DRAFT REPORT

3rd meeting of the Informal Working Group (IWG) on Advanced Emergency Braking Systems (AEBS) for light vehicles

19-20 February 2018

Venue: European Commission
Chairman: Mr. Antony Lagrange (EC) and Mr. Toshiya Hirose (Japan)
Secretariat: Mr. Olivier Fontaine (OICA)

1. **Welcome and Introduction**

2. Approval of the agenda

Document: AEBS-03-01 (Chair)

The draft agenda was adopted with no change

3. Adoption of the report of the 2nd meeting of the Informal Working Group

Document: AEBS-02-18

The draft report was adopted with no change

4. Debrief February GRRF

Document: AEBS-03-05 (chair)

The chair (J) informed the group about the outcomes of the 86th session of GRRF.
OICA recalled the chair's statement that even if the texts could be regulated at the same time, the enforcement could be delayed (e.g. for the C2B).

Conclusion: group to work on the assumption of one unique regulation.

5. First consideration for technical requirements for the items identified at the last meeting (car to car, car to pedestrians and car to cyclists)

Document: AEBS-02-17
AEBS-03-02 (Secretary) AEB draft skeleton
AEBS-03-04 (D) Comments to skeleton
AEBS-03-06_Traffic accidents data in Japan for Bicycle to Vehicle

J presented the document AEBS-03-06.
Crossing collision make 30% of collisions on non-signalized roads.
CLEPA informed having provided GIDAS data showing different scenarii, and questioned whether it could be possible to adapt the J data to align them on these scenarii. This is need to ensure that the data back the decisions. OICA suggested doing this exercise between this meeting and the next.
Some of the J data seem similar to those from GIDAS, yet some information about the level of speeds would be beneficial. CLEPA was keen to find what is common with the European data. Need to well compare the 2 sources.
Slide 8: almost all accidents occur with bicycle at constant speed and straight movement
Conclusion of presentation:

- Crossing collision
- Both vehicles at straight movement and constant speed.

The chair found no big difference with the EU data.
CLEPA questioned “non-signalized”: no traffic light.

Conclusion;
- Homework: find common denominator between the EU and J sources of data

OICA presented the slide 12 of their presentation AEBS-03-08.
OICA recommends priority to C2C < 50 km/h.
Homework: add the missing scenarii if any.
OICA clarified the reason why the scenarii should be limited to < 50 km/h, based on accident data and the LPS being later than the LPB at low speeds.
AUS pointed out that the criterion of LPS is relevant for attentive drivers. High speed scenarii would require standards more rigorous than NCAP. Statistics in AUS show more high speed scenarii. Would be keen to have an optional extension toward high speeds in the future. The expert suggested braking at low speeds and warning at high speeds.
NL pointed out that this is R131 scenarii (high speed).
OICA clarified the problem for Industry with high speed, i.e. possible effect of false warnings on highway traffic. Currently most systems have a warning phase and a braking phase. The expert additionally explained why C2C is 50 and C2P is 60: frequency of accident speed (the curve makes a pick).
Conclusion: question of magnitude.

OICA stressed that a gtr would better address the different scenarii around the world.

Conclusion: the slide 12 makes quite a consensus with regard to the data and the possible scenarii.

Definition of AEBS

OICA presented slide 2 of their presentation AEBS-03-08
The scenario will be quite similar, at low speed, among C2C, C2P and C2B.
D suggested to change “shall include a CWP” into “might include: “The Advanced Emergency Braking System MIGHT include a Collision Warning Phase and SHALL INCLUDE an Emergency Braking Phase”
There was agreement on this principle, the group convened to scrutinize this later.

Speed range

Speeds: OICA presented slide 3 of their presentation AEBS-03-08:
Braking in the 2 cases, yet TTC calculated on LPS vs. LPB

Lateral offset

Inattentive driver: collision, but effects mitigated
OICA stressed that the key in this discussion is the false positives.
D clarified that the problem comes from there is no idea of how the road will develop (curves etc.). The expert supported the OICA approach, with different values, for longitudinal traffic. For C2P and C2B, crossing traffic, the situation is different.
CLEPA stressed that the sensor cannot guarantee that the object detected can anticipate the scenario (avoidance, braking, etc.).
The Chair aimed to focus on C2C < 50 km/h
Conclusion:
- support on the principle on V2V < 50km/h.
- support on the principle of LPS/LPB
- values to be further discussed.

