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## Regulation No. XXX

### UNIFORM PROVISIONS CONCERNING THE APPROVAL OF I EMERGENCY CALL DEVICES (AECD) II VEHICLES WITH REGARD TO THE INSTALLATION OF AN AECD OF AN APPROVED TYPE III VEHICLES WITH REGARD TO THEIR AECS

#### Contents

#### Preliminary comments from the Secretary of GRSG informal group on AECS

1. This document was produced by the informal group Secretary as a working document, for serving as a basis for discussions within the GRSG informal group on AECS. It is expected to evolve and improve along the discussions that will take place during the meetings of the informal group.
2. This document shows the status of the discussions after **the 12<sup>th</sup>** meeting of the informal group. The changes compared to AECS-02-02-Rev.7 (status after **11<sup>th</sup>** meeting) are indicated in bold and strikethrough characters, save for Part III for ease of reading and because it was not **amended** at AECS-12.
3. Basis of the document are
  - AECS-02-02-r7 (Secretariat) Draft regulation with OF notes of 12th meeting
  - AECS-12-03 (GSA) GNSS
  - AECS-12-04 (OICA) proposal for ITU-T P emergency-C
  - AECS-12-06 (ITU) Text proposal for inclusion in chapter 16
  - AECS-12-07-Rev.1 (OICA) Annex 9
  - AECS-12-08 (OICA) Annex 7 proposal
  - AECS-12-12-r1 (J) Proposal disable means with notes
  - AECS-12-14-r1 (GSA) Corrections to GNSS provisions
  - AECS-12-16 (Head Acoustics) Text proposal for inclusion in chapter 16

## 1. Scope

1.1 This Regulation applies to:

- (a) Part I: the approval of Accident Emergency Call Devices which are intended to be fitted to vehicles of categories M1 and N1<sup>1</sup>;
- (b) Part II: the approval of vehicles of categories M1 and N1<sup>1</sup> with regard to the installation of an Accident Emergency Call Device which has been approved to Part I of this regulation.
- (c) Part III: the approval of vehicles of categories M1 and N1<sup>1</sup> with regard to their Accident Emergency Call System or with regard to the installation of an Accident Emergency Call Device which has not been separately approved according to Part I of this Regulation.

1.2 It does not apply to:

- (a) Communication module functionality and communication antenna functionality, unless otherwise prescribed in this Regulation;
- (b) The data additional to MSD to be conveyed to PSAP, the format of the data, the mechanism and logic of data transmission, data exchange protocol, operation modes and conditions of transitions between such modes, performance of the test call and test data transfer, response to protocol commands received from infrastructure and network registration logic;
- (c) Privacy, data protection and personal data processing.
- (d) Periodical Technical Inspection

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 equipped with frontal airbag
- of category N1 in the scope of Regulation No.95 and not equipped with side airbag, or

shall be excluded from the scope of this regulation.

1.4 GNSS positioning may be approved at the request of the applicant.

However, if the applicant opts to request approval ~~to~~ of AECD/AECS without the GNSS positioning as described in this regulation, national requirements of the Contracting Parties apply.

1.4a Pre-crash and/or post-crash hands-free audio performance may be approved at the request of the applicant.

However, if the applicant opts to request approval of AECS without the hands-free audio performance assessment as described in this regulation, national requirements of the Contracting Parties apply.

<sup>1</sup> As defined in Section 2 of the Consolidated Resolution on the Construction of Vehicles (R.E.3) (document TRANS/WP.29/78/Rev.2) – [www.unece.org/trans/main/wp29/wp29wgs/wp29gen/wp29resolutions.html](http://www.unece.org/trans/main/wp29/wp29wgs/wp29gen/wp29resolutions.html).

1.5 Vehicles of the following categories shall be excluded from the scope of this regulation:

- Armoured vehicles<sup>1</sup>,
- M1 vehicles with a total permissible mass above 3.5t

## 2. Definitions - general

For the purposes of this Regulation:

- 2.1 “*Communication module*” means a component of an AECD designed for voice communication and to transmit data about an accident using terrestrial mobile telephone communications networks;
- 2.2 “*Human/Machine interface (HMI)*” means a component or function of an AECD designed to allow the user to interact with the device, including by receiving visual information, obtaining visual information and introducing control commands;
- 2.3 “*Data exchange protocol*” means the set of rules and agreements that define the content, format, time parameters, sequence and error checks in messages exchanged between an AECD and the devices of Public Service Answering Party (PSAP).
- 2.4 “*Public/Private Safety Answering Point (PSAP)*” means a physical location where emergency calls are first received under the responsibility of a public authority or a private organization recognized by the national government / responsible authorities.
- 2.5 “*Airbag*” means a device which, in the event of a severe impact affecting the vehicle, automatically deploys a flexible structure intended to limit the gravity of the contacts of one or more parts of the body of an occupant of the vehicle with the interior of the passenger compartment.
- 2.6 “*Satellite-Based Augmentation System*” (SBAS) is a system ensuring the correction of local errors of GNSS systems due to interferences via a network of ground-based stations. (ex: EGNOS, WASS, QZSS).
- 2.7 “*Power supply*” means the component that supplies power to the AECD.
- 2.8 “*Back-up power supply*” means the component(s) that supplies(y) power to the AECD when the main power supply fails.

## Part I: APPROVAL OF ACCIDENT EMERGENCY CALL DEVICES (AECD) WHICH ARE INTENDED TO BE FITTED TO VEHICLES OF CATEGORIES M1 AND N1

### 3. Definitions

For the purpose of Part I of this regulation,

- 3.1 “*AECD (Accident Emergency Call Device)*” means a unit or a set of units performing at least the following functions;
- receiving and/or generating the automatic and manual triggering signals,
  - and**
  - sending the data. ~~and~~
- It may in addition perform one of the following functions:**

- receiving or determining the vehicle location,
  - providing a warning signal, **and**
  - allowing bidirectional audio signals for voice communication;
- unless specified otherwise in this regulation.**

- 3.2 “*Global Navigation Satellite System receiver*” (“*GNSS receiver*”) means a component of an AECD/AECS designed to determine the vehicle positioning and time information using signals from global navigation satellite systems; the GNSS receiver can be included in the AECD or in another external control unit, as long as the AECD ensure its ability to provide the vehicle positioning information in case of an event.
- 3.3 “*Control module*” means a component of an AECD designed to ensure the combined functioning of all components of the AECD;
- 3.4 “*Type of AECD*” means devices that do not differ in such essential respects as:  
(a) The manufacturer's trade name or mark;  
(b) Their construction;
- 3.5 “*AECD information signal device*” means a device that provides information on the status of the emergency call transaction.
- 3.6 “*AECD warning signal device*” means a tell-tale that provides a failure indication of the AECD.

#### **4. Application for approval of an AECD**

- 4.1 The application for approval of a type of AECD shall be submitted by the holder of the trade name or mark or by his duly accredited representative.
- 4.2 A model of the information document is given in Annex 4.
- 4.3 For each type of AECD, the application shall be accompanied by samples of complete sets of AECDs representative of the type to be approved, in sufficient quantities for the tests prescribed by this regulation. Additional specimens may be called for at the request of the technical service responsible for conducting the test.

#### **5. Markings of an AECD**

- 5.1 The samples of AECD submitted for approval shall bear the trade name or mark of the manufacturer. This marking shall figure at least on the unit or units containing the navigation system receiver and communication module. It shall be clearly legible and be indelible.
- 5.2 The unit or units containing the navigation system receiver and communication module shall possess a space large enough to accommodate the approval mark. This space shall be shown on the drawings referred to in Annex 4.

#### **6. Approval**

- 6.1 If the samples submitted for approval meet the requirements of paragraph 7 6 of this Regulation, approval of the pertinent type of AECD shall be granted.
- 6.2 An approval number shall be assigned to each type approved. The first two digits (at present 00) shall indicate the series of amendments incorporating the most recent major technical amendments made to the Regulation at the time of issue of the approval. The same Contracting Party shall not assign the same number to another type of AECD.

- 6.3 Notice of approval or of refusal, or of extension or withdrawal of approval, or of production definitively discontinued of a type of AECD pursuant to this Regulation shall be communicated to the Parties to the Agreement which apply this Regulation by means of a form conforming to the model in annex 1 ~~3~~ to this Regulation.
- 6.4 There shall be affixed, conspicuously and in the space referred to in paragraph 5.2 above, to every AECD conforming to a type approved under this Regulation, in addition to the mark prescribed in paragraph 5.1, an international approval mark conforming to the model given in annex 1, consisting of:
- 6.4.1 A circle surrounding the letter “E” followed by the distinguishing number of the country which has granted approval;
- 6.4.2 The number of this Regulation, followed by the letter “R”, a dash and the approval number to the right of the circle prescribed in paragraph 6.4.1.
- 6.5 The approval mark shall be clearly legible and be indelible.

## 7. General requirements

Upon reception of a triggering signal, the AECD shall send data and establish voice connection with the PSAP.

If the sending of data failed then the AECD shall retry sending the data.

If the AECD has successfully sent the data and then loses the voice connection, it shall try to re-establish voice connection.

In case it was not possible to establish voice connection and/or send data using mobile communication networks, the AECD shall store the data in non-volatile memory and attempt re-transmission of the data and to establish a voice connection.

- 7.1. The effectiveness of AECD shall not be adversely affected by magnetic or electrical fields. This shall be demonstrated by compliance with the technical requirements and transitional provisions of Regulation No. 10, 04 series of amendments or any later series of amendments.
- 7.2 Position determination
- If the AECD is fitted, in accordance with paragraph 1.4., with GNSS receiver supporting at least three GNSS including GLONASS, Galileo and GPS, and is capable of reception and processing of SBAS signals, then the AECD shall comply with the requirements of paragraphs 7.2.1 to ~~7.2.10~~ **7.2.11**.  
AECD compliance with respect to positioning capabilities shall be demonstrated by performing test methods described in Annex 8: Test methods for the navigation module.
- 7.2.1 The GNSS receiver shall be able to output the navigation solution in a NMEA-0183 protocol format (RMC, GGA, VTG, GSA and GSV message). The AECD setup for NMEA-0183 messages output to external devices shall be described in the operation manual.
- 7.2.2 The GNSS receiver being a part of the AECD shall be capable of receiving and processing individual GNSS signals in L1/E1 band from at least three global navigation satellite systems, including GLONASS, GALILEO and GPS.
- 7.2.3 The GNSS receiver being a part of the AECD shall be capable of receiving and processing combined GNSS signals in L1/E1 band from at least three global navigation satellite systems, including GLONASS, GALILEO, GPS and SBAS.

- 7.2.4 The GNSS receiver being a part of the AECD shall be able to provide positioning information in WGS-84 coordinate systems.
- 7.2.5 Horizontal position error shall not exceed:
- under open sky conditions: 15 m at confidence level 0.95 with Position Dilution of Precision (PDOP) in the range from 2.0 to 2.5;
  - in urban canyon conditions: 40 m at confidence level 0.95 with Position Dilution of Precision (PDOP) in the range from 3.5. to 4.
- 7.2.6 The specified requirements for accuracy shall be provided:
- at speed range from 0 to 140 km/h;
  - linear acceleration range from 0 to 2 G.
- 7.2.7 Sensitivity at receiver input shall be:
- GNSS signals detection (cold start) do not exceed 3600 s at signal level on the antenna input of the AECD of minus 144 dBm;
  - GNSS signals tracking and navigation solution calculation is available for at least 600 sec at signal level on the antenna input of the AECD of minus 155 dBm;
  - Re-acquisition of GNSS signals and calculation of the navigation solution is possible and does not exceed 60 s at signal level on the antenna input of the AECD of minus 150 dBm.
- 7.2.8 Cold start time to first fix shall not exceed
- 60 s for signal level down to minus 130 dBm
  - 300 s for signal level down to minus 140 dBm
- 7.2.9 GNSS signal re-acquisition time after block out of 60 s at signal level down to minus 130 dBm shall not exceed 20 s after recovery of the navigation satellite visibility.
- 7.2.10 **The GNSS receiver shall be able to obtain a position fix at least every second.**
- 7.2.11. The testing procedures in Annex 8 can be performed either on the AECD unit including post processing ability or directly on the GNSS receiver being a part of the AECD.
- 7.3 Mean of access to mobile networks
- The AECD shall be fitted with an embedded hardware allowing registration/authentication on, and access to a mobile network.
- 7.4 AECD information and warning signal
- If the applicant for approval so requests, the AECD information and warning signals verification may be part of the approval of a type of AECD. In this case the following provisions shall apply.
- 7.4.1 The following information shall be provided regarding the status of the emergency call transaction when the AECD is automatically or manually activated:
- system is processing (ecall is triggered, connection is being set up **or** data transmission is in progress or completed ~~or voice call is in progress~~)
  - transmission failed (connection failed or data transmission failed)
- 7.4.2 A warning signal shall be provided in case of AECD internal malfunction. Visual indication of the AECD malfunction shall be displayed while the failure is present. It may be cancelled temporarily, but shall be repeated whenever the

ignition or the vehicle master control switch is being activated (whatever applicable).

7.4.2.1 The manufacturer shall provide a statement which explains the malfunction indication strategy of the AECS system.

~~[OPTION 1~~

The manufacturer shall provide the type-approval authority with an explanation and technical documentation which shows, in overall terms, how this is achieved. This documentation shall be maintained by the manufacturer and shall be made open for inspection by the technical service at the time of the type approval.

This ~~should~~ **shall** at least cover the following items:

- ~~AECD control unit~~
- ~~network access device~~
- ~~GNSS receiver and antenna~~
- ~~connection to crash control unit (crash detection sensor system, triggering device)~~
- ~~Connection to the external mobile network antenna~~
- ~~Connection to the power supply~~
- ~~Connection to the external GNSS antenna~~

ITEM		Comments
Component	Failure type	
AECD Control Unit	Internal failure	Internal failure = e.g. hardware failure, watch-dog, software checksum, software image integrity, ...
Mobile network communication device	Electrical connection / module communication failure	A failure in the module can be detected by the absence of digital communication between the AECD control unit and the module.
Mobile network communication device	internal failure	Item necessary because it is a basic function: a failure implies that the AECS cannot perform its function.
GNSS receiver	Electrical connection / module communication failure	
GNSS receiver	Internal failure	
Mobile network communication antenna	Electrical connection	
GNSS antenna	Electrical connection	
Crash Control Unit	Electrical connection	e.g. crash detection sensor system, triggering device, ...
Crash Control Unit	Internal failure	If not in good condition, then the automatic Ecall is not possible. <b>If CCU internal failure verification is not part of AECD approval (Part I), then it shall be subject to AECS approval (Part II).</b>
Power supply	Electrical connection	<del>(in table 1 : dedicated battery is connected)</del>

Removable SIM	not present	<del>Question whether the fixed SIM presence needs to be detected. In addition, communication is not part of the scope of the regulation. Conclusion: line to be revisited at next meeting. This item only applies if a removable SIM card is used.</del>
Dedicated battery	<del>Electrical connection/battery lack of charge</del> <b>The state of charge, threshold for warning at the discretion of the manufacturer</b>	<del>SOC is no failure, hence "lack" of charge. Failure if the state of charge is at a critical level according to the manufacturer below the necessary charge for the 5-60-5 test.</del>

Table 1: Template of information for self-test function

Verification of the performance of the AECD malfunction shall be conducted against the manufacturer's specification. This can be either by actual test or simulation-

- 7.4.2.2. Test procedure
  - Self-test function verification test
  - 7.4.2.2.1. The following test shall be performed on ~~a vehicle with an AECD eCall in-vehicle system installed or~~ on a representative arrangement of components for the approval of vehicles, components or separate technical units.
  - 7.4.2.2.2. Simulate a malfunction of the ~~AECD eCall~~ system by introducing a critical failure in one or more of the items monitored by the self-test function according to the technical documentation provided by the manufacturer. The item(s) shall be selected at the discretion of the ~~Technical Service type approval authority~~.
  - 7.4.2.2.3. Power the ~~AECD eCall~~ system up (e.g. by switching the ignition ‘on’ or activating the vehicle’s master control switch, as applicable) and verify that the ~~AECD warning signal device malfunction indicator~~ illuminates shortly afterwards **or the electrical signal is generated shortly afterward, whichever is relevant.**
  - 7.4.2.2.4. Power the ~~AECD eCall~~ system down (e.g. by switching the ignition ‘off’ or deactivating the vehicle’s master control switch, as applicable) and restore it to normal operation.
  - 7.4.2.2.5. Power the ~~AECD eCall~~ system up and verify that the ~~AECD warning signal device malfunction indicator~~ does not illuminate or extinguishes shortly after illuminating initially, **or the electrical signal is not generated shortly afterward or is cancelled after being generated initially, whichever is relevant.**
- 7.4.3 Instead of providing information or warning signal, the AECD may provide the electrical signal to other vehicle components, e.g. instrument panel, which enable to provide information or warning signal.
- 7.5 Power supply
  - 7.5.1. Perform the sled test described in Annex 7
  - 7.5.2. Immediately after the sled test, simulate the trigger such to emit the MSD
  - 7.5.3. The AECD shall send the MSD and shall produce status indication (if relevant) upon triggering. This shall be verified by one of the methods described in **Annex 9** ~~[Annex 10]~~.
  - 7.5.3.1. In the case of an AECD equipped with a back-up power supply, at the request of the applicant, it shall be verified that the AECD is able to operate autonomously



for a period of first not less than 5 minutes in voice communication mode followed by 60 minutes in call-back mode (idle mode, registered in a network) and finally not less than 5 minutes in voice communication mode.

7.5.3.2. In the case of an AECD not equipped with back-up power supply, the absence of back-up power supply shall be clearly indicated in the information document of Annex 4.

7.6. Resistance to impact

The AECD shall remain operational after impact. This shall be demonstrated according to Annex 7 and Annex 9, paragraphs 1 (MSD emission), paragraph 2 (MSD emission assessment) and paragraph 5.2 (status indication).

7.6.1. The following AECD components shall be tested to Annex 7:

- Control module
- Communication module excluding microphones and loudspeakers
- Back-up power supply (if fitted)
- Connectors<sup>2</sup>
- Network access antenna

7.6.2. If the applicant for approval so requests, the following AECD components may be tested to Annex 7:

- AECD warning signal device
- Hands-free audio equipment (microphones and loudspeakers)
- AECD information signal device
- Power supply other than back-up power supply mentioned in paragraph 7.6.1.
- GNSS antenna
- GNSS receiver

## 8. Modification and extension of approval of the type of AECD

8.1 Every modification of the AECD type shall be notified to the administrative department which approved the AECD type. The department may then either:

8.1.1 Consider that the modifications made are unlikely to have an appreciable adverse effect, and that in any case the vehicle still complies with the requirements; or

8.1.2 Require a further test report from the technical service responsible for conducting the tests.

8.2 Notice of the confirmation of approval, specifying the alterations made, or refusal shall be communicated to the Parties to the Agreement applying this Regulation by means of a form conforming to the model in annex 1 to this Regulation.

8.3 The competent authority issuing the extension of approval shall assign a series number to each communication form drawn up for such extension.

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- Only connectors related to the parts listed in this paragraph
- The length of the harness, and when applicable its fixation, can be decided by the applicant, in agreement with the Technical Service, so that it is representative for the different installation configurations of the AECD.

## 9. Conformity of production

- 9.1 The conformity of production procedure shall comply with the requirements set out in the Agreement, Appendix 2 (E/ECE/324 E/ECE/TRANS/505/Rev.2).
- 9.2 Every AECD approved under this Regulation shall be so manufactured as to conform to the type approved by meeting the requirements set out in paragraph 7 above.

## 10. Penalties for non-conformity of production

- 10.1 The approval granted in respect of an AECD type pursuant to this Regulation may be withdrawn if the requirement laid down in paragraph 9.1 above is not complied with or if the AECD fails to pass the checks prescribed in paragraph 9.2 above.
- 10.2 If a Party to the Agreement which applies this Regulation withdraws an approval it has previously granted, it shall forthwith so notify the other Contracting Parties applying this Regulation by means of a copy of the approval form bearing at the end, in large letters, the signed and dated annotation "APPROVAL WITHDRAWN".

## 11. Production definitively discontinued

If the holder of the approval completely ceases to manufacture a vehicle type approved in accordance with this Regulation, he shall so inform the authority which granted the approval. Upon receiving the relevant communication, that authority shall inform thereof the other Parties to the Agreement which apply this Regulation by means of a copy of the approval form bearing at the end, in large letters, the signed and dated annotation "PRODUCTION DISCONTINUED".

## 12. Names and addresses of technical services responsible for conducting approval tests, and of administrative departments

The Parties to the Agreement which apply this Regulation shall communicate to the United Nations Secretariat the names and addresses of the technical services responsible for conducting approval tests and of the administrative departments which grant approval and to which forms certifying approval or refusal, or extension or withdrawal of approval, issued in other countries, are to be sent.

## **Part II APPROVAL OF VEHICLES WITH REGARD TO THE INSTALLATION OF AN AECD OF AN APPROVED TYPE**

### **13. Definitions**

For the purposes of Part II of this Regulation:

- 13.1 "*Type of vehicle*" with regard to its AECD means vehicles that do not differ in such essential respects as:
- (a) Their manufacturer;
  - (b) The type of their AECD, or
  - (c) Vehicle features which significantly influence the performances of the AECD

- 13.4 “*Total permissible mass*” means the vehicle technically permissible maximum mass stated by the manufacturer.
- 13.5 “*R point*” means a reference point defined for each seat by the manufacturer in relation to the vehicle's structure, as indicated in Annex 6 to Regulation No.94
- 13.6 “*Triggering signal*” means a logic signal that requests MSD transmission.
- 13.7 “*MSD*” means a set of data as defined in Annex 11
- 13.8 “*AECS*” (Accident Emergency Call System) means an AECD when installed in a vehicle.
- 13.9 “*Multi-task display*” means a display on which more than one message can be shown simultaneously.
- 13.10 “*AECS information signal device*” means a device that provides information on the status of the emergency call transaction.
- 13.11 “*AECS warning signal device*” means a tell-tale that provides a failure indication of the AECD.

#### **14. Application for approval of a vehicle type equipped with an AECD which has been approved to Part I of this regulation**

- 14.1 The application for approval of a vehicle type equipped with an AECD shall be submitted by the holder of the trade name or mark or by his duly accredited representative.
- 14.2 A model of the information document is given in **Annex 2**.
- 14.3 For each vehicle type equipped with an AECD, the application shall be accompanied by samples of complete sets of vehicles **representative of the type to be approved**, in sufficient quantities for the tests prescribed by this regulation. Additional specimens may be called for at the request of the technical service responsible for conducting the test.

#### **15. Approval**

- 15.1 If the vehicle type submitted for approval pursuant to this Regulation meets the requirements of paragraph 15. below, approval of that vehicle type shall be granted.

Before granting approval for a vehicle type with regard to the installation of an AECD approved to Part I of this Regulation, the competent authority shall ensure that the verifications not being part of the Part I approval are included in the Part II approval. **If in this case, the power supply other than back-up power supply is not covered in Part I according to paragraph 7.6.2., this shall be tested to Annex 7 for this Part.**

Approval for a vehicle type with regard to the installation of an AECD shall be granted according to one of the approval procedures I and II described in Table 1<sup>3</sup>.

<sup>3</sup> Procedure II shall only apply to:

- the extension of type approvals to this Regulation, or

Approval procedure	General	HMI	Resistance to impact & Triggering signal emission	AECS functionality	HF Audio
Procedure I	16.1	Paragraph 16.3.	Paragraph 17.3.1. Paragraph 17.3.2.	Paragraph 17.5.	Paragraph 16.5.
Procedure II		Paragraph 16.4.	Paragraph 17.3.3		

Table 2: approval procedures

- 15.2 An approval number shall be assigned to each type approved. The first two digits (at present 00) shall indicate the series of amendments incorporating the most recent major technical amendments made to the Regulation at the time of issue of the approval. The same Contracting Party shall not assign the same number to another type of vehicle.
- 15.3 Notice of approval or of refusal, or of extension or withdrawal of approval, or of production definitively discontinued of a type of vehicle pursuant to this Regulation shall be communicated to the Parties to the Agreement which apply this Regulation by means of a form conforming to the model in annex 3 to this Regulation.
- 15.4 There shall be affixed, conspicuously and in a readily accessible place specified on the approval form, to every vehicle conforming to a vehicle type approved under this Regulation an international approval mark conforming to the model given in annex 2, consisting of:
- 15.4.1 A circle surrounding the letter “E” followed by the distinguishing number of the country which has granted approval;
- 15.4.2 The number of this Regulation, followed by the letter “R”, a dash and the approval number to the right of the circle prescribed in paragraph 15.4.1.
- 15.5 The approval mark shall be clearly legible and be indelible.

## 16. General requirements

- 16.1 General
- 16.1.1. The AECD installed in the vehicle shall be of a type approved under Part I of this Regulation.
- 16.1.2. The AECD shall be connected to the vehicle’s on-board electrical network, so that the AECD functions in all the required modes, and the backup battery (if fitted) is charged.
- 16.1.3. The installation of the AECD shall be such to obtain reception of the GNSS signal and access to a mobile telephone communication network. The applicant shall provide the relevant information with regard to the mobile network and GNSS to which the AECS is intended.

**The installation and orientation of the AECD and its components shall correspond to the AECD approval in a vehicle frontal impact configuration.**

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- vehicles already approved to Regulations Nos.94 or 95 prior the entry into force of this regulation

- 16.1.4 The AECS shall, upon receiving a trigger signal during the vehicle impact test described in this paragraph, ensure the AECS functionality described in paragraph 17.5 (verification of AECS functionality)
- 16.1.5 Vehicles of category M1 shall be subject to the following:
- 16.1.5.1. Vehicles of category M1 with a total permissible mass less or equal to 2,5 tons and R-point height at or below 700 mm:
- 16.1.5.1.1. Paragraphs 17.3.1. and 17.3.2., or paragraph 17.3.3
- 16.1.5.1.3. Paragraph 16.2.
- 16.1.5.2. Vehicles of category M1 with a total permissible mass less or equal to 2,5 tons and R-point height above 700 mm:
- 16.1.5.2.1. Paragraphs 17.3.1. or frontal impact provisions of paragraph 17.3.3.
- 16.1.5.2.3. Paragraph 16.2.
- 16.1.5.3. Vehicles of category M1 with a total permissible mass above 2,5 tons and R-point height less or equal to 700 mm:
- 16.1.5.3.1. Paragraph 17.3.2. or side impact provisions of paragraph 17.3.3.
- 16.1.5.3.3. Paragraph 16.2.
- 16.1.5.4. Vehicles of category M1 with a total permissible mass above 2,5 tons and R-point height above 700 mm: paragraph 17.4.
- 16.1.6. Vehicles of category N1 shall be subject to the following:
- 16.1.6.1. Vehicles of category N1 with a R-point height at or below 700 mm:
- 16.1.6.1.1. Paragraph 17.3.2 or side impact provisions of paragraph 17.3.3
- 16.1.6.1.3. Paragraph 16.2.
- 16.1.6.2. Vehicles of category N1 with a R-point height above 700 mm: paragraph 17.4.
- 16.1.7. A summary of the tests to be performed in function of the vehicle categories can be found in Annex 12
- 16.2. Position determination
- If the AECS is fitted, in accordance with paragraph 1.4. and not yet verified according to Part I of this Regulation, with GNSS receiver supporting at least three GNSS including GLONASS, Galileo and GPS, and is capable of reception and processing of SBAS signals, then the AECS shall comply with the requirements of paragraphs 17.2.1 to ~~7.2.10.~~ **7.2.11.**
- AECS compliance with respect to positioning capabilities shall be demonstrated by performing test methods described in Annex 8: Test methods for the navigation module.
- 16.3. AECS control
- 16.3.1. The AECS control shall be installed such to comply with the relevant requirements and transitional provisions of Regulation No.121, 01 series of amendments or any later series of amendments.
- 16.3.2. The AECS control shall be designed and/or placed in such a way that the risk of an inadvertent activation is reduced.
- 16.3.3. If the AECS control is embedded into a multi-task display, its operation shall be possible with two deliberate actions or less.
- 16.3.4. If the AECS control assessment is not part of the AECD approval per Part I of this regulation, the emergency call control functionality shall be subject to paragraph 17.5.

**16.3.5. Any switch which deactivates automatic AECD function shall be prohibited in the vehicle. However, for the purpose of maintenance and repair of the vehicle, a temporary deactivating function can be permitted, and AECD deactivation shall be permitted only according the manufacturer’s specific process/protocol.**

16.4. AECS information and warning signal

The following provisions are applicable if the AECS information and/or warning signal verification is not part of the approval of an AECD per Part I of this regulation and shall be verified by compliance with the provisions of paragraph 17.5.

16.4.1. The AECS information and/or warning signal shall be installed such to comply with the relevant installation requirements of Regulation No.121, 01 series of amendments or any later series of amendments.

16.4.2. The following information shall be provided regarding the status of the emergency call transaction when the AECS is automatically or manually activated:

- system is processing (ecall is triggered, connection is being set up, data transmission is in progress or completed, or voice call is in progress)
- transmission failed (connection failed or data transmission failed)

16.4.3. A warning signal shall be provided in case of AECD internal malfunction. Visual indication of the AECD malfunction shall be displayed while the failure is present. It may be cancelled temporarily, but shall be repeated whenever the ignition or the vehicle master control switch is being activated (whatever applicable).

16.4.3.1. The manufacturer shall provide a statement which explains the malfunction indication strategy of the AECS system.

The manufacturer shall provide the type-approval authority with an explanation and technical documentation which shows, in overall terms, how this is achieved. This documentation shall be maintained by the manufacturer and shall be made open for inspection by the technical service at the time of the type approval.

~~OPTION 1~~

This ~~should~~ **shall** at least cover the following items:

- ~~AECD control unit~~
- ~~network access device~~
- ~~GNSS receiver and antenna~~
- ~~connection to crash control unit (crash detection sensor system, triggering device)~~
- ~~Connection to the external mobile network antenna~~
- ~~Connection to the power supply~~
- ~~Connection to the external GNSS antenna~~

ITEM		Comments
Component	Failure type	
AECD Control Unit	Internal failure	Internal failure = e.g. hardware failure, watch-dog, software checksum, software image integrity, ...

ITEM		Comments
Component	Failure type	
Mobile network communication device	Electrical connection / module communication failure	A failure in the module can be detected by the absence of digital communication between the AECD control unit and the module.
Mobile network communication device	internal failure	Item necessary because it is a basic function: a failure implies that the AECS cannot perform its function.
GNSS receiver	Electrical connection / module communication failure	
GNSS receiver	Internal failure	
Mobile network communication antenna	Electrical connection	
GNSS antenna	Electrical connection	
Crash Control Unit	Electrical connection	e.g. crash detection sensor system, triggering device, ...
Crash Control Unit	Internal failure	<p>If not in good condition, then the automatic Ecall is not possible. <b>If CCU internal failure verification is not part of AECS approval (Part II), then it shall be subject to AECD approval (Part I).</b></p> <p><b>When the CCU is not part of the AECD, this requirement is deemed to be fulfilled if</b></p> <ul style="list-style-type: none"> <li>• the indication of a malfunction for an internal CCU failure is provided by the vehicle and</li> <li>• the warning strategy in respect to AECD is explained to the driver.</li> </ul>
Power supply	Electrical connection	<del>(in table 1: dedicated battery is connected)</del>
<del>Removable SIM</del>	<del>not present</del>	<del>Question whether the fixed SIM presence needs to be detected. In addition, communication is not part of the scope of the regulation. Conclusion: line to be revisited at next meeting. This item only applies if a removable SIM card is used.</del>
Dedicated battery	<del>Electrical connection/battery</del> lack of charge <b>The state of charge, threshold for warning at the discretion of the manufacturer</b>	<del>SOC is no failure, hence "lack" of charge. Failure if the state of charge is at a critical level according to the manufacturer below the necessary charge for the 5-60-5 test.</del>

Table 3: Template of information for self-test function

Verification of the performance of the ~~AECD~~ AECS malfunction shall be conducted against the manufacturer's specification. This can be either by actual test, simulation ~~or documentation~~

~~[OPTION 2~~

~~The manufacturer shall provide the technical authorities with documentation in accordance with Table 1, which shall contain the following information.~~

- (a) Which of the items listed are being monitored by the self-test function.
- (b) For each item that is being monitored: The technical principle applied to monitor the item.
- (c) For each item that is not being monitored: The technical reason why it is not feasible to monitor the item in the chosen system design.

ITEM		Comments
Component	Failure type	
AECD Control Unit	Internal failure	Internal failure = e.g. hardware failure, watch dog, software checksum, software image integrity, ...
Mobile network communication device	Electrical connection / module communication failure	A failure in the module can be detected by the absence of digital communication between the AECD control unit and the module.
Mobile network communication device	internal failure	Item necessary because it is a basic function: a failure implies that the AECS cannot perform its function.
GNSS receiver	Electrical connection / module communication failure	-
GNSS receiver	Internal failure	-
Mobile network communication antenna	Electrical connection	-
GNSS antenna	Electrical connection	-
Crash Control Unit	Electrical connection	e.g. crash detection sensor system, triggering device, ...
Crash Control Unit	Internal failure	If not in good condition, then the automatic Ecall is not possible. If CCU internal failure verification is not part of AECS approval (Part II), then it shall be subject to AECD approval (Part I).
Power supply	Electrical connection	(in table 1 : dedicated battery is connected)
Removable SIM	not present	Question whether the fixed SIM presence needs to be detected. In addition, communication is not part of the scope of the regulation. Conclusion: line to be revisited at next meeting. This item only applies if a removable SIM card is used.
Dedicated battery	Electrical connection/battery lack of charge	SOC is no failure, hence "lack" of charge. Failure if the state of charge is below the necessary charge for the 5-60-5 test.

Table 3: Template of information for self-test function

}

## 16.4.3.2. Test procedure

## Self-test function verification test



- 16.4.3.2.1. The following test shall be performed on a vehicle with an **AECS eCall** in-vehicle system installed or on a representative arrangement of components ~~for the approval of vehicles, components or separate technical units.~~
- 16.4.3.2.2. Simulate a malfunction of the **AECS eCall system** by introducing a critical failure in one or more of the items monitored by the self-test function according to the technical documentation provided by the manufacturer. The item(s) shall be selected at the discretion of the **Technical Service type approval authority.**
- 16.4.3.2.3. Power the **AECS eCall** system up (e.g. by switching the ignition 'on' or activating the vehicle's master control switch, as applicable) and verify that the **AECS warning signal device malfunction indicator** illuminates shortly afterwards.
- 16.4.3.2.4. Power the **AECS eCall system** down (e.g. by switching the ignition 'off' or deactivating the vehicle's master control switch, as applicable) and restore it to normal operation.
- 16.4.3.2.5. Power the **AECS eCall system** up and verify that the malfunction indicator does not illuminate or extinguishes shortly after illuminating initially.

#### 16.5. Hands-free audio performance

The AECS shall provide sufficient voice intelligibility for the vehicle driver.

Subject to paragraph 1.4a, this shall be demonstrated as follows:

Pre-crash voice intelligibility shall be demonstrated by proving compliance with ITU-T P.1140 06/15 in a vehicle prior to conducting any of the tests according to Regulations No.94 and No.95.

**AECS compliance shall be checked based on ITU-T P.1140 06/15 with the following additions to paras 8.8.1. and 8.8.3. of this ITU Standard:**

- a. **TCLw: TCLw should be at least 46 dB for all settings of the AGC which has to be verified by the manufacturer of the IVS system. During testing the maximum setting of the volume control cannot be reliably determined due to activated AGC. Therefore, the test is conducted with nominal system setting in quiet as described in chapter 8.8.1 of ITU-T P.1140 06/15.**
- b. **Echo performance with time variant echo path and speech: Note that for some vehicles, opening and closing the door may lead to unwanted acoustic warning signals during the measurement, which may impact the test. In such event the test is conducted by positioning a person on the co-driver's seat, who is quietly moving the inboard arm (e.g. left arm for left-hand drive vehicles) up and down during the measurement (according to Paragraph 8.8.3. of ITU-T P.1140 06/15).**

The compliance with ITU-T P.1140 shall apply as follow:

- Paragraphs XXX: shall not apply
- Paragraph YYY: 15dB instead of 6dB
- Etc...

Post-crash voice intelligibility shall be demonstrated either

- by compliance with certain (TBD) sections of P1140, or
- by subjective testing in accordance with paragraph 16.5.1 after performing tests according to Regulations No.94 and No.95.

#### 16.5.1 Testing languages

- 16.5.1.1 The languages used in the hands free audio performance intelligibility test shall be those of one of the Contracting Parties as identified in Annex 9 ~~and 10~~ to this Regulation, with the sentences being voiced in good pronunciation. The language used for the testing shall be noted in the test report.
- 16.5.1.2 The vehicle manufacturer shall demonstrate, through the use of documentation, compliance with all the other languages identified in Annex 9, appendix 1 to this Regulation. Any such documentation shall be appended to the test report.
- 16.5.1.3. In the case the vehicle type may be equipped with different variants of the AECS with regional specific adjustments, the manufacturer shall demonstrate through documentation that the requirements of this Regulation are fulfilled in all variants.
- 16.6. Verification of AECS power supply performance
- If the power supply performance is not covered by the AECD approval under Part I of this regulation, then the paragraphs below apply.
- 16.6.1. AECS is equipped with a back-up power supply
- 16.6.1.1. Before the impact test under Regulation No. 94 and/or Regulation No. 95 whichever relevant, the AECS shall be operable for a period of first not less than 5 minutes in voice communication mode followed by 60 minutes in call-back mode (idle mode, registered in a the network) and finally not less than 5 minutes in voice communication mode. This can be demonstrated by real (actual) test or by calculation/simulation.
- This shall be demonstrated by the manufacturer in all expected post-crash power supply conditions of these impact tests (**Regulation No. 94 and/or Regulation No. 95 whichever relevant R94/95**), taking into account the vehicle's power management strategy.
- 16.6.1.2. After the impact test under Regulation No. 94 and/or Regulation No. 95 whichever 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 10.
- 16.6.2. AECS is not equipped with a back-up power supply
- 16.6.2.1. The absence of back-up power supply shall be clearly indicated in the information document of Annex 5.
- 16.6.2.2. Before the impact test under Regulation No. 94 and/or Regulation No. 95 whichever relevant, the AECS shall be operable for a period of first not less than 5 minutes in voice communication mode followed by 60 minutes in call-back mode (idle mode, registered in a the network) and finally not less than 5 minutes in voice communication mode. This can be demonstrated by real (actual) test or by calculation/simulation.
- This shall be demonstrated by the manufacturer in all expected post-crash power supply conditions of these impact tests (R94/95), taking into account the vehicle's power management strategy.
- 16.6.2.3. After the impact test under Regulation No. 94 and/or Regulation No. 95 whichever 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 10~~ **Annex 9**.

## 17. Performance requirements

- 17.2. Position determination

- 17.2.1 The AECS shall be able to output the navigation solution in a NMEA-0183 protocol format (RMC, GGA, VTG, GSA and GSV message). The AECD setup for NMEA-0183 messages output to external devices shall be described in the operation manual.
- 17.2.2 The AECS shall be capable of receiving and processing individual GNSS signals of standard accuracy in L1/E1 band from at least three global navigation satellite systems, including GLONASS, GALILEO and GPS.
- 17.2.3 The AECS shall be capable of receiving and processing combined GNSS signals of standard accuracy in L1/E1 band from at least three global navigation satellite systems, including GLONASS, GALILEO, GPS and SBAS.
- 17.2.4 The AECS shall be able to provide positioning information in WGS-84 ~~and PZ-90~~ coordinate systems.
- 17.2.5 Horizontal position error shall not exceed:
- under open sky conditions: 15 m at confidence level 0.95 with Position Dilution of Precision (PDOP) in the range from 2.0 to 2.5;
  - in urban canyon conditions: 40 m at confidence level 0.95 with Position Dilution of Precision (PDOP) not less than 4.
- 17.2.6 The specified requirements for accuracy shall be provided:
- at speed range from 0 to [140] km/h;
  - linear acceleration range from 0 to [2] G.
- 17.2.7 Sensitivity at receiver input shall be:
- GNSS signals detection (cold start) do not exceed 3600 s at signal level on the antenna input of the ~~AECS AECD~~ of minus 144 dBm;
  - GNSS signals tracking and navigation solution calculation is available for at least 600 s at signal level on the antenna input of the ~~AECS AECD~~ of minus 155 dBm;
  - Re-acquisition of GNSS signals and calculation of the navigation solution is possible and does not exceed ~~20~~ 60 s at signal level on the antenna input of the ~~AECS AECD~~ of minus 150 dBm.
- 17.2.8 Cold start time to first fix shall not exceed
- 60 s for signal level down to minus 130 dBm
  - 300 s for signal level down to minus 140 dBm
- 17.2.9 GNSS signal re-acquisition time after block out of 60 s at signal level down to minus 130 dBm shall not exceed 20 s after recovery of the navigation satellite visibility.
- 17.2.10 **The GNSS receiver shall be able to obtain a position fix at least every second.**
- 17.2.11.** The testing procedures in Annex 8 can be performed either on the ~~AECS AECD unit~~ including post processing ability or directly on the GNSS receiver being a part of the ~~AECS AECD~~.
- 17.3 Verification of the trigger signal as well as the AECS after a vehicle impact test.
- Subject to the approval procedures defined in paragraph 15.1, the verification of the trigger signal as well as the AECS functionality per par. 17.5 shall be performed either
- 17.3.1 When performing a collision of the vehicle according to Regulation No.94 (frontal collision),

- 17.3.2 When performing a collision of the vehicle according to Regulation No.95 (lateral collision), or
- 17.3.3 Subject to Footnote 2 to par. 15.1, when demonstrating with existing documentation (report, images, simulation data or equivalent) that during a Regulation No.94 and Regulation No.95 test
- a triggering signal was generated
  - the installation of AECD is not adversely affected by the impact to the vehicle
- 17.4 For the purpose of paragraph 16.1.4.4 and paragraph 16.1.5.2 only, the manufacturer shall demonstrate with existing documentation (report, images, drawing or equivalent) that a triggering signal is available for the purpose of AECS.
- 17.5 Verification of AECS functionality (emission of Ecall, HMI functionality and MSD)  
The following items shall be verified according to the test procedures of Annex 9 or Annex 10 of this regulation as appropriate:
- Antennas,
  - power supply,
  - microphone and
  - speaker
- 17.5.1 Activation of automatic call
- 17.5.2 When relevant to complete the test procedures per Annex 9 or 10, manual emergency call control operation
- 17.5.3 Information signal generation
- 17.5.4 Recording, content and emission of Minimum Set of Data (MSD)
- 17.5.5. Voice communication

## **18. Modifications and extension of approval of a vehicle type equipped with an AECD which has been approved to Part I of this regulation**

- 18.1 Every modification of the vehicle type shall be notified to the administrative department which approved the vehicle type. The department may then either:
- 18.1.1 Consider that the modifications made are unlikely to have an appreciable adverse effect, and that in any case the vehicle still complies with the requirements; or
- 18.1.2 Require a further test report from the technical service responsible for conducting the tests.
- 18.2 Notice of the confirmation of approval, specifying the alterations made, or refusal shall be communicated to the Parties to the Agreement applying this Regulation by means of a form conforming to the model in annex 2 to this Regulation.
- 18.3 The competent authority issuing the extension of approval shall assign a series number to each communication form drawn up for such extension.

## **19. Conformity of production**

- 19.1 The conformity of production procedure shall comply with the requirements set out in the Agreement, Appendix 2 (E/ECE/324 E/ECE/TRANS/505/Rev.2).

- 19.2 Every vehicle approved under this Regulation shall be so manufactured as to conform to the type approved by meeting the requirements set out in paragraph 16 above.

## **20. Penalties for non-conformity of production**

- 20.1 The approval granted in respect of a vehicle type pursuant to this Regulation may be withdrawn if the requirement laid down in paragraph 19.1 above is not complied with or if the vehicle fails to pass the checks prescribed in paragraph 19.2 above.
- 20.2 If a Party to the Agreement which applies this Regulation withdraws an approval it has previously granted, it shall forthwith so notify the other Contracting Parties applying this Regulation by means of a copy of the approval form bearing at the end, in large letters, the signed and dated annotation "APPROVAL WITHDRAWN".

## **21. Production definitively discontinued**

If the holder of the approval completely ceases to manufacture a vehicle type approved in accordance with this Regulation, he or she shall so inform the authority which granted the approval. Upon receiving the relevant communication, that authority shall inform thereof the other Parties to the Agreement which apply this Regulation by means of a copy of the approval form bearing at the end, in large letters, the signed and dated annotation "PRODUCTION DISCONTINUED".

## **22. Names and addresses of technical services responsible for conducting approval tests, and of administrative departments**

The Parties to the Agreement which apply this Regulation shall communicate to the United Nations Secretariat the names and addresses of the technical services responsible for conducting approval tests and of the administrative departments which grant approval and to which forms certifying approval or refusal, or extension or withdrawal of approval, issued in other countries, are to be sent.

## **Part III APPROVAL OF VEHICLES WITH REGARD TO THEIR AECS OR EQUIPPED WITH AN AECD WHICH HAS NOT BEEN SEPARATELY APPROVED ACCORDING TO PART I OF THIS REGULATION**

### **23. Definitions**

For the purposes of Part III of this Regulation:

- 23.1. "Type of vehicle" with regard to its AECD means vehicles that do not differ in such essential respects as:
- (a) Their manufacturer;
  - (b) The type of their AECD, or
  - (c) Vehicle features which significantly influence the performances of the AECD

- 23.2. “AECS” (Accident Emergency Call System) means
- an AECD when installed in a vehicle, or
  - an AECD fully integrated to the vehicle [electrical and data networks], such that its components cannot be separately tested.

23.3. “Multi-task display” means a display on which more than one message can be shown simultaneously.

## **24. Application for approval of a vehicle type equipped with an AECS**

24.1 The application for approval of a type of vehicle equipped with an AECS shall be submitted by the holder of the trade name or mark or by his duly accredited representative.

24.2 A model of the information document is given in Annex 3.

24.3 For each vehicle type equipped with an AECS, the application shall be accompanied by samples of complete sets of vehicles representative of the type to be approved, in sufficient quantities for the tests prescribed by this regulation. Additional specimens may be called for at the request of the technical service responsible for conducting the test.

## **25. Approval**

25.1 If the vehicle type submitted for approval in accordance with paragraph 22 above meets the requirements of paragraph 24 of this Regulation, approval shall be granted.

25.2. An approval number shall be assigned to each type approved. The first two digits (at present 00) shall indicate the series of amendments incorporating the most recent major technical amendments made to the Regulation at the time of issue of the approval. The same Contracting Party shall not assign the same number to another type of vehicle.

25.3 Notice of approval or of refusal, or of extension or withdrawal of approval, or of production definitively discontinued of a type of vehicle pursuant to this Regulation shall be communicated to the Parties to the Agreement which apply this Regulation by means of a form conforming to the model in annex 3 to this Regulation.

25.4 There shall be affixed, conspicuously and in a readily accessible place specified on the approval form, to every vehicle conforming to a vehicle type approved under this Regulation, an international approval mark conforming to the model given in annex 3, consisting of:

25.4.1 A circle surrounding the letter “E” followed by the distinguishing number of the country which has granted approval;

25.4.2 The number of this Regulation, followed by the letter “R”, a dash and the approval number to the right of the circle prescribed in paragraph 14.4.1.

25.5 The approval mark shall be clearly legible and be indelible.

## **26. Requirements**

26.1 General

26.1.1. The AECD installed in the vehicle shall not be of a type approved under Part I of this Regulation, or shall be fully integrated per paragraph 23.2.

- 26.1.2. In case of an AECD, it shall be connected to the vehicle's on-board electrical network, so that the AECD functions in all the required modes, and the backup battery (if fitted) is charged. In case of a fully integrated AECS, it shall be such that it functions in all the required modes, and the backup battery (if fitted) is charged.
- 26.1.3. The AECS, or the installation of the AECD when relevant, shall be such to obtain reception of the GNSS signal and access to a mobile telephone communication network.  
The applicant shall provide the relevant information with regard to the mobile network and GNSS to which the AECS is intended.
- 26.1.4. Vehicles of category M1 shall be subject to the following:
- 26.1.4.1. Vehicles of category M1 with a total permissible mass less or equal to 2,5 tons and R-point height at or below 700 mm:
- 26.1.4.1.1. Paragraphs 17.3.1. and 17.3.2., or paragraph 17.3.3
- 26.1.4.1.2. Paragraph 16.2.
- 26.1.4.2. Vehicles of category M1 with a total permissible mass less or equal to 2,5 tons and R-point height above 700 mm:
- 26.1.4.2.1. Paragraphs 17.3.1. or frontal impact provisions of paragraph 17.3.3.
- 26.1.4.2.2. Paragraph 16.2.
- 26.1.4.3. Vehicles of category M1 with a total permissible mass above 2,5 tons and R-point height less or equal to 700 mm:
- 26.1.4.3.1. Paragraph 17.3.2. or side impact provisions of paragraph 17.3.3.
- 26.1.4.3.2. Paragraph 16.2.
- 26.1.4.4. Vehicles of category M1 with a total permissible mass above 2,5 tons and R-point height above 700 mm: paragraph 17.4.
- 26.1.5. Vehicles of category N1 shall be subject to the following:
- 26.1.5.1. Vehicles of category N1 with a R-point height at or below 700 mm:
- 26.1.5.1.1. Paragraph 17.3.2 or side impact provisions of paragraph 17.3.3
- 26.1.5.1.2. Paragraph 16.2.
- 26.1.5.2. Vehicles of category N1 with a R-point height above 700 mm: paragraph 17.4.
- 26.1.6. A summary of the tests to be performed in function of the vehicle categories can be found in Annex ~~12~~ 13
- 26.2. AECS control  
When the vehicle is fitted with an AECS control, the AECS control shall fulfil the requirements of paragraphs 16.3.1. to 16.3.3.
- 26.2.1. The AECS control shall be installed such to comply with the relevant installation requirements of Regulation No.121.
- 26.2.2. The AECS control shall be designed and/or placed in such a way that the risk of an inadvertent activation is reduced.
- 26.2.3. If the AECS control is embedded into a multi-task display, its operation shall be possible with two deliberate actions or less.
- 26.2.4. The emergency call control functionality shall be subject to paragraph 17.5.
- 26.3. AECS information and warning signal

The following provisions shall be verified by compliance with the provisions of paragraph 17.5.

- 26.3.1. The AECS information and/or warning signal shall be installed such to comply with the relevant installation requirements of Regulation No.121., 01 series of amendments or any later series of amendments.
- 26.3.2. The following information shall be provided regarding the status of the emergency call transaction when the AECS is automatically or manually activated:
  - system is processing (ecall is triggered, connection is being set up, data transmission is in progress or completed, or voice call is in progress)
  - transmission failed (connection failed or data transmission failed)
- 26.3.3. A warning signal shall be provided in case of AECD internal malfunction. Visual indication of the AECD malfunction shall be displayed while the failure is present. It may be cancelled temporarily, but shall be repeated whenever the ignition or the vehicle master control switch is activated (whatever applicable).
- 26.3.3.1. The manufacturer shall provide a statement which explains the malfunction indication strategy of the AECS system.

~~[OPTION 1~~

The manufacturer shall provide the type-approval authority with an explanation and technical documentation which shows, in overall terms, how this is achieved. This documentation shall be maintained by the manufacturer and shall be made open for inspection by the technical service at the time of the type approval.

This should at least cover the following items:

- ~~AECD control unit~~
- ~~network access device~~
- ~~GNSS receiver and antenna~~
- ~~connection to crash control unit (crash detection sensor system, triggering device)~~
- ~~Connection to the external mobile network antenna~~
- ~~Connection to the power supply~~
- ~~Connection to the external GNSS antenna~~

ITEM		Comments
Component	Failure type	
AECD Control Unit	Internal failure	Internal failure = e.g. hardware failure, watch-dog, software checksum, software image integrity, ...
Mobile network communication device	Electrical connection / module communication failure	A failure in the module can be detected by the absence of digital communication between the AECD control unit and the module.
Mobile network communication device	internal failure	Item necessary because it is a basic function: a failure implies that the AECS cannot perform its function.



ITEM		Comments
Component	Failure type	
GNSS receiver	Electrical connection / module communication failure	GNSS approval optional in this regulation
GNSS receiver	Internal failure	GNSS approval optional in this regulation
Mobile network communication antenna	Electrical connection	
GNSS antenna	Electrical connection	GNSS approval optional in this regulation
Crash Control Unit	Electrical connection	e.g. crash detection sensor system, triggering device, ...
Crash Control Unit	Internal failure	If not in good condition, then the automatic Ecall is not possible. If CCU internal failure verification is not part of AECS approval (Part II), then it must be subject to AECD approval (Part I)
Power supply	Electrical connection	(in table 1 : dedicated battery is connected)
Removable SIM	not present	Question whether the fixed SIM presence needs to be detected. In addition, communication is not part of the scope of the regulation. Conclusion: line to be revisited at next meeting.
Dedicated battery	<del>Electrical connection/battery</del> lack of charge The state of charge, threshold for warning at the discretion of the manufacturer	SOC is no failure, hence "lack" of charge. Failure if the state of charge is at a critical level according to the manufacturer below the necessary charge for the 5-60-5 test.

**Table 4: Template of information for self-test function**

Verification of the performance of the AECD malfunction shall be conducted against the manufacturer's specification. This can be either by actual test **or** simulation}

{OPTION 2

~~—————The manufacturer shall provide the technical authorities with documentation in accordance with Table 1, which shall contain the following information.~~

- ~~(a) Which of the items listed are being monitored by the self test function.~~
- ~~(b) For each item that is being monitored: The technical principle applied to monitor the item.~~
- ~~(c) For each item that is not being monitored: The technical reason why it is not feasible to monitor the item in the chosen system design.~~

ITEM		Comments
Component	Failure type	
AECD Control Unit	Internal failure	Internal failure = e.g. hardware failure, watch dog, software checksum, software image integrity, ...
Mobile network communication device	Electrical connection / module communication failure	A failure in the module can be detected by the absence of digital communication between the AECD control unit and the module.
Mobile network communication device	internal failure	Item necessary because it is a basic function: a failure implies that the AECS cannot perform its function.
GNSS receiver	Electrical connection / module communication failure	-
GNSS receiver	Internal failure	-
Mobile network communication antenna	Electrical connection	-
GNSS antenna	Electrical connection	-
Crash Control Unit	Electrical connection	e.g. crash detection sensor system, triggering device, ...
Crash Control Unit	Internal failure	If not in good condition, then the automatic Ecall is not possible.
Power supply	Electrical connection	(in table 1 : dedicated battery is connected)
Removable SIM	not present	Question whether the fixed SIM presence needs to be detected. In addition, communication is not part of the scope of the regulation. Conclusion: line to be revisited at next meeting.
Dedicated battery	Electrical connection/battery lack of charge	SOC is no failure, hence "lack" of charge. Failure if the state of charge is below the necessary charge for the 5-60-5 test.

Table 4: Template of information for self-test function

]

### 26.3.3.2. Test procedure

Self-test function verification test

26.3.3.2.1. The following test shall be performed on ~~a vehicle with an AECD eCall in-vehicle system installed or~~ on a representative arrangement of components for the approval of vehicles, components or separate technical units.

26.3.3.2.2. Simulate a malfunction of the AECD eCall system by introducing a critical failure in one or more of the items monitored by the self-test function according to the technical documentation provided by the manufacturer. The item(s) shall be selected at the discretion of the **Technical Service type** approval authority.

26.3.3.2.3. Power the AECD eCall system up (e.g. by switching the ignition 'on' or activating the vehicle's master control switch, as applicable) and verify that the

**AECD warning signal device malfunction indicator illuminates shortly afterwards or the electrical signal is generated shortly afterward, whichever is relevant.**

- 26.3.3.2.4.** Power the **AECD eCall system** down (e.g. by switching the ignition 'off' or deactivating the vehicle's master control switch, as applicable) and restore it to normal operation.
- 26.3.3.2.5.** Power the **AECD eCall system** up and verify that the **AECD warning signal device malfunction indicator** does not illuminate or extinguishes shortly after illuminating initially, **or the electrical signal is not generated shortly afterward or is cancelled after being generated initially, whichever is relevant.**
- 26.4. The AECS shall properly function after the vehicle has suffered a serious road accident. This shall be verified by compliance with the provisions of paragraph 17.5.
- 26.5. Hands-free audio performance

The AECS shall provide sufficient voice intelligibility for the vehicle driver. Subject to paragraph 1.4a, this can be demonstrated by proving compliance with [ITU-T Recommendation P.1140] in a vehicle prior to conducting any of the tests according to Regulations No.94 and No.95. In addition, subjective testing in accordance with paragraph 16.5.1 shall be conducted after performing tests according to Regulations No.94 and No.95. as follows:

**Pre-crash voice intelligibility shall be demonstrated by proving compliance with ITU-T P.1140 06/15 in a vehicle prior to conducting any of the tests according to Regulations No.94 and No.95.**

**AECS compliance shall be checked based on ITU-T P.1140 06/15 with the following additions to paras 8.8.1. and 8.8.3. of this ITU Standard:**

- a. **TCLw: TCLw should be at least 46 dB for all settings of the AGC which has to be verified by the manufacturer of the IVS system. During testing the maximum setting of the volume control cannot be reliably determined due to activated AGC. Therefore, the test is conducted with nominal system setting in quiet as described in chapter 8.8.1 of ITU-T P.1140 06/15.**
- b. **Echo performance with time variant echo path and speech: Note that for some vehicles, opening and closing the door may lead to unwanted acoustic warning signals during the measurement, which may impact the test. In such event the test is conducted by positioning a person on the co-driver's seat, who is quietly moving the inboard arm (e.g. left arm for left-hand drive vehicles) up and down during the measurement (according to Paragraph 8.8.3. of ITU-T P.1140 06/15).**

Post-crash voice intelligibility shall be demonstrated either

- o by compliance with certain (TBD) sections of P1140, or
- o by subjective testing in accordance with paragraph 16.5.1 after performing tests according to Regulations No.94 and No.95.

- 26.5.1 Testing languages
- 26.5.1.1 The languages used in the hands free audio performance intelligibility test shall be those of one of the Contracting Parties as identified in Annex 9 and 10 to this Regulation, with the sentences being voiced in good pronunciation. The language used for the testing shall be noted in the test report.

- 26.5.1.2 The vehicle manufacturer shall demonstrate, through the use of documentation, compliance with all the other languages identified in Annex 9, appendix 1 to this Regulation. Any such documentation shall be appended to the test report.
- 26.5.1.3 In the case the vehicle type may be equipped with different variants of the AECS with regional specific adjustments, the manufacturer shall demonstrate through documentation that the requirements of this Regulation are fulfilled in all variants.

26.6. Verification of AECS power supply performance

26.6.1. AECS is equipped with a back-up power supply

- 26.6.1.1. Before the impact test under Regulation No. 94 and/or Regulation No. 95 whichever relevant, the AECS shall be operable for a period of first not less than 5 minutes in voice communication mode followed by 60 minutes in call-back mode (idle mode, registered in a the network) and finally not less than 5 minutes in voice communication mode. This can be demonstrated by real (actual) test or by calculation/simulation.

**This shall be demonstrated by the manufacturer in all expected post-crash power supply conditions of these impact tests (Regulation No. 94 and/or Regulation No. 95 whichever relevant), taking into account the vehicle's power management strategy.**

- 26.6.1.2. After the impact test under Regulation No. 94 and/or Regulation No. 95 whichever 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 10~~ **Annex 9**.

26.6.2. AECS is not equipped with a back-up power supply

- 26.6.2.1. The absence of back-up power supply shall be clearly indicated in the information document of Annex 4.

- 26.6.2.2. Before the impact test under Regulation No. 94 and/or Regulation No. 95 whichever relevant, the AECS shall be operable for a period of first not less than 5 minutes in voice communication mode followed by 60 minutes in call-back mode (idle mode, registered in a the network) and finally not less than 5 minutes in voice communication mode. This can be demonstrated by real (actual) test or by calculation/simulation.

This shall be demonstrated by the manufacturer in all expected post-crash power supply conditions, taking into account the vehicle's power management strategy.

- 26.6.2.3. After the impact test under Regulation No. 94 and/or Regulation No. 95 whichever 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 10~~ **Annex 9**.

**27. Modifications and extension of approval of a vehicle type equipped with an AECS**

- 27.1 Every modification of the vehicle type shall be notified to the administrative department which approved the vehicle type. The department may then either:

- 27.1.1 Consider that the modifications made are unlikely to have an appreciable adverse effect, and that in any case the vehicle still complies with the requirements; or
- 27.1.2 Require a further test report from the technical service responsible for conducting the tests.

- 27.2 Notice of the confirmation of approval, specifying the alterations made, or refusal shall be communicated to the Parties to the Agreement applying this

Regulation by means of a form conforming to the model in annex 3 to this Regulation.

- 27.3 The competent authority issuing the extension of approval shall assign a series number to each communication form drawn up for such extension.

## **28. Conformity of production**

- 28.1 The conformity of production procedure shall comply with the requirements set out in the Agreement, Appendix 2 (E/ECE/324 E/ECE/TRANS/505/Rev.2).

- 28.2 Every vehicle approved under this Regulation shall be so manufactured as to conform to the type approved by meeting the requirements set out in paragraph 26 above.

## **29. Penalties for non-conformity of production**

- 29.1 The approval granted in respect of a vehicle type pursuant to this Regulation may be withdrawn if the requirement laid down in paragraph 28.1 above is not complied with or if the vehicle fails to pass the checks prescribed in paragraph 28.2 above.

- 29.2 If a Party to the Agreement which applies this Regulation withdraws an approval it has previously granted, it shall forthwith so notify the other Contracting Parties applying this Regulation by means of a copy of the approval form bearing at the end, in large letters, the signed and dated annotation "APPROVAL WITHDRAWN".

## **30. Production definitively discontinued**

If the holder of the approval completely ceases to manufacture a vehicle type approved in accordance with this Regulation, he or she shall so inform the authority which granted the approval. Upon receiving the relevant communication, that authority shall inform thereof the other Parties to the Agreement which apply this Regulation by means of a copy of the approval form bearing at the end, in large letters, the signed and dated annotation "PRODUCTION DISCONTINUED".

## **31. Names and addresses of technical services responsible for conducting approval tests, and of administrative departments**

The Parties to the Agreement which apply this Regulation shall communicate to the United Nations Secretariat the names and addresses of the technical services responsible for conducting approval tests and of the administrative departments which grant approval and to which forms certifying approval or refusal, or extension or withdrawal of approval, issued in other countries, are to be sent.

# Annex 1

## Communication

(Maximum format: A4 (210 x 297 mm))



issued by :

Name of administration:

.....  
 .....  
 .....

4

- concerning<sup>5</sup>: Approval granted  
                     Approval extended  
                     Approval refused  
                     Approval withdrawn  
                     Production definitively discontinued

of a type of AECD intended to be fitted to vehicles of categories M1 and N1 pursuant Part I to Regulation No. AECS

Approval No..... Extension No. ....

1. Trade name or mark of device: .....
2. Manufacturer's name for the type of device: .....
3. Manufacturer's name and address:.....
4. If applicable, name and address of manufacturer's representative: .....
5. Submitted for approval on: .....
6. Technical Service responsible for conducting approval tests: .....
7. Date of report issued by that Service .....
8. Number of report issued by that Service.....
9. Brief description .....
- AECD information and warning signal: yes/no.....
- Hands-free audio equipment (micros and speakers) : yes/no .....
- Back-up power supply: yes/no.....
- Network access device antenna: yes/no .....
- GNSS antenna: yes/no .....
- GNSS receiver: yes/no .....
10. Component was tested according to the sled test of Annex-4 7 (components necessary for sending the MSD are by default tested to Annex-4 7 –TCU, back-up power supply, AECD information signal, GNSS antenna when internal to TCU, GNSS receiver when internal to the TCU):
- AECD warning signal: yes/no.....
- Hands-free audio equipment (micros and speakers): yes/no .....
- Power supply other than back-up battery: yes/no.....
- GNSS antenna (when external to the TCU): yes/no .....

<sup>1</sup> Distinguishing number of the country which has granted/extended/refused/withdrawn approval (see approval provisions in the Regulations).

<sup>5</sup> Strike out what does not apply.

GNSS receiver (when external to the TCU): yes/no .....

11. Position of the approval mark: .....
12. Reason(s) for extension (if applicable): .....
13. Approval granted/refused/extended/withdrawn<sup>2</sup>:
14. Place:.....
15. Date:.....
16. Signature: .....
17. The list of documents deposited with the Type Approval Authority which has granted approval is annexed to this communication and may be obtained on request.

## Annex 2

### Communication

(Maximum format: A4 (210 x 297 mm))



issued by :

Name of administration:

.....  
 .....  
 .....

6

concerning<sup>7</sup>: Approval granted

Approval extended

Approval refused

Approval withdrawn

Production definitively discontinued

of a type of vehicle of category M1 or N1 pursuant Part II of Regulation No. AECS, fitted with an AECD approved pursuant to Part I of Regulation No. AECS

Approval No..... Extension No. ....

1. Trade name or mark of device: .....
2. Manufacturer's name for the type of device: .....
3. Manufacturer's name and address:.....
4. If applicable, name and address of manufacturer's representative: .....
5. Submitted for approval on: .....
6. Technical Service responsible for conducting approval tests: .....
7. Date of report issued by that Service .....
8. Number of report issued by that Service .....
9. Brief description .....
- AECD information and warning signal: yes/no.....
10. Position of the approval mark: .....
11. Reason(s) for extension (if applicable): .....
12. Approval granted/refused/extended/withdrawn<sup>2</sup>:
13. Place:.....
14. Date:.....
15. Signature: .....
16. The list of documents deposited with the Type Approval Authority which has granted approval is annexed to this communication and may be obtained on request.

<sup>1</sup> Distinguishing number of the country which has granted/extended/refused/withdrawn approval (see approval provisions in the Regulations).

<sup>7</sup> Strike out what does not apply.



### Annex 3

## Communication

(Maximum format: A4 (210 x 297 mm))



issued by :

Name of administration:

.....  
 .....  
 .....

8

- concerning<sup>9</sup>: Approval granted  
                             Approval extended  
                             Approval refused  
                             Approval withdrawn  
                             Production definitively discontinued

of a type of vehicle of category M1 or N1 approved pursuant Part III of Regulation No. AECS.

Approval No..... Extension No. ....

1. Trade name or mark of device: .....
2. Manufacturer's name for the type of device: .....
3. Manufacturer's name and address:.....
4. If applicable, name and address of manufacturer's representative: .....
5. Submitted for approval on: .....
6. Technical Service responsible for conducting approval tests: .....
7. Date of report issued by that Service .....
8. Number of report issued by that Service .....
9. Brief description .....
10. Position of the approval mark: .....
11. Reason(s) for extension (if applicable): .....
12. Approval granted/refused/extended/withdrawn<sup>2</sup>:
13. Place:.....
14. Date:.....
15. Signature: .....
16. The list of documents deposited with the Type Approval Authority which has granted approval is annexed to this communication and may be obtained on request.

<sup>1</sup> Distinguishing number of the country which has granted/extended/refused/withdrawn approval (see approval provisions in the Regulations).

<sup>9</sup> Strike out what does not apply.

## Annex 4

### Information document relating to the type approval of an emergency call device (AECD)

The following information, if applicable, shall be supplied in triplicate and shall include a list of contents.

Any drawings shall be supplied in appropriate scale and in sufficient detail on size A4 paper or on a folder of A4 format.

Photographs, if any, shall show sufficient detail.

1. Make (trade name of manufacturer):.....
2. Type and general commercial description(s): .....
3. Means of identification of type, if marked on the device:.....
4. Name and address of manufacturer:.....
5. Location of and method of affixing the approval mark: .....
6. Address(es) of assembly plant(s): .....
7. Arrangement (indicate components covered by the application of this type approval): .....
8. Description of method(s) of attachment to the vehicle (if applicable, dimensions, structure and materials of the attachments and supports of the device): .....
9. Sufficiently detailed drawings to identify the complete device, including installation instructions (for aftermarket devices only); the position for the type-approval mark must be indicated on the drawings: .....
- 10. Back-up power supply: yes/no.....**
- 11. Internal crash control unit: yes/no.....**

## Annex 5

### **Information document relating to the type approval of a vehicle with regard to the installation of emergency call devices**

The following information, if applicable, shall be supplied in triplicate and shall include a list of contents.

Any drawings shall be supplied in appropriate scale and in sufficient detail on size A4 paper or on a folder of A4 format.

Photographs, if any, shall show sufficient detail.

#### General

1. Make (trade name of manufacturer): .....
2. Type and general commercial description(s): .....
3. Means of identification of type, if marked on the vehicle: .....
4. Location of the marking: .....
5. Location of and method of affixing the approval mark: .....
6. Category of vehicle: .....
7. Name and address of manufacturer: .....
8. Address(es) of assembly plant(s): .....
9. Photograph(s) and/or drawing(s) of a representative vehicle: .....
10. E-call device/system
  - 10.1 Make (trade name of manufacturer): .....
  - 10.2 Type and general commercial description(s): .....
  - 10.3 Arrangement (indicate components included in delivery): .....
  - 10.4 Description of means of automatic transmission of information about the accident (if fitted): .....
  - 10.5 Description of method(s) of attachment to the vehicle: .....
  - 10.6 Drawing(s) showing the position of the e-call device/system: .....
11. Approval procedure (I, II) .....
12. **Internal crash control unit: yes/no.....**

**Annex 6**

**Information document relating to the type approval of a vehicle with regard to AECS**

The following information, if applicable, shall be supplied in triplicate and shall include a list of contents.

Any drawings shall be supplied in appropriate scale and in sufficient detail on size A4 paper or on a folder of A4 format.

Photographs, if any, shall show sufficient detail.

General

- 1. Make (trade name of manufacturer): .....
- 2. Type and general commercial description(s): .....
- 3. Means of identification of type, if marked on the vehicle: .....
- 4. Location of the marking: .....
- 5. Location of and method of affixing the approval mark: .....
- 6. Category of vehicle: .....
- 7. Name and address of manufacturer: .....
- 8. Address(es) of assembly plant(s): .....
- 9. Photograph(s) and/or drawing(s) of a representative vehicle: .....
- 10. E-call device/system
- 10.1 Make (trade name of manufacturer): .....
- 10.2 Type and general commercial description(s): .....
- 10.3 Arrangement (indicate components included in delivery): .....
- 10.4 Description of means of automatic transmission of information about the accident (if fitted): .....

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## Annex 7

### Test method for resistance to mechanical impact (paragraphs 7.6. and 17.3.)

1. Purpose  
The purpose of this test is to verify the safety performance of the representative AECD installation under inertial loads which may occur during a vehicle crash.
2. Installation
  - 2.1. This test shall be conducted in a worst case configuration either with the mandatory components listed in paragraph 7.6.1., or, at the request of the manufacturer, in addition with the components listed under paragraph 7.6.2.
  - 2.2. The tested ~~device~~ **devices** shall be connected to the test fixture only by the intended mountings provided for the purpose of attaching the representative AECD installation. **If the intended mountings of the power supply are specifically designed to break in order to release the power supply in an impact event, they shall not be included in the test. The technical service shall verify that such release in a real-life high-severity crash event shall not impair the functionality of the system (e.g. no disconnection from the power supply).**
3. Procedures
  - 3.1. General test conditions and requirements  
The following condition shall apply to the test:
    - (a) The test shall be conducted at an ambient temperature of  $20 \pm 10$  °C,
    - (b) At the beginning of the test, the power supply shall be charged at the level recommended by the manufacturer;
    - (c) At the beginning of the test, all protection devices which affect the function of the tested-device and which are relevant to the outcome of the test, shall be operational.
  - 3.2. Test procedure  
The sled with the AECD components shall be decelerated or accelerated such that the curve remains within the area of the graph in Table 1 of this Annex, and the total velocity change  $\Delta V$  is maximum 70 [+0/-2km/h]. However if, with the agreement of the applicant, the test was performed at a higher acceleration or deceleration level, a higher  $\Delta V$  and/or longer duration the test shall be considered satisfactory.  
  
The position and orientation of the components on the sled shall correspond to the installation recommendations of the manufacturer and shall be indicated in the communication document of Annex 1, paragraph 10.

Figure 1  
Generic description of test pulses

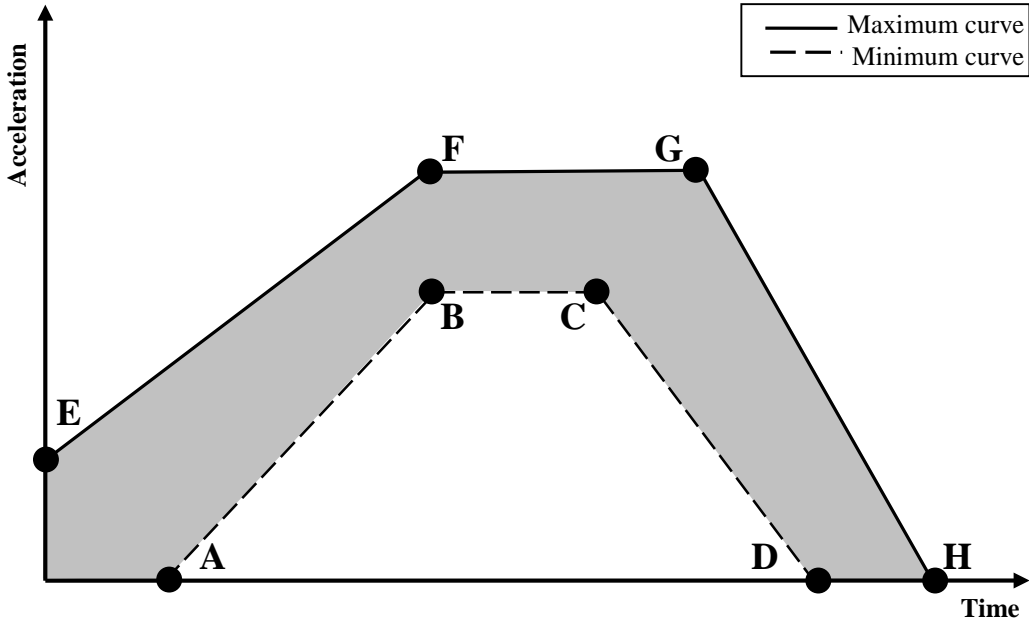


Table 1 for M<sub>1</sub> and N<sub>1</sub> vehicles:

Point	Time (ms)	Acceleration (g)
A	10	0
B	34	65
C	38	65
D	46	0
E	0	16
F	25	77
G	47	77
H	60	0

## Annex 8

### Test methods for the navigation solutions (paragraphs 7.2 and 17.2)

The purpose of the tests in this Annex is to verify the compliance of navigation characteristics of the AECD/AECS calculated by its GNSS receiver ~~navigation module~~, to the requirements defined in sections 7.2 and 17.2. of this Regulation.

#### 1. Definitions

For the purposes of this Annex:

- 1.1 “*Global Navigation Satellite System (GNSS)*” means a satellite based system that is used to pinpoint the location, speed and time of a user's receiver in any point of the Earth surface, water areas, air space, and in the near-Earth space environment.
- 1.2 “*Cold*” *start mode*” means the condition of the GNSS receiver when position, velocity, time, almanac and ephemeris data are not stored in the receiver, and therefore the navigation solution is to be calculated by means of a full sky search;

#### 2. Test conditions

- 2.1 The test object is the AECD/AECS, which includes a ~~GNSS navigation~~ receiver and a GNSS antenna, specifying navigation characteristics and features of the tested system.
- 2.1.1 The number of the AECD/AECS test samples shall be at least 3 pieces **and the testing can be performed in parallel.**
- 2.1.2 The AECD/AECS is provided for the test with the installed SIM-card, operation manual and the software (provided on electronic media).
- 2.1.3 The attached documents shall contain the following data:
- device serial number;
  - hardware version;
  - software version;
  - device provider identification number ;
  - the relevant technical documentation to perform the tests.
- 2.1.4. Tests are carried out in normal climatic conditions in accordance with standard ISO 16750-1:2006:
- air temperature  $(23 \pm 5)$  °C and
  - relative air humidity of 25 % to 75 %.
- 2.1.5. Tests of the AECD/AECS in respect of its ~~GNSS navigation~~ receiver shall be performed with test and auxiliary equipment specified in Table 4.

Table 4 – Recommended list of measurement instruments, test and auxiliary equipment

Equipment name	Required technical characteristics of test equipment	
	Scale range	Scale accuracy

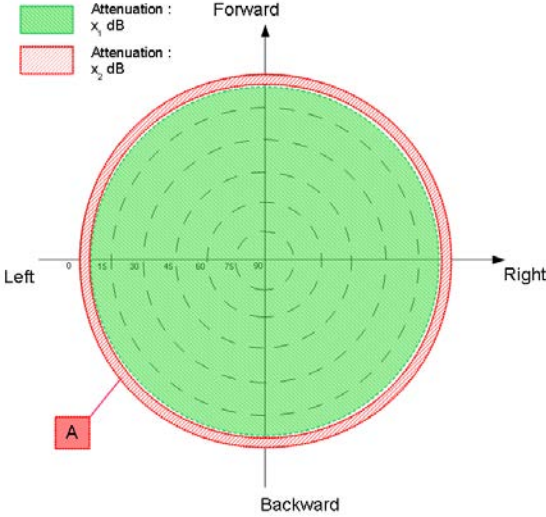
Equipment name	Required technical characteristics of test equipment	
	Scale range	Scale accuracy
Global navigation satellite system simulator of GLONASS, Galileo and GPS signals	Number of simulated signals: at least 18	Mean square deviation of random accuracy component of pseudo-range to GLONASS / Galileo / GPS satellites not more: <ul style="list-style-type: none"> <li>- <i>stadiometric code phase: 0,1 m;</i></li> <li>- <i>communication carrier phase: 0,001 m;</i></li> <li>- <i>pseudovelocity: 0,005 m/s.</i></li> </ul>
Digital stopwatch	Maximum count volume: 9h 59 min 59,99s	Daily variation at (25±5)°C: not more + 1,0s. Time discreteness: 0,01s.
Vector network analyzer	Frequency range: 300 kHz .. 4000 kHz  Dynamic range: (minus 85 .. 40) dB	<b>Accuracy F</b> 1·10 <sup>-6</sup> <b>Accuracy D A</b> (0,1 .. 0,5) dB
Low-noise amplifier	Frequency range: 1200.. 1700 MHz  Noise coefficient: not more 2,0 dB  Amplifier gain coefficient: 24 dB	
Attenuator 1	Dynamic range: (0 .. 11) dB	<b>Accuracy</b> ± 0,5 dB
Attenuator 2	Dynamic range: (0 .. 110) dB	<b>Accuracy</b> ± 0,5 dB
Power source	Range of direct current voltage setting from 0,1 to 30 V  Current intensity of output voltage at least 3A	<b>Accuracy V</b> ± 3% <b>Accuracy A</b> ± 1%
Note – it is allowed to apply other similar types of equipment providing determination of characteristics with <b>the</b> required accuracy.		

**2.1.7.** Unless otherwise specified, GNSS signal simulation shall follow “Open sky” pattern as shown in Figure 1.

Figure 1: Open sky definition



Zone	Elevation range (deg)	Azimuth range (deg)
A	0 – 5	0 – 360
Background	Area out of Zone A	



1) Open Sky plot - Attenuation:

	0 dB
A	-100 dB or signal is switched off

- 3. Test procedures
- 3.1. NMEA-0183 messages output test.
- 3.1.1 Make connections according to Figure 2.

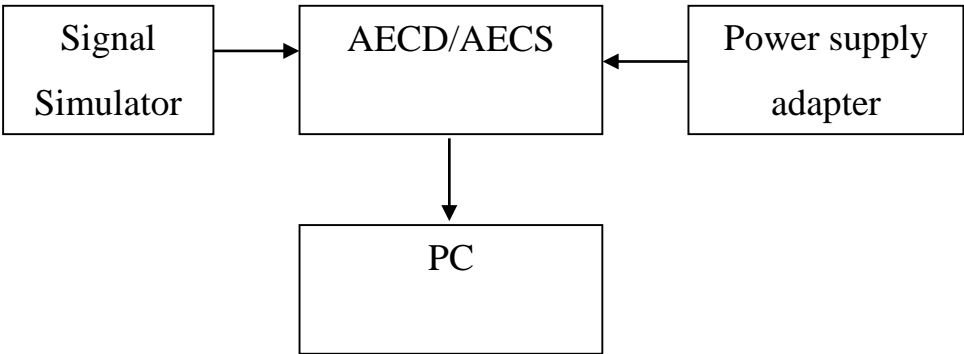


Figure 2 – Diagram of test stand

- 3.1.2 Prepare and turn on the AECD/AECS. By means of operation manual and developer software set up the GNSS receiver for receiving signals from GLONASS, Galileo, GPS GNSS and SBAS . Set up the GNSS receiver to output NMEA-0183 messages (messages RMC, GGA, VTG, GSA and GSV).

- 3.1.3 Set up the simulator according to the simulator user guide. Initialize simulator script with the parameters, given in Table 5 for GLONASS, