

Justifications to document ECE/TRANS/WP.29/GRSG/2016/19 (Draft UN Regulation on AECS)

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Justifications:

Paragraph 1.1: The Regulation is divided into three parts according to the decision made at AECS-01:

- Part I describes the approval of a type of ecall device (Accident Emergency Call Device - AECD)
- Part II describes the approval of a vehicle type when fitted with an ecall device (AECD) approved to Part I. An installed AECD is called an AECS (Accident Emergency Call System)
- Part III describes the approval of a vehicle type when fitted with a fully integrated AECS or with an AECD which was not previously approved to Part I of the regulation.

Paragraph 1.2: According to the decisions of AECS-06, the regulation covers a restricted scope. At the 7th meeting of the informal group, the experts agreed to clearly identify the boundaries of the regulation by listing the items not covered by the regulation:

- a) The capabilities of the ecall to connect to the mobile phone networks shall not be part of the approval. This was agreed by the informal group on the following reasons:
 - i. Mobile phone networks legislation is not under the control of UNECE/WP29.
 - ii. Mobile phone networks evolve too rapidly to be regulated by a UN regulation in the frame of the 58 Agreement.
 - iii. Regulating the capabilities of the ecall to connect to the mobile phone networks would jeopardise the efforts of the vehicle and AECD manufacturers to best match the evolution of technology.

“Unless otherwise prescribed in this Regulation”: while the group agreed to exclude communication functionality from the scope of the regulation, some aspects of this functionality, not related to the

networks, can easily be tested for approval. These aspects are clearly mentioned in the text.

- b) Only the data listed in the MSD table, i.e. relevant for ecall, can be part of an approval with regard to ecall.
- c) An approval regulation, under the auspices of the 58 Agreement, can only deal with items related to the vehicle. The 58 Agreement indeed aims at improving mutual recognition and harmonization of rules of construction for automobiles. It is then obvious that problems of privacy, data protection etc. can only be regulated outside of the AECS regulation, i.e. at national/regional level.
- d) A regulation addressing approval, i.e. the state of the vehicle at the time of its homologation, cannot guarantee its state during its lifetime. In addition, testing the ecall at PTI would provoke the same difficulties as those explained in a) above, i.e. usage of the telephone and GNSS networks for testing:
 - a. The PTI environment may prevent communication through the air.
 - b. Testing could only be done by manual triggering, i.e. accident case could not be simulated.
 - c. PTI testing would generate numerous fake emergency calls to the PSAP, hence would lead to the need for arranging special dedicated ecall management, which would jeopardise the value of the testing.

Paragraph 1.3:

In order to avoid extra costs due to the implementation of the ecall, only the vehicles that are designed by construction to be fitted with an automatic triggering system related to the detection of an impact are included in the scope of the regulation. For defining these vehicles, it is assumed that all vehicles approved, or subject to approval to the regulations dedicated to the assessment of the resistance to impact, are fitted with an automatic triggering system. This is because, in the current state of the technology, there is no other way to fulfil the requirements of these regulations than by equipping the vehicles with “airbags” whose inflation must be triggered by an automatic triggering system. The informal group was keen to take the opportunity of the pre-existence of these airbag automatic triggering systems for triggering the ecall.

For security reasons GNSS related devices are usually not installed on armoured vehicles. They are in addition often equipped with scrambling equipment because their users usually refuse tracing systems. A definition of “armoured vehicle” exists in RE.3: “*Vehicle intended for the protection of conveyed passengers and/or goods and complying with armour plating anti-bullet requirements*”.

The European Commission subsequently (email of 30 June 2016) challenged the wording of this paragraph and proposed the following wording:

“1.3 Vehicles

- in the scope of neither Regulation No. 94 nor Regulation No. 95 and not fitted with an automatic triggering system,

- of category M1 in the scope of Regulation No.94 and not in the scope of Regulation No.95 and not fitted with an automatic triggering system,
- of category N1 in the scope of Regulation No.95 and not fitted with an automatic triggering system,

shall be excluded from the scope of this regulation.”

Paragraph 1.4: At AECS-08, the idea of “if fitted” requirements for GNSS connectivity assessment was adopted:

- If the applicant chooses to do so, he can include GNSS connectivity in his request for approval, when e.g. he intends to place the product in markets mandating such compliance.
- If on the contrary the manufacturer chooses to request approval without GNSS connectivity, contracting parties signatory to the regulation having national rules regulating GNSS connectivity may then nationally require compliance with these rules.

In both cases, all contracting parties signatory to the regulation will then accept the approval.

Some experts requested that the text confirm freedom for Contracting Parties to nationally apply GNSS connectivity approval for the case the UN regulation applicant opts for approval without GNSS connectivity assessment.

Paragraph 1.5: Similarly, the audio performance can be part of the approval at the request of the applicant when e.g. the applicant intends to place the product in markets mandating such compliance.

Paragraph 2: This paragraph covers the definitions that are common to the complete regulation.

Paragraph 2.6: A definition of “power supply” is necessary to well define the “back-up power supply”.

Paragraph 2.7: the AECD/AECS may get its power from many ways depending on the power management of the vehicle. The group hence faced difficulties in defining and elaborating proper requirements for the back-up power supply. Paragraphs 2.6 and 2.7 must hence work together for the definition of “power supply”.

Paragraph 2.23: The definition of AECD makes the distinction between what is really the core of the AECD (managing a triggering signal and emitting data) and what can be generated by its environment (GNSS, HMI).

Paragraphs 3: This paragraph covers the definitions that are particular to the Part I of the regulation.

Paragraph 7.1: Basic description of the sequence of operation of the Ecall.

Paragraph 7.2: Decision taken at AECS-09 to refer to the technical requirements of the last series of amendments to UN R10, or any later series of amendments. This guarantees a minimum level of severity (04 Series), yet gives the contracting parties sufficient flexibility to adapt the level of severity to their national situation. According to the revision 3 of the 58 Agreement, contracting parties will have the possibility of applying a version of a regulation anterior to the latest, without prejudice to the fundamental rule that a vehicle compliant to the latest series shall be accepted by all contracting parties signatory to the regulation.

Paragraph 7.3: The group at its 8th meeting agreed on the addition of if-fitted requirements for GNSS receiver supporting at least three GNSS

including GLONASS, GALILEO and GPS. “If-fitted” requirements permit the manufacturer to have the flexibility in the positioning technology. Paragraph 1.4. confirms that national regulations apply when the GNSS provisions are not part of the approval.

The group in addition agreed on the following main criteria:

- Capability to reception and processing SBAS signals
- Demonstration by performing a reduced set of test methods
- Tests can be performed conveniently:
 - Simulated GNSS signals per the test methods (no need for time-consuming complex field tests).
 - Either on the AECD unit or directly on the GNSS receiver being a part of the AECD.

General requirements and performance requirements are indicated in the main text of the regulation, test methods are described in the relevant annex (Annex 8).

The name of the processed GNSS signal constellations is quoted, while there is no need to specify the SBAS system required. This is related to the fact that different GNSS constellations like GPS, Glonass or Galileo have different frequencies, bandwidth, atomic clocks,... and therefore the performance vary even in the same scenario. On the other hand, the corrections performance of two different SBAS (e.g. WAAS in the US and EGNOS in EU) operate in a similar and standardised way.

Paragraph 7.3.1: NMEA 0183 is a combined electrical and data specification for communication defined by the “National Marine Electronics Association”. This standard uses a simple ASCII, serial communications protocol and was initially sought to be used for communication between marine electronics (including GNSS receivers) but given its simplicity, it has been adopted by many industries. It is common for low cost GNSS receivers as commonly used within the road domain to provide an NMEA output. This is especially useful where systems not specific to a particular receiver manufacturer are concerned as this means this provides flexibility in the choice of receiver.

Among others, the messages provide data related to the time, position, speed and fix; together with information related to the number, elevation, azimuth and health of the satellites.

Paragraph 7.3.2: “L1/E1 band” corresponds to the radio frequency spectrum portion destined to radio navigation satellite service as defined by the International Telegraph Union (ITU). This band is allotted between 1,559 and 1,591 MHz and centred at 1,575.42 MHz.

The robustness provided by having multiple GNSS constellations permits to achieve significant simplification of the performance requirements and the respective test methods endorsed.

Paragraph 7.3.4: “WGS-84 coordinate system” is a standard for use in cartography, geodesy, and navigation (including GNSS), comprising a standard coordinate system for the Earth, a standard reference surface for raw altitude data, and a definition of the nominal sea level. Outputs in WGS-84 coordinates is provided by all GNSS receivers in the market.

Paragraph 7.3.5: The group found reasonable to request a frequency of position determination of at least 1 Hz, such to ensure a good balance between the burden of a too high frequency (refreshing the data in the memory) and necessity of a good precision in positioning when the vehicle is moving.

- Paragraph 7.3.6: “Open sky” refers to a situation in which the GNSS signals are not affected by buildings, trees, etc. that make it difficult to reach the GNSS receiver. It is the case of most rural and sub-urban conditions.
- “Urban canyon” refers to a situation in which the GNSS signals are affected by buildings, trees, etc. making it difficult to reach the GNSS receiver. It is the case of most urban conditions.
- “Position Dilution of Precision” (PDOP) is a measure of how the geometry of the satellites’ position negatively affects a final position determination of the user. In practice, it is the combination of both the Horizontal and Vertical components of position error caused by satellite’s position geometry. To ensure testability upper and lower PDOP bounds are needed. Values of PDOP ranging from 2.0 to 4.0 correspond to most conditions of rural, sub-urban and urban areas. As an example, in urban conditions a higher PDOP is expected given the very low visibility of satellites due to the dense presence of high buildings.
- Paragraph 7.3.7: The 140 Km/h speed corresponds to the simulation of the highest value of maximum speed that is legally allowed in the nations signatories to the 58 Agreement.
- The linear acceleration is defined as a range from 0 to 2G (i.e. the maximum linear acceleration in the full simulation should not exceed 2G). Some common mass market GNSS chipsets have reported operational limits up to 4G.
- Paragraph 7.3.8: The cold start time to first fix provides information in relation to the time it takes a receiver to fix a position from scratch without having information on previous position of the user nor the satellites.
- Paragraph 7.3.9: The objective behind repeating again the signal re-acquisition requirement for a block out of 60 seconds is to simulate the case of a vehicle going under a medium-distance tunnel (of up to around 1 Km), where the signal get temporary lost. When the vehicle exits the tunnel, the chipset should re-acquire the position. All larger tunnels normally have video surveillance systems in case of emergency.
- Paragraph 7.3.10: The sensitivity provides information in relation to the minimum power of the signal at the antenna input that make the GNSS receiver capable of fixing a position. The test is performed consecutively (i.e. navigation data are decoded in the first stage and should continue in the second and third stages)
- The 3600 seconds time corresponds to the simulation of the maximum duration estimated in a breakdown call. It defines the maximum time to be tested. Nonetheless, the vast majority of GNSS chipset can pass the test in a few minutes.
- The re-acquisition time provides information in relation to the time it takes a receiver to fix a position after some temporary loss of signal reception (e.g. when driving through a tunnel). It is also known as warm start acquisition time.
- Paragraph 7.3.11: this provision permits flexibility on the procedure of homologation of the AECD.
- Paragraph 7.4: SIM-chip or similar technology is targeted in this paragraph for identification and authentication on the mobile phone network or the PSAP. There is no need for further details as telecommunication performance requirements are out of the scope of the regulation.