OICA recalled their wish for mandatory activation > 10 km/h and optional activation < 10km/h (for the manufacturers). Justifications: false reactions of the systems < 10 km/h. Also overlap with the GRSG-VRU-Proxi on low speed detection. In addition, GIDAS show no accident at this speed range (no severity).

Malfunction tell-tale

OICA presented the paragraph 5.2.1.2. and paragraph 5.5.4. on the failure warning.
Paragraph 5.2.1.2.: adopted
Paragraph 5.2.1.3.: default ON, plus warning. D did not support manual deactivation.
OICA stressed that ABS and ESC have this possibility for covering different situations (snow, tracks, off-roads), vehicle being towed, laden/unladen vehicles on lorries, etc.
EuroNCAP provides bonus if the AEBS can be deactivated such to avoid involuntary deactivation.
OICA pointed out the balance between false positives and deactivation. OICA also mentioned the little misalignment of the sensor after small collisions. Suggested to cross check the wording of EuroNCAP.
D committed to check internally.
AUS proposed that this be possible when vehicle is stationary. He also pointed out that the AEBS should be disabled if the ESC is disabled (strategy).
D proposed to couple ESC and AEBS deactivation. This was challenged by some experts.
Conclusion:

- majority in favour of a manual deactivation control, not too easy to activate
- look at EuroNCAP.
- 2-action, and/or stationary: to investigate further.

Self-check

Paragraph 5.2.1.2.1.adopted
AUS informed that it is common there that the vehicle is equipped with “bull-bars” and that the debate should be conducted, similar to that of the “snow-plough”.

Link AEBS/ESC: emergency braking in case of a curve, or avoidance by steering.

Interruption by the driver

Conclusion: general support on paragraph 5.3.
UK and AUS subsequently challenged the compromise, the deactivation should be substantially difficult.
CLEPA anticipated that the subject will be discussed at GRRF
Industry committed to provide the technical reasons
Conclusion: item to be re-discussed at AEBS-04

C2C

The proposal for 10m/s² come from performance capabilities of M1 vehicles on the market
D presented their document AEBS-03-04
TTC is “inflated” for taking the driver’s reaction and braking jerk into account. D identified the 3 parameters: brake, jerk, deceleration to define the expected speed reduction.
Highest time for avoidance: 0,77s, not including response time needed (0,11s).
Hence 0,9 should be the proper TTC for avoidance.
Brake timing at the earliest: should not be specified
Brake timing at the latest: should not be specified
Avoidance until 42 km/h
Tolerance: would give the final proposal.

OICA supported not to define the timing of the EBP.
Braking value; need to consider the R13H value, and the fact that in real conditions the performances are worse than on tracks.
Braking performance in V2V vs. V2P: greater number of scenarii in case of C2P. Pedestrian target can be identified at 20 m; vs. 60 for a vehicle.
The D expert sees high c/b benefits in C2P due to the high number of killed and severely injured persons.
CLEPA had a concern: the requirements must work in all conditions, and during the whole lifetime of the vehicle.
The chair stressed that there is room for discussion.
OICA informed that some manufacturers use the value of 6,4 m/s² as a “mean deceleration” for the development of their products.
OICA pointed out the LPS in case of C2P must be different to that of the V2V because the lateral displacement is lower. D replied that the false positives must be taken onto account: OK to brake later if the exact situation is known. The expert from D clarified that the LPS approach is not acceptable for C2P

AUS understood the concern of the theoretical approach, yet the LPS/LPB concept is quite theoretical as well. In addition, we don't need to avoid the collision, the mitigation is OK.
AUS subsequently repeated their concern as follows:

