtain improved PMHS data and additional accident data and improve …"

"(3) Adult Lower Leg and Knee Test Procedure" was changed to "(3) Adult Leg and Test Procedure"
It was also decided that the central person to be responsible for maintaining the accident database will be Mr Lawrence.
The chairman informed the meeting that already 3 Working Groups have reported to GRSP (front impact, side impact and compatibility). It is planned to have a presentation on pedestrian safety during the next session of GRSP (May 2002). The chairman will prepare a draft presentation in April and circulate this for comments before making the presentations to the Steering Committee and GRSP.
Mr Donnelly provided the chairman with the latest information about the Steering Committee meeting indicating that the presentation time is limited to 1 hour per Working Group and that the presentation should include the terms of reference and the work status.

6. Test procedures
(1) Adult head test procedure + (2) Child head test procedure (combined discussions)
* Computer simulation study re-evaluation and proposal
The results from RARU were presented in paper IHRA/PS/205.
The JARI and NHTSA results were combined in one presentation presented by Mr Ishikawa (IHRA/PS/206).
Mr McLean said that accident data shows most frequent impacts are on the back and the side of the head because of knee bending that initiates rotation and because of torsion of the column. Very few clavicle injuries are found in accident data suggesting the shoulder doesn't play a big role in the impact. Sometimes there are elbow contacts.
Mr McLean also explained that there is a danger in averaging the results from the 3 independent working groups. If only 1 set of results is wrong and averaging is used, the outcome would lead to wrong conclusions. First it is important to understand why the different working groups have different results and Mr McLean expressed his disappointment in the lack of access to the program of the other groups. He proposed to use the program of one group that can be improved by the other groups and is willing to offer the RARU program as the basis.
Mr Janssen said that it was important that the 3 groups worked independently. When 3 groups produce 3 different results this tells something about the sensitiveness.
Mr Lawrence said that WG17 experience had shown the different MADYMO models giving different results and none of them being probably correct. He concluded that MADYMO cannot handle such complex situations.
Mr McLean argued that RARU has used MADYMO for accident reconstruction and this gave a reasonable output. He asked again to get insight into the other group's models.
Mr Ishikawa explained that the JARI model, which started as a Honda model, is now working for 1 year without help from Honda and thus became a JARI model. He agreed to make it open to the other groups.
Mr Janssen explained that MADYMO models are available and that these are not black boxes.
The chairman suggested to do this study into each other's models as a mid or long term plan. In the mean time the meeting should come to tentative conclusions.
Mr Ishikawa presented the work from JARI and NHTSA and stated he will need time to include the RARU data. Mr Lawrence asked how effective mass was calculated. Mr Ishikawa explained they used the resultant acceleration and force in the timeframe t_1 and t_2 (during head contact). Mr Lawrence argued that only the component in the direction of impact should be considered because the vertical accelerations have nothing to do with the bonnet contact.
Mr Ishikawa also explained that a difference in walking position gives a different impact location on the car. Mr Lawrence commented that the neck remains straight suggesting high head impact velocity in contrast to other simulations where the neck is bend which suggests protection by the shoulder. He wondered why these variations occur since some seem to be very human unlike. The shoulder position upon impact and the shoulder stiffness could be the cause why there are so big variations between the 3 models (RARU, JARI, NHTSA).
Mr Provensal asked if there is a (SAE) validation scheme used for these data.
Mr Janssen explained that 2 years ago the validation for the TNO adult human model was 2 (out of 8) meaning global kinematics and injury prediction are satisfactory. The TNO child human model was 1 meaning the global kinematics are satisfactory. As a reference the Hybrid III dummy model was level 4 which was the best available.
Mr Ries asked if the validation data used by JARI and NHTSA was the same. Mr Ishikawa answered that this data was not available.
Mr Provensal asked if this simulation could be used to determine the head impact velocity.

Mr Janssen answered that improved simulation is an open question for the next 20 years. An assessment will always have to be based on the objectives. The purpose of these simulations was to see variations and come up with a proposal for test conditions.
The chairman thanked the 3 groups for their effort. He asked if extra data would come from RARU and NHTSA since they only simulated 40 km/h tests and not 30 and 50 km/h.
Both Mr McLean and Mr Donnelly confirmed that they can provide data for the 3 speeds and for child and adult models by the end of April.
Mr Lawrence said it is impossible to decide the impact conditions until we understand the data and the sensitiveness.
The chairman asked how to solve the variations.
Mr Donnelly asked what extra data could teach us more than we know today. How to continue so that we can define impact conditions?
The chairman said the number of answers depends on the number of parameters selected. Need to find reasons for variations before making corrections. If that is not possible, we have to use the conclusion of the ninth meeting: use average + 1 standard deviation.
Mr McLean said that finalizing the data might raise additional questions.
The chairman likes to conclude (including a list of open issues) based on a full set of data.
Mr Lawrence said there is a need to understand the variation so that the model can be adapted (make the shoulder less influencing) and then run a full set of data.
Mr Donnelly questioned how a better model can be established without cadaver testing, full scale dummy tests and accident investigation.
The chairman theoretically agrees but because of time limitation there is a need for conclusions and define what further research is needed.
Mr Lawrence said variations would be too wide to come to conclusions.
Mr Janssen outlined that there is nothing wrong with saying 'this is the state of the art' and these are our conclusions.
The chairman defended the conclusions of the previous meeting saying that when using the average + 1 standard deviation regulatory people can choose for the safest side.
Mr McLean agreed with this proposal but said that some results are too much apart. So need to study the model first. Mr Ishikawa agreed that based on current data it is not possible to come to good conclusions.
Conclusion 1: The chairman concluded that by the end of April a full set of data will come from 3 institutes. They will prepare recommendations and these will be circulated. Different ideas will be included in the conclusion.
Mr Lawrence asked JARI to study the walking stance, including the influence of the shoulder and the impact on the head (side and back). Mr Ishikawa agreed.
Mrs Brun-Cassan asked who will analyze the computer models. Mr Ries said that there is now a population of 3 child models and which is best is not known because no child cadaver data is available.
The chairman said that if someone is interested in studying the 3 models they can.
Mr Lawrence said that an extra stature between the 6 year old and the 50% male is needed.
The chairman said that stature is related to the WAD and component tests cover the whole area of the bonnet / windscreen.
Mr Lawrence argued that the impact areas also mean different statures. Need to proportion between child and adult. If the child hits at 5 m/s and the adult head at 15 m/s what is the impact velocity for the area where intermediate statures hit? It was agreed which scope the models have (6 year old can be used for 9 year old) but no decision was taken about the impact velocity.
Mr Janssen said that the impact zones are based on 40 km/h accident speed so different speed will move the test areas on cars. This will become too complex.
Mr Ishikawa said it is difficult to make simulations with mid sized stature.
Mr Donnelly said there is no guarantee that success will come out of the model itself. Need a 3-group committee to study the models based on cadaver data and accident data.
The chairman asked for a volunteer.
Mr Janssen referred to a paper (IHRA/PS/207) from previous meeting and explained again the conclusions: further study is needed and use temporally current results in the test methods.
Conclusion 2: Mr Ishikawa will collect the data of the 3 models and use it for the average + 1 standard deviation calculation. Results will be made available by next meeting.
Mr McLean will make extra accident reconstruction data available.

** Definition of side reference line including W/S

OICA needs more time to study. Will provide data by next meeting combined with the definition for the upper part of the windscreen (proposal of Mr Akiyama during 9th meeting).
Mr Lawrence said the intention was to test everything that was likely to be hit. Why should we have an upper part windscreen limit? This limit was set because of worries that for some cars like the Smart the test would have to be done on the rear windscreen if only the WAD was taken into account. Has someone measured the WAD to the back of the roof of a Smart? If the WAD is smaller than the measurement on the Smart to the back of the roof, there is no need for an upper part windscreen limit.
The chairman explained that if the roof needs to be included, extra simulation would have to be done. There is no volunteer for this simulation work so a limit is needed.
Mr Tanahashi said this issue was discussed and agreed (test front part only) during the 9th meeting and that there is no need to repeat the discussion.
Conclusion 3: The chairman concluded the test will be limited to the upper part of the windscreen.