Paragraph 7.5: Provisions with regard to Human Machine Interface. Consistency necessary with the provisions of Part II (installation section). The introductory paragraph addresses the necessary link between Part I and Part II (paragraph 16.5) of the regulation, taking into account that the supplier may not know, at the time of AECD Type Approval, whether the parts will be approved to Part II. The wording is then linked to the Annexes 1, 2 and 3 (Communication Forms).

The group agreed that the AECS regulation should focus on when the warning shall be given to the driver, while a dedicated regulation (i.e. UN R121 – controls and tell-tales) should address how the warning shall be given. The group agreed to limit the warning signals to those providing the progress status of the emergency call (whether automatic or manual) and the presence of an internal malfunction.

Paragraph 7.5.1: Progress status of the emergency call:

- System is processing: the driver is interested only in knowing one of the items listed in the sub-paragraph. Progress of voice call is not critical to the driver because the establishment of a voice communication is *de facto* an acoustic information that voice call is in progress.
- “Transmission failed” is considered necessary to the driver.

Paragraph 7.5.2: An internal malfunction of the AECD/AECS does not prevent the vehicle from being driven safely. However the driver has the right to be informed when one of the safety systems of his vehicle has a failure. The provisions in this paragraph are inspired from UN R48 (installation of lamps): a signal must be emitted upon the occurrence of the failure, and must be repeated, at least temporarily, each time the engine is started again.

Paragraph 7.5.2.1: As the AECS is a complex electronic system, not all possible failures within the sensors, CPU, connections, wiring, software etc. can be listed then checked following an exhaustive list in the regulation. On the other hand, the regulator cannot let total freedom to the manufacturer on the possible failures to be checked at the time of approval. The group held several debates on the best approach and two options arose: exhaustive list of items vs. an explanatory documentation. The group finally opted for the solution of an exhaustive minimum list of items, as described in Table 1 of paragraph 7.5.2.1.

- AECD control module: it is the centre of the AECD intelligence, a software self-check is hence considered necessary.
- Mobile network communication device: the part of the mobile phone communication chain which is under the responsibility of the applicant is of course eligible to a check at the time of type approval.
- GNSS receiver: this item is similar to that of the mobile phone network communication above: the part of the communication with the Global Navigation Satellite System which is under the responsibility of the applicant must be checked at the time of type approval.
- Crash Control Unit: as this unit is the one which trigger the ecall, in the current state of the technology, it is a key item to be checked.

- Power supply: the ecall can be generated only when there is power supplied to the AECD/AECS.
- SIM card: currently most AECD/AECS are designed with a non-removable SIM card. Yet this item in the table applies when a removable SIM card is used.
- Back-up power supply: in case the AECD/AECS is fed by a dedicated battery, its state of charge must be sufficient to generate the ecall: the value is under the responsibility of the applicant.

Paragraphs 7.5.2.2 to 7.5.2.2.5: The test procedure is inspired from the test procedure currently proposed at European level, yet adapted to the situation of the UN regulation.

Paragraph 7.5.3: In case the AECD, as a separate device, cannot display the information, the Technical Service must at least verify that the signal dedicated to this display is generated by the AECD. It will be then up to the approval under Part II of the regulation to verify that the information is well displayed.

Paragraph 7.5: Provisions with regard power supply. AECS-08 held a debate on the best way to assess the power supply performances. Either the AECD has a dedicated energy supply, or energy supply is outsourced. And either the vehicle is subject to regulations Nos.94/95 crash tests, or it is not. The group found logical:

- At device level: if fitted approach, device test.
- At vehicle level:
 - o Verification of performance before impact
 - o State of power source and its relevant connections after impact.

The text well indicates that the tests not performed at device level (Part I) must be performed at vehicle level (Part II).

Paragraph 7.6: Power supply is definitely a key subject when it comes to AECS efficiency. When the vehicle is subject to a crash, it may happen that the vehicle's power supply disconnect from the internal circuit. The regulation makes then sure that the AECD is still fed in post-crash situations.

Paragraph 7.6.1: The best way to make sure the AECD is fed in post-crash situations is to perform a test simulating the high decelerations occurring in a severe impact. This is described in the Annex 7.

Paragraph 7.6.2: The triggering component may not be part of the AECD, rather of the passive safety protection strategy. The triggering signal must hence be generated as soon as possible after the sled acceleration.

Paragraph 7.6.3: The AECD shall succeed the test if the MSD is emitted and if the relevant HMI is displayed. Item 2 of Annex 9 addresses "Post-crash assessment of the AECS operation".

Paragraph 7.6.3.1: In most cases, the AECD is fed by a dedicated power battery (vs. the vehicle main battery) integrated into the AECD unit (similar to a rechargeable "button battery"). In such cases, the regulation must make sure that this battery still contains enough energy to feed the AECD such that it performs what it is expected to. The group decided to accept the proposal from RUS for the 5-60-5 test procedure as this procedure is deemed to sufficiently represent reasonable worst cases.

Paragraph 7.6.3.2: As the presence/absence of the back-up battery is the criterion deciding which test method to follow, it is necessary that the applicant well indicate the information into the relevant form.

Paragraph 7.7:	Provisions with regard to the assessment of the resistance to impact. AECS-08 adopted the final provisions and references: paragraph 7.7.1. provides a list of components subject to mandatory tests, paragraph 7.7.2. provides a list of components subject to optional test, at the request of the applicant.
Paragraph 7.7.1:	<p>List of mandatory items subject to tests:</p> <ul style="list-style-type: none"> - Control module: obvious. - Communication module: microphones and loudspeakers are excluded because it was demonstrated to the informal group (12th session) that deteriorated loudspeakers maintain a sufficient level of performance. In addition, there is no clue of their installation at the time of AECD approval. - Back-up power supply: this applies of course only when the AECD is fitted by design with a back-up power supply. If yes, then it is logical that its resistance to high decelerations be assessed. - Connectors: this item was subject to debate. It was agreed that only that part of the connectors which is close to the device must be subject to test. - Network access antenna: of course the ecall cannot be emitted if the antenna is absent or severely deteriorated. <p>It was agreed that for the high severity deceleration test representing a severe crash condition, data communication (MSD) is the most important. For the UN R94 and R95 based vehicles test both voice communication and data communication must be ensured.</p>
Paragraph 7.7.2:	list of optional items subject to tests. These items are optional because they may be approved to Part II of the regulation (warning and information device, power supply), or because their approval to this regulation is optional (GNSS communication equipment, audio equipment).
Paragraphs 8 to 12:	Conventional paragraphs per the 58 Agreement.
Paragraph 13:	Definitions that are considered necessary for Part II.
Paragraph 14:	Conventional text per a regulation annexed to the 58 Agreement.
Paragraph 15:	Approval provisions.
Paragraph 15.1:	<p>The text ensures the link between Part I and Part II with regard to the verification of information and warning signal and to the power supply, which can be performed either under Part I or Part II of the regulation.</p> <p>The regulation proposes two approval procedures with regard to the verification of the trigger signal and the AECS functionality after a vehicle impact test:</p>
Paragraph 15.2 to 15.5:	Conventional text per a regulation annexed to the 58 Agreement.
Paragraph 16.1.1:	According to the definition of Part II of the regulation, the requirements for the installation of an AECD should apply only when the vehicles is indeed equipped with an AECD approved to Part I of the regulation.
Paragraph 16.1.2:	Provision per the initial proposal AECS-01-05 (RUS), as a guarantee that the AECD has sufficient power supply at all time.
Paragraph 16.1.3.:	Requirement that the AECD capabilities with regard to localisation and access to mobile phone networks, which are assumed to be

demonstrated per Part I of the regulation, are not jeopardised by the AECD installation in the vehicle.

It is deemed beneficial that some information on the performances of the AECD, with regard to the connections to the networks, are provided to the Technical Services.

The text also stresses that there should not be any difference of installation of the AECD between the impact tests and the AECD tests.

Paragraph 16.2: Necessary link between the triggering signal and the AECS functionality. The test methods are described in Annex 9 (Test method for AECD/AECS post-crash performance).

Paragraph 16.2.1: Provisions for vehicles of category M1 per the table established in document AECS-04-14 paragraph 7.3.

Paragraph 16.2.1.1: This paragraph addresses the vehicles in the scopes of both UN R94 and 95. The good functioning of the AECS must then be assessed either when performing the frontal and lateral impact tests of these regulations (paragraph 16.2.1.1.1), or by showing the relevant evidence (paragraph 16.2.1.1.2).

The latter case can exist when the impacts to UN R94/95 were already performed: extension of an existing approval, or approval to these regulations already performed. It would indeed be unreasonable to require the destruction of two additional vehicles or prototypes when sufficient evidence can be shown to the Technical Service with the same level of confidence.

This level of confidence is assumed to be reached when the applicant can demonstrate that a triggering signal was generated at the time of the impacts AND the installed AECD was, after the impacts, in a state sufficiently good to emit the MSD and start generating voice communication.

Paragraph 16.2.1.2: This paragraph addresses the vehicles in the scope of only UN R94 (frontal impact). The vehicles with a “R” point above 700 mm are indeed excluded from the scope of the side impact regulation. The group was of the opinion that those vehicles may not be equipped with a side airbag, i.e. may not be equipped with a triggering system related to the (non-existing) side airbag. Hence they must be subject to the AECS provisions of only the frontal impact situation (paragraph 16.2.1.2.1).

The paragraph 16.2.1.2.2 focuses on the cases where the impact tests were performed prior the application for AECS approval.

Paragraph 16.2.1.3: This paragraph addresses the vehicles in the scope of only UN R95 (side impact). The vehicles with a mass above 2.5 tons are indeed out of the scope of UN R94. Similarly to paragraph 16.2.1.2, the group considered that those vehicles may not be equipped with a triggering system sensitive related to a (non-existing) frontal impact, and then may not have to fulfil the requirements of the AECS regulation in frontal impact situations.

Again, paragraph 16.2.1.3.2 focuses on the cases where the impact tests were performed prior the application for AECS approval.

Paragraph 16.2.1.4: When a manufacturer applies for approval to AECS of a vehicle not in the scope of UN R94/95 (excluded from the scope of this AECS regulation per paragraph 1.3, if not equipped with an automatic triggering system), they must show evidence of the existence of a triggering signal. This also applies for the cases where the manufacturer voluntarily applied to UN R94 (paragraph 1).

- Paragraph 16.2.2: Provisions for vehicles of category N1 per the table established in document AECS-04-14 paragraph 7.3.
- Vehicles of category N1 are always out of the scope of UN R94 (frontal impact). Therefore they are only subject to the AECS provisions related to side impact. In this case, either their “R” point is below 700 mm, and then the situation is similar to that of the corresponding M1 vehicles, and the provisions of paragraphs 16.2.2.1.1 and 16.2.2.1.2 apply (similar to paragraphs 16.2.1.3.1 and 16.2.1.3.2), or their “R” point is above 700 mm, and then the paragraph 16.2.2.2 applies (similar to paragraph 16.2.1.4).
- Paragraph 16.3: Verification of the position determination capabilities when they were not assessed under Part I of the regulation. See also the justifications under paragraph 7.3.
- Paragraph 16.4: The group agreed at its last meeting to mandate a manual AECS control. The group held a debate on the pros and cons of a manual triggering system: there are some crashes in some contracting parties where the airbag system does not inflate (data are awaited for the second phase of the regulation), hence the need for a manual triggering system; on the other hand, a majority of the ecalls existing today are false calls due to misuse or testing by the user.
- Paragraph 16.4.1: It is commonly understood that the particular regulations must regulate whether the manual control must be installed, while UN R121 (controls and tell-tales) must regulate how the manual control must be installed.
- Paragraph 16.4.2: Provision for avoiding accidental activation of the manual control.
- Paragraph 16.4.3: Similarly, when the control is part of a multi-task display, it is necessary not only to avoid a too simple single action (as mentioned above), but also a too difficult procedure, in particular for a system that is mainly used in case of emergency. The solution prevents continuous display of the AECS control on the multi-task display, hence avoids mishandling and accidental AECS activation.
- Paragraph 16.4.4: The correct operation of the AECS manual control must be checked according to the relevant annex (Annex 9). There was an agreement within the informal group that the assessment of the manual control can be conducted either per Part I of the regulation (paragraph 7.5.3), when the AECD control exists, or per Part II of the regulation (paragraph 16.4).
- Paragraph 16.4.5: In order to get the most benefits of the AECS, the group believed that a de-activation switch should be prohibited. However, in some circumstances like maintenance, PTI and repair, there is a need to keep the possibility of de-activating the AECS. This action must be processed according to the manufacturer’s specifications.
- Paragraph 16.5: Provisions with regard to warning display to the driver. Consistency necessary with the provisions of Part I (device section). The group agreed that the ecall regulation should focus on when the warning shall be given to the driver, while a dedicated regulation (i.e. UNR121 – controls and tell-tales) should address how the warning shall be displayed. A reference to the relevant HMI test methods is added for consistency with the new regulation structure.
- Paragraph 16.5.1: This paragraph is included because it is necessary that the AECS warning information respect the relevant provisions of UN R121, similarly to the AECS control.

- Paragraph 16.5.2: The information regarding the status of the call transaction is relevant, rather than that of the connection itself. See also the justifications under paragraph 7.5.1. In the case of AECS approval (Part II of the regulation), compliance with both the provisions of Items 1 & 2 of Annex 9 are relevant.
- Paragraph 16.5.3: As for paragraph 7.4.2. in Part I of the regulation, an internal malfunction of the AECD/AECS does not prevent the vehicle from being driven safely. However the driver has the right to be informed when one of the safety systems of his vehicle has a failure. The provisions in this paragraph are inspired from UN R48 (installation of lamps): a signal must be emitted upon the occurrence of the failure, and must be temporarily repeated each time the engine is started again.
- Paragraph 16.5.3.1: See the justifications under paragraph 7.5.2.1.
- Paragraphs 16.5.3.2. to 16.5.3.2.5.: Similarly to paragraph 7.5.2.2, the test procedure is inspired from the test procedure currently proposed at European level, yet adapted to the situation of the UN regulation.
- Paragraph 16.6: Paragraph adding audio performance requirements, referring to the ITU-T recommendations. Compliance is subject to the request of the manufacturer to ask for approval with regard to audio performances.
The paragraph provides provisions for pre- and post-crash.
- Paragraph 16.6.1: The pre-crash provisions refer to the ITU-T recommendation. According to the proposed text, the applicant must simply show compliance with the ITU standard, e.g. show the ITU certificate, rather than performing again all the tests of the standard. The group agreed to add slight notes to complement the text of the standard (sub-paragraphs (a) and (b)).
- Paragraph 16.6.2: The post-crash provisions refer to the next paragraph.
- Paragraph 16.6.3: The provisions for the testing languages are inspired from those of UN R130 (lane departure warning system). The vehicle will be tested according to one of the languages specified in Annex 9, and the manufacturer will demonstrate compliance with the other languages. The demonstration documentation must then be appended to the test report.
- Paragraph 16.7: Power supply performance assessment. These paragraphs should apply only when the tests were not performed under the device section (Part I of the regulation).
- Paragraph 16.7.1.1: For assessing the quantity of energy available in the power supply, the group agreed on a simple test of 5-60-5 minutes; as it is the case for paragraph 7.6.3.1., this test was considered relevant without real experience.

In order to make this test as close to the reality as possible, it is requested that the demonstration take place in the expected “post-crash power supply conditions”. It is also important that these conditions are those following the UN R94/95 crash tests, and that the power management strategy of the vehicle, as explained by the manufacturer, is taken into account.
- Paragraph 16.7.1.2: As the back-up power supply post-crash assessment may be impossible to perform, the text permits a choice of test methods according to Annex 9.
- Paragraph 16.7.2: The provisions for an AECS not equipped with a back-up power supply are similar to those of an AECS fitted with back-up power supply.

- Paragraph 16.7.2.1: The absence of the back-up power supply is a key parameter for assessing the capabilities of the AECS post-crash; it is hence logical to indicate its absence in the communication form.
- Paragraph 16.7.2.2: See the justifications under paragraph 16.7.1.1.
- Paragraph 16.7.2.3: This paragraph should be amended such that the back-up power supply is not cited: *“After the impact test under Regulations Nos. 94 and/or 95 whichever is relevant, the AECS ~~back-up~~ power supply shall be able to supply power to the AECS. This may be verified by one of the methods described in Annex 9 to this Regulation”*.
- Paragraphs 17 to 21: Conventional wording per regulations under the 58 Agreement
- Part III: This part addresses the approval of the vehicles equipped with an AECD which was not primarily approved to Part I of the regulation. Some debates took place within the informal group to determine whether this section should also address the vehicles with a fully integrated AECD. As this technology is not mature for the time being, and because this case is included in the case of a non-approved AECD, the group agreed that the fully integrated AECD do not need to be identified in the text.
- Paragraph 22: Definitions that are considered necessary for Part III.
- Paragraph 23: Conventional text per a regulation annexed to the 58 Agreement.
- Paragraph 24: Approval provisions.
- Paragraph 24.1: The text ensures that the approval of a vehicle to Part III is fully equivalent to an approval according to the addition of Parts I and II.
- Paragraphs 24.2. to 24.5: Conventional text per a regulation annexed to the 58 Agreement.
- Paragraph 25.1.1: In consistency with the objective of Part III of the regulation, the 1st paragraph addresses vehicles equipped with an AECS NOT approved to Part I of the regulation. Together with paragraph 16.1.1 of the regulation, this permits the regulation to cover all the possibilities of vehicles equipped with an AECD.
- Paragraph 25.1.2: Provision per the initial proposal AECS-01-05 (RUS), as a guarantee that the AECD has sufficient power supply at all time.
- Paragraph 25.1.3: Provisions similar to that of the approval of a vehicle per Part II. However, there is no recommendation that there should not be any difference of installation of the AECD between the impact tests and the AECD tests, because the AECD is not assumed to have been approved to Part I of the regulation.
- Paragraph 25.1.4: See justifications under paragraph 7.1. This description does not exist in Part II of the regulation (paragraph 16.2.) because the vehicle subject to approval per Part II is assumed to be equipped with an AECD approved to Part I.
- Paragraph 25.2: According to the wish of the group that the Part III is fully equivalent to the sum of Parts I & II, see the justifications under paragraph 7.2.
- Paragraphs 25.3 to 25.3.11: According to the wish of the group that the Part III is fully equivalent to the sum of Parts I & II, see the justifications under paragraphs 7.3 to 7.3.11.
- Paragraph 25.4: SIM-chip or similar technology is targeted in this paragraph for identification and authentication on the mobile phone network or the PSAP. No need for further details as telecommunication performances requirements are out of the scope of the regulation.

- Paragraphs 25.5 to 25.5.2.2.1: According to the wish of the group that the Part III is fully equivalent to the sum of Parts I & II, see the justifications under paragraphs 16.2 to 16.2.2.
- Paragraphs 25.6 to 25.6.5: According to the wish of the group that the Part III is fully equivalent to the sum of Parts I & II, see the justifications under paragraphs 16.4 to 16.4.5
- Paragraphs 25.7 to 25.7.3.2.5: According to the wish of the group that the Part III is fully equivalent to the sum of Parts I & II, see the justifications under paragraphs 16.5 to 16.5.3.2.5.
- Paragraphs 25.8 to 25.8.3.3: According to the wish of the group that the Part III is fully equivalent to the sum of Parts I & II, see the justifications under paragraphs 16.6.3.3.
- Paragraphs 25.9 to 25.9.2: According to the wish of the group that the Part III is fully equivalent to the sum of Parts I & II, see the justifications under paragraphs 16.7 to 16.7.1.2. The case of an AECS not equipped with a back-up power supply does not need to be discriminated from that of the presence of such power supply because the AECD power supply management is assumed to be part of the vehicle. The Technical Service must then simply verify the good functioning of the AECS pre- and post-crash.
- Paragraphs 25.10 to 25.10.2: According to the wish of the group that the Part III is fully equivalent to the sum of Parts I & II, the resistance to impact of the AECD must be tested separately. These paragraphs then copy/paste those of sections 7.7 to 7.7.2.
- Paragraphs 26 to 30: Conventional paragraphs per the 58 Agreement.
- Annexes 1, 2, 3: AECS-07 agreed to the addition of Annexes 1, 2 and 3 as Communication Forms which permit the Type Approval authorities to communicate with each other on the approvals granted. A sub-item to item 9 in Annex 1 provides an entry for indicating whether the AECD approval contains assessment of the AECD information and warning signal. Should the answer be “no” in Annex 1, then the Communication form for AECS in Annex 2 should contain a “yes” to this entry, and vice-versa. Such discrimination is not necessary when the AECS is fully integrated in the vehicle (Annex 3).
- An entry “10” was added to Annex 1 for addressing the AECD sled test of Annex 4.
- Annex 4: Information document for the AECD as a separate device. Some special particulars address the presence of a back-up power supply and of an internal crash control unit.
- Annex 5: Information document for the vehicle equipped with an approve AECD. The entry 10.6 provides information about the approval number of the AECD as a separate device. Entry 11 also provides clarity about the homologation status of the vehicle when presented for approval.
- Annex 6: Information document for the vehicle equipped with an AECD not approved to Part I of the regulation. Here again, entry 11 provides clarity about the homologation status of the vehicle when presented for approval.
- Annex 7: Annex dedicated to the assessment of the resistance to mechanical impact. The group agreed in principle on a sled test ensuring that AECS deliver high societal benefits to those casualties which need it most because it covers collision configurations that are more challenging to AECD than full-scale tests (UN R94 &95). The proposal is based on the

decelerations collected in a sample of full-scale crash test results of superminis, MYs 2012 and 2013 (56 km/h, rigid barrier, full-width).

Some debates took place in the group with regard to this approach, firstly because it deviates from the initial commitment of the group to remain in the environment of UN R94 & 95, and secondly because definitive decisions should not be taken on a small sample of old-design vehicles.

The group then agreed on a peak deceleration of 65 g in a corridor similar to that of UN R44.

At its 12th meeting, a majority of the parties communicated having encountered problems in achieving the demanded deceleration because of the sustainability of their testing equipment. The European Commission informed having no power to change value of the required peak deceleration because the text of the EU Draft Delegated Act is frozen.

At the last meeting of the informal group, the experts convened that their initial choice for a value of 65g peak deceleration (points B and C of Table 4) was erroneously taken. The group then agreed to revise the value and to re-shape the corridor as it is in the document GRSG/2016/19. The European Commission vehemently opposed this decision because it deviates from the initial agreed values, because the sustainability of the testing equipment should not be a criterion for choosing a deceleration value and because there would be few chance for the EU to downgrade the severity of the EU Draft Delegated Act at this stage of the negotiation. NL (not present at the last meeting of the informal group) also subsequently communicated to the group that they could not support the change of corridor.

The final outcome of this debate can be found in paragraph 49 of the GRSG-110 session report (document WP29/GRSG/89).

- Annex 8: Annex dedicated to the assessment of the navigation solution, at the request of the manufacturer. Proposal per document AECS-07-13 (GSA).
- Paragraph 1: definitions necessary for the application of the annex.
- Paragraph 2.1.1: Even though the testing of the 3 pieces can be performed in parallel, they shall be compared against the GNSS performance requirements separately.
- Paragraph 2.1.3: The "device serial number" is the unique identification assigned either by the AECD/AECS or the GNSS manufacturer (depending on who made the first activation).
The "device provider identification number" is the Tax Identification Number.
- Paragraph 2.1.5: A GNSS simulator provides an effective and efficient means to test GNSS receivers and the systems that rely on them. GNSS simulators generate the same kinds of signals that are transmitted by the GNSS satellites, thus GNSS receivers can process the simulated signals in exactly the same way as those from actual GNSS satellites. Testing with simulators is the widely-accepted best practice for validating the performance of GNSS receivers and systems, in many different scenarii and operating conditions, in controlled laboratory environments. Indeed, there are significant advantages of testing with GNSS simulators in laboratory instead of real-world, live-sky testing with actual GNSS signals (e.g. fully repeatable of the constellation signals and

environmental conditions, no unintended interference signals or unwanted signal effects, design of easy test scenarios, cost-effective testing compare to the field testing and vehicle trials...).