- AUS understands that delaying braking until LPS (rather than LPB) is a method to reduce unnecessary harsh braking due to false positive detections, but delay may not always be an appropriate solution.
- Steering at last possible moment could be ok model for expert drivers if free space is available, but may not be suitable timing for novice or distracted drivers, or if free space is not available.
- AUS not aware that LPS delay is mentioned in NCAP or R131.
- As UK noted, drivers have the option to steer but are not doing so successfully (hence trauma stats).
- Full delay until LPS in all situations may increase trauma effects compared to braking closer to LPB. Even a few percent loss of AEBS effectiveness due to additional braking delay in emergency situations could impact KSI rates (what is the potential impact on KSI/effectiveness of LPB vs LPS delay?).
- AUS questioned if evidence supports that LPS is a better general solution than braking closer to LPB if used universally for all situations (does evidence support a compromise delay somewhere between LPB and LPS if a single model is used for all situations?)

The expert from AUS also added, for clarification, that LPS braking delay may be suitable only if system detects free space to steer into is not blocked. If system detects free space to steer into is blocked, brake timing closer to LPB may be more suitable.
UK wondered how the systems currently on the market deal with this issue. The chair proposed that only the warning be given before the LPS. D informed their experience that the driver never relies on the braking.

Conclusion: Industry to provide justifications that this approach is a sound theory backed by evidence.

J raised the idea of a range of flexibility between the physical collision avoidance last point and the normal driving collision avoidance last point based on document AEBS-02-08 (slide 14).

CLEPA added there might be a need to discriminate the passenger cars from the light CVs. Need for a criterion for discriminating the M1 derived from N1 from the real ones.
NL recalled that UN R131 was designed to ensure that the AEBS cannot be used as a super-ACC, i.e. the system should brake in emergency cases only.

The chair proposed 2 options: either deciding a point when the vehicle should not brake, or remaining with speed reduction only
OICA was keen to have some flexibility on the deceleration time (speed reduction only). Should not be design dependent, rather situation dependant.
NL pointed out that 6.4m/s² is a real EB for a passenger car. OICA did not see any risk of misusing AEBS as an ACC, on high adhesion (but low adhesion should be taken in account as well). NL stated that all is assumed on high adhesion. If the vehicle brakes at the latest point, then the highest deceleration should be used. D would not want to prescribe the value but would accept to put the deceleration at 3 m/s², AEBS should not activate before that point. AUS proposed ABS cycling. NL found 3m/s² too low. The value can be discussed but some clear difference must be addressed.

How to determine the value? Based on a calculation with 3 criteria: speed reduction, lateral acceleration (or LPB), TTC.

Sweden subsequently challenged the reference to EuroNCAP for the vehicle pre-conditioning.

Conclusion (criteria used to calculate AEBS functioning):

- Timing for deceleration:
  - OICA/D: earliest time for braking should be based on a vehicle deceleration of 3,0m/s²
  - NL: earliest time for braking should be based on a vehicle deceleration of 6,4m/s²
- Speed reduction:
  - Principle of the graph of Slide 5 of OICA document adopted by the group
  - The vehicle should not be required to brake before the LPS.
  - However, parameters that determine the shape of the graph still open for discussions
  - These parameters include
    - lateral acceleration (or LPS)

        - lateral displacement
        - maximum longitudinal acceleration
        - jerk (objection from CLEPA: there should not be any requirement on that value, yet it should be part of the calculation)
    - full collision avoidance:
        - OICA: up to 32,6 km/h;
        - D: 42 km/h
- OICA to provide data on M1/N1 dynamics in relation to LPS
- D to argument with test data on M1 vehicle dynamics.
- Lateral acceleration:
    - For the debate, need to know whether whether a full lane change or a pure avoidance maneuver is taken into account.
    - Homework for D: to provide data

Test for C2C

Slide 13 of OICA presentation

Moving target:

Test on stationary target, moving target, but not on decelerating target.
D: OK, but would request a 42 km/h relative speed as a criterion on the moving target test. Moving target scenario shows that the system shall not shut off when there is a moving target.
UK believes that in urban environment the overlap should be 50%
OICA supported 100% because the technology must be confident that the target is a real obstacle, this is a question of robustness. The overlap was introduced in the 2018 protocol.
D pointed out that the overlap would change the criteria for the calculation. Full speed reduction of 42 km/h is not relevant at 50% overlap since the last point to steer will be closer to the target.
Conclusion: 50% overlap to be reviewed at a later stage of the group.

