Minutes

10th meeting of the Informal Working Group (IWG) on Advanced Emergency Braking Systems (AEBS) for light vehicles

28-29 November 2019,
in Brussels, Belgium

Chairman: Mr. Antony Lagrange (EC) and Mr. Toshiya Hirose (Japan)
Secretariat: Mr. Yukihiro Shiomi (Japan) and Mr. Olivier Fontaine (OICA)

1. **Welcome and Introduction**

2. Approval of the agenda

Document: AEBS-10-01-Rev.1 (Chair)

The agenda was adopted with no change.
J and CLEPA informed about their intention to provide information:
J update on the introduction dates
CLEPA update on VRU-Proxi progress of work

3. Status report of 4th GRVA

Document: GRVA-2019-16, GRVA-2019-17, GRVA-04-38

The Chair presented the state of play at GRVA-04 (presentation)
The document GRVA-04-51 & 52 (outcomes of GRVA September session) will be discussed at the March session of WP.29 seeking adoption at that session.
Dr. Benz (CLEPA) presented the state of play at VRU-Proxi informal group to GRSG for enhancing the capability of the driver to avoid impact to Vulnerable Road Users (VRU). Scope of the group is: Forward motion: driving straight and turning scenario, reversing motion and direct vision. Forward motion - driving straight item could have some overlap with AEBSM1N1. The VRU-Proxi informal group has no mandate on "intervening systems" rather warning systems; "Move-Off Information system" (MOIS).
At their last meeting (the day before AEBSM1N1-10) there was a discussion on

- Scenario; low speed behaviour: when to warn and which warning to give to the driver. This could somehow overlap with AEBS (low speed AEBS intervention is only braking, no warning).
- However the scope (vehicle categories): M1N1 are temporarily excluded from the scope. Yet Japan may decide to include them in the near future.

Conclusion: there is no overlap with AEBS for the time being.

J gave supplemental comment about scope of the MOIS regulation in J: no decision today on scope at national level on, hence cannot prevent the informal group to make their discussions and decisions.

4. Discussion for Car to Bicycle scenario of AEBS

Documents: ECE/TRANS/WP.29/GRVA/2019/5 (AEBS)
AEBS-10-05 and 06 (BASt), AEBS-10-04 (EC)

Presentation of AEBS-10-04 (EC) on the performance of vehicles in the Euro NCAP database on car-to-cyclist scenario.
D proposed some deviation from the Euro Ncap??
N found 15 km/h too low for the bicycle scenario.
OICA comment on AEBS-10-04:

- 80% of compliance: some systems are designed not to fulfil the scenario since the warning is quite early
- The NCAP test protocol is extremely defined, and the AEBS is very sensitive to this. Technology is also progressing fast and the capabilities of the current systems may evolve.

J: referred to the J presentation done per AEBS-03-06, Slide 3. Most important scenario is that of the crossing bicycle. No data currently available on the bicycle speed during the accident.
EuroNCAP bases their scenarios on 3 criteria:

- Accidentology,
- state of the art of the technology,
- testability

From the D data, it seems the AEBSM1N1 informal group should focus on the crossing scenario, (2% vs. 33%).
NL referred to the AEBS-04-07(CATS study):Accident data do not take into account the electric bicycles and scooters.
Debate on the orientation to give to the group:

- Which bicycle speed to choose: low speed bicycle may give more time to react, is more representative, but may not represent the electric bicycles. High speed bicycle covers electric vehicles but decrease time to react and does not represent manually propelled bicycles.
- CAT research from the NL covers 6 countries. Seems the longitudinal scenario may have some relevance
- OICA/CLEPA data (presentation to come)
- J research: seems average speed is about 10 km/h

Conclusion:

- EuroNCAP database to be used as a basis as this is the only data source with practical testing at this stage.

BAST subsequently presented AEBS-10-05 and AEBS-10-06 proposing to base the C2C scenario on the same logic as the C2P with the concept of point of no return where a collision cannot be avoided by the driver. Industry showed the existing document AEBS-05-08 providing a reasoning similar to that proposed by BASt.

CLEPA referred to AEBS-05-08. Current sensors can detect ca 25° each side leading to consistent conclusions about speed. OICA pointed out that different functionalities are using common sets of sensors.

Debate:

- OICA: OK to have challenging provisions in the 2nd step, yet keen to keep current technology for the vehicles currently under development. Some increased requirements would provoke a tremendous re-design of the vehicle.
- Relationship between the bicycle speed and the sensor angle. Tolerance due to the positioning of the sensors and the detectability of the bicycle (need for more than proposed angle)
- Assuming that
    - the impact point at the centre of the vehicle front and at the centre of the bicycle length and
    - both vehicles have a constant speed for identifying the assumed impact point
- Questions:
        - as from which time the bicycle must have started braking for avoiding the collision? This gives:
        - the time as from which the vehicle must start braking (since the bicycle didn't) for avoiding the collision

- PPotential bicycle deceleration must be taken into account by the manufacturer to avoid false positives (adjusting the system on the assumption of high deceleration – aggressive driving or of normal deceleration?).
- BAST anticipated a bicycle deceleration < 7m/s² (aggressive driving). J shared data on cyclist trajectories and deceleration. Bicycle deceleration seems always < 1m/s², vehicle deceleration always < 3m/s². Data is selected as critical situations only.
- Reviewing the data from document AEBS-10-04, seems the practice matches the theory (AEBS-05-08).
- Industry: need to review the technico-economical approach since the performance of the sensors are in stake. EuroNCAP only tested 14 vehicles out of 60 equipped models.

Conclusion on the key factors to address when defining the scenario:

- General agreement to follow an approach similar to C2P and Euro NCAP. Parameters to be further discussed.
- dynamics of the bicycle to be addressed
- type of cyclist assumed as representative.
- Collision point to be discussed
- Angle of detection (in current production) – data from EuroNCAP or others is welcome

5. Discussion for amendment of existing regulation

5.1. Robustness of the system

Document: GRVA-04-11 (CLEPA-OICA)
AEBS-10-02 (CLEPA-OICA) Compensation for test external influences V1
AEBS-10-03 (J) Study of AEBS False Reaction scenarios for passenger cars

Presentation by OICA of AEBS-10-02

J: keen to get confirmation that the purpose is indeed to address the “non-representativeness” of the test method.
OICA: clarified that 100% perfect conditions would lead to 100% proper system reaction. As the Technical Service cannot detect the root cause of the fail (in the dedicated amount of time foe a type approval), there is a need to address the issue; this is some concern of repeatability.
EC: summarized that the question is “how injecting the non-perfect target into the performance results”.
The delegate anticipated two ways for the regulatory text:

1. 100% robustness of the test conditions (leading to the threat that manufacturers would be tempted to design their system for the test), or
2. Less robust test, yet how introducing this factor into the test method?

There was a debate on the best approach to follow. The Chair proposed to have a global assessment including false positives. OICA pointed out that the vehicle user is actually the proper false positive detector.
When scrutinizing the document AEBS-10-03 (Vehicle B in Slide 12), the group acknowledged that the Technical Service may be unable to discriminate the cause of the erratic results of due to the variability of test conditions.
The Chair suggested the CEL approach for such cases (i.e. documentation by the manufacturer, then investigation by the Technical Service, on the base of documentation)
NL: pointed out the test conditions are the best conditions and hence the vehicle should succeed in each trial.
OICA: clarified that it is impossible to get 100% robustness and simultaneously 0% false positives. The expert added that the vehicles passing the tests are fully identical to those of production
CLEPA, as expert in EuroNCAP test protocol: explained that the EuroNCAP does not assess the false positives. The stars are granted by good results in a combination of different safety systems, a manufacturer can opt for a strategy giving more importance to one system vs. another. In this context, the UN R152 is more severe than EuroNCAP since it requests 100% success.
The Chair asked whether a difference between the C2C and the C2P scenarios (C2P more demanding than C2C) would help and stressed that the technology may progress in the near future.

OICA: clarified that the concern of robustness to external influences applies to both the C2C and the C2P scenarios. Concerning the progress of technology, the expert agreed that the values may indeed vary over time. The expert confirmed that at EuroNCAP, the manufacturer can afford losing some points yet not in the type approval.

D (BASt) explained the AEBS at NCAP were started to be tested in 2014, when the systems were not sophisticated. They tried to solve the problem by the repletion of the tests, and then progressively arrived to the grid approach: chose 9 out of 45 test cases, and check how good is the system within these 9 tests. The allowance of repeating the tests comes from the need to address that sometimes some very well-designed vehicles do not react as expected.
Robot + target must be finetuned.
Robot: need to simulate a human but can generate strange system reactions
Target: re-building may provoke a slight change in the recognition by the radar.
If the system robustly fails then it is a fail.
UTAC (F) mentioned that other factors than the robot and the target can have influence like e.g. the weather.
The Chair still wondered how to discriminate whether the failure comes from the test method or from the vehicle.
Problem that BASt and NCAP did not have experience of a vehicle "robustly failing". Yet seems that Thatcham could discriminate by repeating the test, including some prediction from the manufacturer, and checking whether the prediction is verified.

Conclusion:
- The group agreed that the variability of the test method could make it difficult to sometimes explain the root cause of a fail (because of the method or because of the poor performance of the vehicle)
- Need to go in the details of the approach

Debate on the quantity of failed tests on C2P scenario
OICA: there is a, issue with the target. And there will probably be issues with the C2C
BASt: proposed one fail per target (C, P, B)
Debate:
- Repetition by test run vs. batch
- NCAP approach: within 5km/h of the prediction, repetition twice (see slide 13 of presentation)
- Suggestion to keep the value of 10%
- Question of the 3 different approvals: need to keep the same outcome if 1 approval vs. 3 approvals. Agreement to keep 10% per block.
- The title is misleading: should read "2 out of the 2" rather than "2 out of the 3".
- Investigation of the root causes of a failure. "shall be analysed" should lead to some decision or further investigation. Yet sometimes there will not be any precise answer as to the causes.

Conclusion: OICA to provide an improved text for 29 November, in particular on robustness, based on text in slide 9. All interested parties to contribute. OICA subsequently presented the text below:

"6.10. Repeatability of test runs Compensation for external test influences

6.10.1. Any of the above test scenarios [,where a scenario describes one test setup at one subject vehicle speed at one load condition] shall be performed two times. If one of the two test runs fails to meet the required performance, the test may be repeated once. A test scenario shall be accounted as passed if the required performance is met in two test runs. [The total number of failed test runs shall not exceed [10%] of all performed test runs of all Car to Car and Car to Pedestrian scenarios in all load conditions.]

6.10.2. The root cause of any failed test run shall be analysed.

6.10.3. During the assessment per Annex 3, the manufacturer shall demonstrate via appropriate documentation that the system is capable of reliably delivering the required performances.]"

After discussion, the group then agreed on the text as reproduced below:

"**6.10. Robustness of the system**

6.10.1. **Any of the above test scenarios, where a scenario describes one test setup at one subject vehicle speed at one load condition of one category (Car to Car, Car to Pedestrian), shall be performed two times. If one of the two test runs fails to meet the required performance, the test may be repeated once. A test scenario shall be accounted as passed if the required performance is met in two test runs. The number of failed test runs within one category**

- **shall not exceed 10.0 % of the performed test runs for the Car to Car tests and**
- **shall not exceed 10.0 % of the performed test runs for the Car to Pedestrian tests.**

6.10.2. **The root cause of any failed test run shall be analysed together with the Technical Service and annexed to the test report. If the root cause cannot be linked to a deviation in the test setup, the technical service may test any other speeds for subject vehicle and target vehicle within the speed range as defined in paragraph 5.2.1.3., 5.2.2.3. or 5.2.2.4. as relevant.**

6.10.3. **During the assessment per Annex 3, the manufacturer shall demonstrate via appropriate documentation that the system is capable of reliably delivering the required performances.**"

Conclusions:
- references to the paragraphs to be replaced by the very text from the relevant paragraphs
- Secretary to send an official document for GRVA-05 (done and forwarded to the UNECE Secretariat on 29 November – document will probably get the reference GRVA/2020/10)
- Review of the text sent to GRVA by all parties and if need be, propose changes at GRVA-05 as informal document.

5.2. False Reaction scenarios

Document: AEBS-10-03 (J)

J presented the document AEBS-10-03
Selection of the scenarios: reference to the vehicle owner's manual was used to select the demanding scenarios, in addition to MLIT data collection of users' complaints.
OICA: last bullet of 1st slide: "If activation of AEBS is confirmed in some scenarios, the manufacturer should explain the design philosophy to the Technical Service according to Annex3 (CEL)." But the proposed tests seem to contradict this; what does the TS do with the manufacturer's declaration? J clarified that basically the manufacturer should confirm the system behaviour for each scenario in the context of the CEL annex.
ROK: in ROK, false reaction like Scenario 4 happen frequently. What sensors are equipping the vehicle? J: A and C vehicles have camera only, B has both camera and millimetre radar.
ROK showed a movie of a real-world incident with false AEBS activation on a M2/M3. However this was more dedicated to the AEBS under UN R131
OICA wondered what to do with the outcomes of the J presentation. According to the orientation the group decides, the scenario and its parameters may vary. J explained that the study will be further conducted until March 2020.
N: experience in N: weather conditions are difficult, AEBS activation may lead to disasters in some conditions.
CLEPA supported OICA that the group must well decide what is the aim,
OICA also was concerned that this exercise does not lead the group to invent new requirements. The expert was also keen that the next meeting decides on the orientation to be given with regard to those tests.
Conclusion:

- Appetite from J and ROK on false alert scenarios, any contracting party to provide further experience.
- Scenarios are focusing on urban situation
- Request to Industry to collaborate with J, subject to reciprocal exchange of views and data.
- J to provide proposal for amendments to the regulation according to their research outcomes (probably around May/June 2020)
- AEBS-11 (6-7 February) to decide on orientation of the tests.

6. Other business

7. List of action items

- Car to Bicycle scenario
  - All to comment the approached proposed by BASt per documents AEBS-10-05 and 06
  - Industry to provide input on the scenario
- Robustness of the system:
  - All to review text adopted at AEBS-10
  - Corrections to be proposed, if necessary, at AEBS-11 (67 February 2020) or at GRVA-05 (10-14 February 2020)
- False Reaction scenarios
  - Industry to collaborate with J, subject to reciprocal exchange of views and data
  - J to provide proposal for amendments to the regulation according to their research outcomes (probably around May/June 2020)
  - AEBS-11 (6-7 February) to decide on orientation of the tests.

8. Next meetings (AEBS and others)

Please check at this link: https://wiki.unece.org/pages/viewpage.action?pageId=63310525

Title	Dates	Venue	Comment
VMAD-05	16-17 January	Tokyo	
ACSF-25	21-23 January	Tokyo	
CS/OTA		Washington	
EDR-DSSAD-04	28-30 January	Tokyo	
AEBSM1N1-11	6-7 February	OICA	
GRVA-05	10-14 February	Geneva	
WP1-80 and WP29-180	10-13 March	Geneva	
VMAD-06	14-15 April	Paris	TBC
FRAV-03	16-17 April	Paris	TBC
AEBSM1N1-12	13-14 May	Tokyo	
VMAD-07	8-9 September	USA	TBC
FRAV-04	10-11 September	USA	TBC
GRVA-06	21-25 September	Geneva	
VMAD-08	3-4 November	Brussels	TBC
FRAV-05	5-6 November	Brussels	TBC