- Paragraph 3.1.3, Table 5: The requirement to obtain a position fix at least every second is guaranteed by setting 1 Hz value for the output frequency.
- It is at the discretion of the applicant to specify the latitude coordinate of the AECD/AECS in the latitude range 80°N and 80°S. Polar areas have been ruled out to facilitate the GNSS signals availability and to replicate the conditions in the most likely areas of application of this regulation.
- The SBAS signal strength is not specified in order to facilitate the GNSS simulator configuration as it depends on the AECD/AECS location selected for the simulation. Moreover, simulators normally consider the SBAS option ON/OFF in the settings; but don't discriminate between the different regional SBAS infrastructures (e.g. EGNOS, SDCM, WAAS...) because they all work in a standardized way. In case the simulator require to set this parameter, it will be at the discretion of the applicant to specify the preferred signal strength value.
- Paragraph 3.1.4: The requirement to receive and process SBAS signals is guaranteed by checking that the value of field 6 in the GGA messages of the NMEA-0183 protocol is set to "2".
- Paragraph 3.2: "Static mode" refers to a situation in which the GNSS receiver is simulated to be in a static position, i.e. without moving.
- Paragraph 3.2.10: It is at the discretion of the applicant to compute the calculation of the horizontal accuracy based only on a Gaussian of range errors (formula 6), or on both Gaussian and non-Gaussian distributions (formula 7) that is more appropriate for urban scenarios.
- Paragraph 3.3: "Dynamic mode" refers to a situation in which the GNSS receiver is moving in what is expected to be a challenging scenario for GNSS signal (at high speed, with a turn radius displacement).
- Annex 9: According to the test equipment and different factors, the regulation proposes a choice among four methods of testing the post-crash performance of the AECD/AECS. Pre-crash assessment is performed by manual triggering via the AECD/AECS manual control.
- Test Method 1: Functional check using over the air transmission for MSD and voice call via a real PLMN. When the test conditions permit the transmission of the MSD and voice communication via the existing networks, then it is beneficial to use these conditions because they are very close to the real world situation.
- Test Method 2: Functional check using over the air transmission for MSD and voice call via a network simulator. When the test conditions do not permit voice communication via the existing network, then the Technical Service may use a network simulator. This may be beneficial because it avoids the obstacles of the environment that could prevent the test results from being reliable.
- Test method 3: Functional check using a wired connection to a network simulator. When the test conditions permit neither a transmission of MSD nor voice communication via the existing networks, then the Technical Service may use a simulator for both. This will permit laboratory conditions for scientifically robust test results. See also justifications to paragraph 2.4 below.

	<p>This method in addition is needed for performing AECS testing in contracting parties regions with a frequency restriction (e.g. use of EU frequencies even for testing is restricted in Japan).</p>
Test method 4:	<p>After impact move the vehicle to a shielded environment and functional check using over the air transmission for MSD and voice call via a network simulator. This method is primarily intended for AECS testing after a UN R94/95 test. In such case, the vehicle should be moved as quickly as possible after the impact took place, and the AECS can then be tested according to the conditions appropriate for test results best simulating the reality.</p> <p>This method is needed because UN R94/95 test facilities can not necessarily ensure a reliable mobile network connection and only very few UN R94/95 test facilities are shielded to allow the set-up of a simulated mobile network that doesn't interfere with the real mobile network</p>
Paragraph 2.1:	<p>Among the data contained in the MSD definition (see Annex 10), only the vehicle location, the time stamp and the VIN are relevant for approval testing.</p>
Paragraph 2.2:	<p>The hands-free voice communication assessment must at least contain the clear hearing of the originating voice in both directions. The group agreed not to enter the details of scientific recognition of voice intelligibility in the context of this regulation. As a consequence, it was agreed to limit the requirements to a subjective test, with a defined minimum level of accuracy described in the Appendix of the annex.</p>
Paragraph 2.3:	<p>the assessment of the HMI is fully corresponding to the requirements in the text of the regulation.</p>
Paragraph 2.4:	<p>During a severe impact, deterioration of the network antenna and its wiring may occur due to the high level of deceleration. This deterioration could be missed by testing with a simulator, hence it was found reasonable that an additional check must be performed on the antenna and its wire. This check is limited to the mobile network antenna because the GNSS data are assumed to have been recorded pre-crash.</p>
Appendix:	<p>Similarly to UN R130 (Lane Departure Warning Device), a list of languages with their typical sentences representing the most common sounds of these languages was established; only the languages of the contracting parties to this regulation can be relevant for approval to this regulation. One language will be selected for the purpose of homologation test, and, as mentioned in paragraphs 16.6.3.2 and 25.8.3.2, the manufacturer will demonstrate compliance with the languages of the other contracting parties via documentation.</p>
Annex 10:	<p>Definition of the minimum set of data (MSD). As agreed at the 2nd meeting of the informal group, this dedicated annex provides the minimum requirements for the MSD, i.e. the mandatory part of CEN15722 Standard, Table 1. The annex is limited to a list of the basic minimum data to be conveyed to a PSAP; the exact format of MSD is still under the responsibility of the manufacturer, in relation with the countries where the vehicle is intended to be marketed.</p>