Stationary target

At low speed, only stationary target should be addressed. Difficult to move the target at low speed.
AUS found it relevant to keep one scenario to check whether it is relevant in city driving.

Braking target:

Dropped, performance requirements very hard to identify.

C2P

OICA keen to use the graph of the C2C, yet change the values.
D and UK challenged this as there is no clue where the pedestrian will be when the steering manoeuvre starts.
D was keen that the group decides when the vehicle should start braking: when the pedestrian enters the vehicle's path, 50 cm before? When the calculation assumes the pedestrian will hit the centre of the vehicle.
CLEPA raised the concern of product liability. Debate: D not sure the same logic of LPS can be used for pedestrian avoidance. Key is that the technology is unsure to discriminate a moving pedestrian from a static one. And also, a pedestrian can start moving at any time. The technology is not mature enough yet to ensure a sufficient robustness of the system. UK; there are some systems on the market, hence possibility to put something in the text. In addition, always possibility to override the system. OICA challenged this approach since the regulation should define a minimum set of requirements.
The debate started on the purpose of the regulation. The European Commission stated that the aim is to decrease the number of fatalities as much as possible, hence using the best available technology. Yet there is need to be attentive to the concerns of the Industry.
J stated that their accidentology shows that highest rate of accidents is for pedestrians, hence supported the European Commission approach.

D showed a slide showing that 50% of the KSI (killed and severely injured) are in the range of a vehicle's speed between 30 and 50 km/h
CLEPA challenged that approach, and suggested to base the decision on the accidentology rather than the market.

Conclusion: D to get the data internally.

C2P scenarii

OICA further presented the C2P scenarii. Adult vs. child, day vs. night
OICA proposes to limit to 1-2 scenario Adult dummy crossing at 50% /5 km/h.
UK supported that 10-50 km/h. yet child should be scrutinized as well. And limiting to the worst case scenario would limit the costs. Hence UK favours the child scenario in daylight. OICA voiced that the main difficulty with the child scenario is that it is obscured, since only the legs can be detected.
D clarified that the longitudinal pedestrian was not retained in the 2016 EuroNCAP test procedure because it was difficult to design a test tool without metal part in the path of the vehicle. Not because the scenario is not relevant.
CLEPA confirmed that the worst case is the child obscured. With regard to accident data, night is relevant. However, there is some complexity in defining and simulating the night conditions.

D showed an ESV conference presentation showing that the night scenarii are relevant in accidentology. The chair was ready to understand that the nightlight scenarii are still being implemented and that there is currently no sufficient experience. OICA supported this point of view since there is no clue of the performances of the systems in these conditions.
The chair then proposed to phase the introduction of night scenarii.

OICA clarified that the robust systems have both a radar and a camera, yet only the radar remains robust by night. Hence at night there is no redundancy of the detection.

J informed having also higher figures in night. Hence J has same concern with regard to the scenario.

Conclusion:
- Choice between adult crossing and child crossing
- Night conditions to be investigated at a later stage of the regulation.

D questioned the scheme of a phasing-in of the technology: whether the dates of 2020/2024 are for the 2 phases or only for the implementation of the 1st phase.

C2B

Industry favours a crossing with target at 15 km/h.
D found that the group currently lacks accident data. D challenged the LPS in this scenario since the bicycle cannot brake as easily as a pedestrian.
CLEPA found necessary that some experience is gained next year. Also, the technology cannot ensure collision avoidance in this scenario, yet OK with collision mitigation. Problem with the dynamics of the scenario since the bicycle can be fast, whatever the sensor technology.

Accidentology cyclists vs. pedestrian
In EU, NL and DK have more cyclists than pedestrians
AUS have 4 times more pedestrians than cyclists.
J: 1. Car, 2. Pedestrian, 3. Cyclists

CLEPA shared a presentation on the physics of the scenario: the vehicle cannot take 100% of the cyclist protection. The faster the target, the less the vehicle can take over.

6. Other business

7. List of action items

See document 03-07-Rev.1