

## **DRAFT REPORT**

### **5<sup>th</sup> meeting of the Informal Working Group (IWG) on Advanced Emergency Braking Systems (AEBS) for light vehicles**

26-27 June 2018,

**Venue:** The Society of Motor Manufacturers and Traders,  
London

**Chairman:** Mr. Antony Lagrange (EC) and Mr. Toshiya Hirose (Japan)

**Secretariat:** Mr. Olivier Fontaine (OICA) and Mr. Yukihiro Shiomi (Japan)

**1. Welcome and Introduction**

**2. Approval of the agenda**

Document: AEBS-05-01 (Chair)

The draft agenda was adopted with the addition of the document references

**3. Adoption of the report of the 4<sup>th</sup> meeting of the Informal Working Group**

Document: AEBS-04-08

The report was adopted with no change.

**4. Review of the action points from the 3<sup>rd</sup> and 4<sup>th</sup> meeting in Brussels and Tokyo**

Document: AEBS-03-07r1 and AEBS-04-09

The group agreed to keep this document as a reference document along the meeting.

**5. Discussion for draft proposal of AEBS (car to car, car to pedestrians, car to bicycle)**

Document: *AEBS-03-02-r2*

D was keen that the performance requirements are in the “Requirements” section rather than in a separate annex. D wants a different structure (vs. a copy/paste of UN R131). Consequently, D anticipates delay in the work delivery.

Industry supported this approach with a change in the structure of the text. J requested a presentation of the D comments such to get a general view.

Conclusion: the objective remains to achieve a final proposal by the end of the session.

**Introduction:**

Industry keen to delete requirements about the collision warning phase since there would be too many false positive.

**Definitions:**

*Collision warning phase*

Industry was keen to delete this definition from the regulation at least for the low speed scenarios. J, supported by UK, opposed the deletion as the warning is quite important.

Conclusion: the group agreed to get back to this item at the relevant time

*Targets:*

J proposed adding targets definitions, supported by Industry with the addition of some improvements. The chair questioned the necessity of such details in a definition e.g. the direction of movement, and recalled that Car-to-Bicycle scenario (C2B) is requested in the terms of reference.

*Time To Collision (TTC):* the group agreed to keep this definition.

Conclusion: definitions accepted, will be reviewed for best consistency of the regulatory text. Principle agreed to have general definitions at the top, then particular ones.

**Paragraph 5 (Specifications):**

*Reference to UNR10*

J was keen to refer to UN R10.05 or any later series of amendments. The group agreed that the text should address all the situations. Yet a static reference would be very convenient because the group cannot accept a reference to “any” later series of amendments. The Chair proposed to refer to the 05 Series of amendments, J supported this approach

Conclusion: static reference to UN R10.05

*Reference to CEL annex:*

UK as pilot to the GRVA informal group on the CEL annex, supported the deletion of “complex”

Conclusion: “complex” deleted

*Collision warning*

J and D presented their proposals (AEBS-05-03 and AEBS-05-04).

Industry challenged<

- An earliest time
- Not giving a warning

D explained that the paragraph should focus on the behaviour of the system in real world rather than in test conditions, as an attempt to find a compromise with J since D would accept deleting requirements for the warning.

UK supported the principle and stressed that the UN R131 focus on high speed.

J stressed that a jerk is quite effective at high speeds. “Higher speeds” means “speeds above the speed where the vehicle cannot avoid the collision”. Collision warning should be at the latest 0,8s before the EBP with the idea to encourage the driver to press the braking pedal.

D keen that the warning does not delay the braking phase, in particular for pedestrians.

Industry supported deleting the provisions for warning for

- Not delaying the emergency braking
- Avoiding false positives

The group tried to elaborate a tentative principle: the warning will be regulated only at speeds above that of the full avoidance.

UK: OK but then the warning should appear as soon as the possibility of a collision is detected.

J favoured the following: 0.8s in principle, except in certain extreme emergency situations, when there is no 0.8 s possible, then immediate braking considered as a haptic warning.

Establishment of a task-force to capture these principles.

*Paragraph 5.2. (performance requirements)*

Deletion of paragraph 5.2.1.2.1.: Industry keen that there are no prescriptive requirements. Yet the chair found the paragraph important since it defines the EBP. Industry: when there the vehicle knows well in advance that the braking will be necessary, why delaying the brake application?

Debate, UK fears about the misuse of AEBS as an ACC.

The Industry explained that the system could be designed to brake 5 minutes before it is necessary, however this would not be accepted by the user, yet there is no safety issue in not defining the braking force.

The group tried to elaborate tentative principles:

- Principle 1: no mandatory warning if the collision can be avoided
- Principle 2: when the 0,8 s are too short, mandatory warning upon detection; the EBP should not be deleted.

Conclusion: paragraph adopted as per the working document.

#### *Emergency braking phase*

Proposal for a simplification by deleting the braking phase.

OICA challenged the proposal for a peak at 6,43 m/s<sup>2</sup> in the case there is no evasive manoeuvre possible. If the emergency braking time is defined by the LPS, and there is no steering possible, then the system should be permitted to brake earlier. In addition, a proper warning strategy could prevent the AEBS being misused as an ACC. Industry found no safety benefit in such prescriptive provision, and stressed that EuroNCAP also limit the provisions to performance requirements.

#### *Speed range*

There was a debate on the outcomes of the 4<sup>th</sup> meeting. Industry was keen to take into account some safety margin for passing the approval test, i.e. 10% + 60, which would make 66 km/h.

#### *Table of assumptions*

LPS: seems 0,9s is acceptable, subject to confirmation

LPB:

- J ready to compromise on the D proposal for the sake of progress
- European Commission: ready to compromise on the D proposal for the sake of progress
- D: 0,6 is a value reflecting regular passenger cars as tested at EuroNCAP.
- M1/N1 have different values
- R13H and R13 have different values according to whether the engine is connected or not.
- Request for data about N1/N2 category vehicles. AEBS/LDWS-18-03 provides data
- Conclusion: requirements in 2 groups: M1/N1 derived from M1, and N1 derived from N2

Lateral offset: seems this is a question of methodology since D performed tests while Industry made theoretical calculations.

Speed reduction: the 2 lines could be merged: 60 / 18 km/h (42 relative speed) or 42 / 0 km/h.

Conclusion:

- the 2 lines can be merged
- Formula: to be included into the justifications.

Agreed table per document AEBS-05-08

<b>Test Speed [km/h]</b>	<b>Speed Reduction [km/h]</b>	<b>Impact Speed [km/h]</b>	<b>Impact Speed [km/h]</b>
10	10,00	0,00	0,00
15	15,00	0,00	0,00
20	20,00	0,00	0,00
25	25,00	0,00	0,00
30	30,00	0,00	0,00
35	35,00	0,00	0,00
40	40,00	0,00	0,00
42	42,00	0,00	0,00
45	32,39	12,61	15,00
50	29,15	20,85	25,00
55	27,53	27,47	30,00
60	26,56	33,44	35,00

Conclusion:

- table to be included into the draft text, all to check the approach overnight.
- Overnight conclusion: 3 lines can cover the regulatory scenarios: 0, 15, 25 impact speeds.

D subsequently presented the table per document AEBS-05-06. AUS wanted the real conditions to be taken into account; wanted a buffer. Industry did not accept to compromise at 42 m/s<sup>2</sup>.

D and AUS supported 42 km/h taking into account the future progress in technology. CLEPA was keen to organize a demonstration to help the experts understanding the consequence of such high value.

OICA accepted 42 km/h for M1 and N1 derived from M1

Full avoidance shall be mandatory up to a test speed of 41 km/h, and 25 km/h speed reduction mandatory above 41 km/h test speed.

*N1 derived from N2*

Debate on the place for the “N1 derived from N2”: in scope of R131 or in the new regulation?

Usage vs. the regulatory approach: the N1 “derived from N2” are primarily used in inter-urban roads but the scope covers all N1.

D had concern in justifying 27 km/h in this regulation while similar vehicles face higher performances in R131.

J had concerns for light trucks in J whose braking system is approved to UN R13

Possibility to link the approval to AEBS to the regulation to which the braking system is approved to UN R13.

### **Conclusion**

- 42 km/h (M1)  
42 km/h (N1)
- [30] km/h (some N1) – interested parties to provide justifications (approved to R13?, braking system technology?, LPS?, parameters linked to AEBS performance?, other?) for degraded performances + proposals for alternative performance based on the justifications.
- “derived from N2” means pneumatic and air over hydraulic

*Paragraph 5.2.1.4.*

Collision warning avoidance

Change name to “false reaction”

J announced to introduce a proposal for test for false reaction test.

*Manual deactivation*

The European Commission committed to produce a draft text overnight

D was not able to change their position.

Conclusion: informal group to make a compromise decision, D to still oppose the manual deactivation, and to raise the issue at GRVA if necessary

### **C2P**

J informed that their proposal follows the same approach as the C2C

Industry found the warning should not be mandatory for the pedestrian.

D explained the experience with current vehicles in C2P: the warning often is not relevant.

UK shared this opinion.

Paragraph 5.51. requests 2 out of 3 modes of warning. Industry clarified that the braking vehicle is a haptic warning

Conclusion: warning according to paragraph 5.5.1. and not later than at EBP

*Speed range:*

Conclusion: upper speed at 60 km/h. also, degraded performances to be defined below 20 km/h.

Crossing pedestrian speed: 5km/h per the OICA proposal; yet included into the performance requirements section. See working document, expected impact point in vehicles centre.

*Assumptions:*

Debate as to whether the timeline permits Industry to change their approach.

Positions are then quite aligned.

Debate on the level of performance that can reasonably be required

D: keen for 1-step. Yet the technology is not as mature as that of C2C

UK: 1-step with speed at 50 km/h

J showed their accident data per document GRRF-83-17.

D supported the UK that the main benefits can be achieved with pedestrians, yet this conflicts the informal group ambition with regard to the timing.

Possible stepwise approach:

1. OICA approach: at EIF 2020 for 30 km/h
2. Increased requirements (42km/h for NT:2024)

Conclusion:

- all to review their position for next step.
- Possible review at GRVA

Proposal from the chair:

- Phase 1 (at EIF): 30 km/h for M1/N1
- Phase 2 ([2024]): 42 km/h for M1/N1

UK did not support “30km/h” as this value is not supported by the accidentology.

Industry challenged too high performance requirements for an optional system as it would discourage the manufacturers install AEBS

J raised the same concerns as for C2C for N1 approved to R13: (some N1) – interested parties to provide justifications (approved to R13?, braking system technology?, LPS?, parameters linked to AEBS performance?, other?) for degraded performances + proposals for alternative performance based on the justifications.

## **C2B**

Agreed: 2 scenarii whose wording is derived from C2C and C2P

### *Crossing scenario*

For the crossing scenario, problem that the bicycle runs faster than a pedestrian, hence the detection angle needs to be wider than in the C2P scenario, and this makes a technical challenge.

Max opening angle of 90°, i.e. 75° in practice, hence cannot detect an object traveling at ½ speed of the vehicle. (20-25 km/h ego vehicle speed)

In addition, for higher speeds, (>40km/h), there are possible variations in the bicyclist behaviour, that cannot be anticipated.

Industry presented AEBS-05-08

The chair reminded that accident data put the priority on the crossing scenario, while the technology is more mature for the longitudinal scenario.

The logics of V2B is similar to that of the V2P.

One parameter is the safety margin: 3 m/s<sup>2</sup> is a relevant deceleration for a bicycle. The bicycle stopping distance is then 70 cm. as the bicycle is 1,5 m long, the centre is 70 cm after the front, i.e. the centre of the bicycle is about 1,5 m away from the vehicle path at the time the bicycle cannot brake anymore. As the vehicle is 2,0 m wide, this makes a distance of 2,5m. This leads to 0,6s TTC. If we insert the parameters this makes about 22 km/h as ego vehicle speed. However, the technology may evolve and the above value may then evolve.

Yet Industry challenged the logics of anticipating the progress of technology for deciding the values in the regulation.

Conclusion:

- difficult to decide stable values now while the technology is still at its beginning.
- Field data are currently missing for the crossing scenario.
- Tension between the state of the art in technology and the accident data.

### *Longitudinal scenario*

Logic should be similar to that of the C2C.

Yet the traffic rules prohibit the cyclist to travel in the middle of the lane, the cyclist width is lower than that of a car.

NCAP parameters:

- 50 cm wide cyclist
- Speed of bicycle: 15 km/h traveling in the middle of the lane.
- Approach: only in case of a bicycle traveling in the middle of the lane a braking makes sense. For other scenarii, warning makes more sense. Accidentology also does not support middle of the lane, rather side of the road.
- 50-80 ego speed, 20 cyclist: TTC 1,7s, warning mandatory. Inter-urban scenario, based on accident data.

Industry supported a warning-only in such a scenario, yet the speeds must be revised. Industry pointed out that most of the fatalities with cyclists are due to alcohol in cyclist's blood.

Conclusion: not everything can be solved by braking.

## Manual deactivation

*Paragraph 5.1.1.:* the group did not make any decision as to whether ESC should be mandatory when AEBS is fitted.

*Paragraph 5.5.:*

D proposed deleting the timing since some requirements for the warning already exist in other sections.

*PTI*

D to check the last version of the PTI paragraph.

General comment

General comment from D; in the specifications section, there should be more precise statements that the system must react to a vehicle driven in a certain direction at a constant speed, etc.

Attention also to the vehicle weight.

*Load conditions*

Debate on the weight in test conditions. UK keen to choose the worst case. Yet this would make it almost impossible for fully laden vehicles and would contradict the compromise from Industry for 42km/h.

As EuroNCAP test with 200 kg (i.e. 2 persons + equipment), it makes sense to propose this load.

Question for the orientation of the group: either fully laden, or a certain weight with demonstration that the system fulfils the requirements in other loading conditions.

What kind of performance can we guarantee for a certain mass? At what load condition do we test the vehicle?

ESC regulation defines the load conditions. Requiring the performances at all load conditions implies that this must be tested.

The contracting parties were keen to get guarantee that the system deliver performances in a wide range of conditions.

Alternative 1

- M1: 2 occupants + equipment = 200kg
- N1: 2 occupants + equipment = 200kg (as the performance requirements are similar to that of M1, this is consistant).
- Degraded performances in fully laden conditions, TBD

Alternative 2

- Fully laden
- Worst case

D keen to know how the 2 parameters change with load.

LPS does not change with load, yet LPB does change

Industry clarified that the systems on the market should have to be re-designed should the regulation deviate from the current NCAP test conditions.

Conclusion:

- Industry to provide data on performances according to load

- Test: M1 with 200 kg.

### **Test conditions**

#### *Luminance*

Industry proposed added conditions.

D was keen that the system delivers in all conditions

#### *Pre-test conditions*

Industry proposed additional provisions

#### *Test targets*

They are still not delivered; proposal to refer to ISO in brackets

UK keen to copy/paste the appropriate text into the regulation.

The soft targets are a volatile subject hence difficult to have static references in the regulation.

ISO 19206 defines AEB targets.

Subject to be raised at GRVA, expecting consistency with GRSG

#### **Conclusion:**

- reference to ISO 19206 in brackets, or copy/paste the standard, subject to the agreement by the group that the reference is relevant.
- Item to be decided at GRVA level

#### *Paragraph 6.4.*

Debate on the targets and the possible damage that can occur at high relative speeds.

Rest of the tests: chairs and secretary to review what can still be added, to be reviewed at GRVA

### **6. Other business**

### **7. List of action items**

Chair and secretary to deliver a document mid-July and to be sent to Geneva mid-July.

All to review and provide comments such to eventually produce a revised document for GRRF-87 (GRVA-01).

Bicycle: provisions will probably refer to NCAP provisions.

#### *Plan of next meetings:*

6<sup>th</sup> meeting: 1-2, October, 2018 in Paris (OICA)

7<sup>th</sup> meeting: 4-5 December, one additional day for chairs and Secretary, in Brussels / Cologne