*** Others
Impactors
NHTSA explained paper IHRA/PS/204. The paper is a draft: figure 10 needs corrections. The moment of inertia will be measured in the coming months. The HIC response for the child and adult impactors is the same (see figures 9 and 11). Why do we need 2 headforms? A corrected paper will be made.
Mr Janssen said the IHRA adult impactor is not the same as a WG17 update. Looking at figure 12, can angle sensitivity be the cause of scatter?
The chairman asked NHTSA to give advice on the diameter tolerance but keeping an eye on the mass.
Mr Ries explained about 2 problems: the accelerometer offset to the center of gravity gives a scatter of 10% for a 10 mm offset, and if the accelerometer would be in the center of gravity the variation of the impact angle (± 2°) gives a scatter of ± 4%. Both problems remain undetected by the drop test and the dynamic certification test.
Mr Lawrence proposed 3 different solutions.
1/ Move the accelerometers as close as possible together.
2/ Make sure the main accelerometer is positioned sideways.
3/ Place the main accelerometer in the middle and leave the other two accelerometers more offset.
Mr Ries favored this last proposal but Mr Lawrence said it might not be the best since the error would be bigger for the other two accelerometers. Mr Ries said the location and the tolerance for the accelerometer position should be addressed in the specifications.
A recommendation was made by TRL to EURO-NCAP to adapt the second proposed solution. This is reflected in paper IHRA/PS/208.
Conclusion 4: The chairman said there is a need for deciding the detailed specifications and the final certification method.
Mr Ries said that industry is working together with FTSS and TNO on refinements and that results can be provided to this meeting as well (specifications and draft certification test).
Mr Janssen said a balance is needed between tighter specifications and still make it possible for different manufacturers to produce the headforms.

WAD
Mr Ishikawa made a presentation on the transition zone (IHRA/PS/209) concluding that the relief ratio in the transitioning zone doesn't vary much between the overlapping method and the boundary line method. The best boundary line position is at a WAD of 1700. The relief ratio with overlap is smaller but not significantly different. The total consequence (including feasibility) should be considered.
Mr McLean said 0% bottoming out is best for a pedestrian so the study should not take 50% and 100% bottoming out into account.
Mr Lawrence argued that if bottoming out in the test has a low effect it will have a bigger effect for higher speeds. The overlap method was discussed and voted last meeting. The overlap method guarantees a check of different impactors on an area where both adults and children hit cars.
Mr Provensal said the customers are regulators so options should be offered. This could be a table with for every option also providing the feasibility.
Conclusion 5: The chairman said that this is the first time both methods were compared. This data was not available last meeting and the conclusion is no big difference between both methods.
Mr Janssen asked if global data could be used (in stead of only Japanese data). This may shift the adult curve. He asked if the risk of adults impacting the front and children impacting the rear is included in the calculations. Mr Ishikawa confirmed this.

Mr McLean said if the relief rate for one solution is 98% and 94% for the second it still means that 3 times as many people are killed by the second method. So there is a big difference between the two. Also if injured people would be included the distribution may also shift.
Mr Janssen said it also depends on how you calculate a life: is a child life (only) equal to an adult life?
Mr Ries, said that today's situation is 0% saved and that will rise to 94% or 98% lives saved. So it is a big improvement and only a small difference.
Mr Janssen said a feasibility study is needed in parallel with the other discussions. He added that feasibility needs a definition. Not feasible means not possible (against physical law) or not easy (no knowledge yet, no time or no money) or conflicts with other requirements.
The chairman said industry can only comment on feasibility once a test method is established.
Mr McLean said if the industry doesn't say anything about the feasibility study, it cannot be taken into account.
Mr Provensal asked if the AU-NCAP feasibility study could be useful for this group.
Mr Lawrence argued that cars not designed to have pedestrian protection don't say anything about feasibility. Also NCAP tests the worst points and that doesn't say anything about the overall performance. The TRL Metro and the TNO Ecofront are examples of feasibility together with a recent TRL study on the Civic (see item 8).
Mr Janssen said already agreed conditions could be used to study feasibility: impactor mass, speeds, HIC, and some others.
Conclusion 6: The chairman asked industry to supply a first feasibility report by next meeting.
Mr Ries said the research on the overlap question should be included in the 2001 report.
The chairman agreed to included it as an Appendix in a future report but not in the 2001 report.
Mr Janssen said that a high WAD probably means a windscreen impact not a bonnet impact. How does this influence the result since the paper assumes a very long bonnet?
Mr Ishikawa said the study wanted to show the difference between both methods and for that reason the principle used is valid.
Mr Lawrence said the difference between both methods is how broad the area is that needs extra clearance. The concept is the same.
Mr Janssen proposed to combine the study with feasibility, accident data and take a decision then.
Mr Ries presented the ACEA and JAMA conclusions (IHRA/PS/210).
Mr Janssens stated that if it is the industry intention to shift the boundary line to the bonnet end, the study itself is irrelevant.
Mr Donnelly understands the argument of Mr McLean on the percentages (life savings) but supports Mr Ries that it is a vast improvement on today's situation and that a standard is better than no standard. It seemed that overlap is a small issue compared to other matters. He wants to study the JARI paper in more detail and make a decision later.
Mr Janssen said that this group is talking about harmonized research and offers proposals to authorities. If decisions (completely defined tests) are taken these will be criticized.
Conclusion 7: Options will have to be offered together with information why these options are available and their consequences. These options can serve as basis for decisions by authorities. The chairman agrees but added that certain decisions are needed on general issues.

(3) Leg (knee and lower leg) test procedure
The chairman started by saying parameters and threshold levels need to be selected based on biomechanical data.
Mr Lawrence proposed it would be good to consider dummy tests (POLAR dummy but only worry about the knee output) or something between subsystem and dummy tests (impactor + weight for body). Because of a different car group (global versus EU) it might be necessary to also look at different impactor sizes.
Mr Tanahashi explained dummy tests require many cars. He agrees the current impactor needs improvement.
The chairman agreed a dummy is better but no existing dummy is fully developed so use subsystem test but improve the impactor (upper mass, bones, knowledge from POLAR).
Mr Ries asked to what size the impactor will be designed. It should not have adverse effects on children.
Mr Lawrence said it may be that one stature is most at risk so use that size for the impactor (as WG17 did). This is a possible solution but will need to be worked out.
The chairman reminded the meeting that the priorities set were adult head and child head first and then adult leg.

Mr Janssen referred to the terms of reference (IHRA/PS/197R1) where everything was already decided. One possible solution could be a test with the dummy that has to fulfil all requirements (head , chest, knee) and next to that subsystem tests for head and leg. The POLAR could be used to evaluate existing legforms (effect of upper body mass, second leg, …). Decide afterwards what (impactor - dummy) to use.
Mr Lawrence added that studies should not be restricted to current tools only. Funding is needed to develop new tools if necessary. If he receives a specific question he can take that to his customer (government) and ask for funding. If no funding is provided, the WG17 impactor will have to be used.
Mr Donnelly said he can volunteer VRTC to do testing but VRTC has no tools so other members have to lend those.
Mr Tanahashi said the sequence of study should be: accident data, analyze injury (mechanism), define tool, define criteria. He asked what data was already available within IHRA.
Mr Lawrence answered accident data was available.
The chairman remarked this data (used to define the priorities) only give the number of leg injuries but it was not a detailed study.
Mr McLean agreed with the procedure proposed by Mr Tanahashi and said based on accident data reconstruction could be done.
Mr Donnelly explained about the US situation where US law requires NHTSA to establish performance requirements. Tools are needed that can be certified before and after the test so frangible parts in tools present a difficulty.
Mr Ishikawa said the legform based on the POLAR dummy would hopefully be finished next fiscal year.
Conclusion 8: The chairman asked for information about current tools and what was already studied, besides all other information to develop test procedures. Everyone to submit data and information they have and this will be circulated. Based on this data and information, it will be defined what is missing and that should be researched.

7. IHRA/PS WG2001 Report

The chairman reported on the status. Revised chapter 8 is now included, chapter 5 and 7 summary were still missing.
Because of problems with the font (error messages) and printing problems (Appendix C tables) it was agreed that each author would send to the secretariat a paper version in addition to the electronic format by the end of March. The font should be "Times New Roman" and the font size should be 11. The secretariat will circulate the final version by the end of first week of April. Chapter 1 (executive summary) and chapter 2 (summary) will be combined into one chapter and all following chapters will be renumbered subsequently.
In all chapters, the word "global" should be replaced by the word "IHRA" because the data in this report reflect conditions in Australia, Europe (Germany), Japan and U.S.A. only.
Regarding the Tables 5.3 and 5.4 in chapter 5, Mr. Lawrence said that the values should be described with range (ex. 46.2-75.0), not with an average value plus minus 1 standard deviation (ex. 60.6±14.4), because an average value does not have particular meaning. The chairman concluded that it was not necessary to revise the tables but Mr. Lawrence's opinion would be reported in the meeting minutes.
On the subject of "Feasibility", which was originally included (title only) in the Draft version but was omitted from the Version II, it was agreed that this subject should be incorporated in the 2001 Report. Therefore, the explanation such that "the feasibility is under discussion and will be incorporated as Appendix G in the future report" should be described in chapter 9.

8. Up-to-date information on pedestrian safety by the governments and industries

JMLIT: In Japan, 28% of all fatalities are pedestrians, 60% of which die of head injury. The regulation will be based on IHRA and the test method will hopefully be recognized as a GTR. Use will be made of 2 headform impactors and corresponding zones. Vehicle/pedestrian crash speed will be set around 40 km/h and various car shapes will be defined.
EU: The Negotiated Agreement proposal consists of passive and active safety measures. The passive safety measures are defined in two steps with a feasibility study by 1/7/2004. The document is now under consultation by the Council and the European Parliament. The Council is supportive, the Parliament is still debating. In parallel a Directive is proposed based on the Agreement's passive safety requirements. The Parliament is planned to vote in the week of April 6. The final timetable will depend on this decision (depending on acceptance of the Agreement or not).
US: Concluded chapter 4 of the 2001 report and made computer simulations which were presented together with the JARI results. The simulation will be continued as promised during this meeting. A

system for measuring the result of the simulations would be useful and NHTSA will look into that. NHTSA will also study the legform (POLAR – JARI). Additionally, NHTSA will look into the headform moment of inertia (to be available in the next months) and they will also study the accelerometer issue for the headform impactors.
EEVC: The SC of September discussed a possible new mandate for a new WG on pedestrian protection. A decision will be taken in March. The mandate might include windscreen (and surroundings) impact, computer simulation (how to use in test procedures?) and new future tools (including dummies). A new chairman will be appointed. The brackets issue in the WG17 report will be finalized by April or May.
AUS: Work is in progress to report by the next meeting. Possibly a draft standard for bull bars will be ready this year. The pedestrian component might be based on a child head test on the top bar at 40 km/h.
ACEA: Working for the Agreement. EUCAR is researching (some) items of Annex 4 of the Agreement. The 3,5 kg headform specifications can be made available to IHRA.
JAMA: Working for the Agreement and the Japanese regulation.
TRL: WG17 dynamic legform certification corridors will be improved. A study (under contract by UK-DETR) on the Honda Civic was made. The study looked into the effectiveness of the Civic on WG17, Phase 1 of the Agreement, the costs involved and proposes improvements to the design.

9. Others
10. Next meeting date and venue

26-28 June 2002, USA (exact location to be advised later).

Appendix 1

Attendees at IHRA Pedestrian Safety WG 10th Meeting, February 19-21, 2002

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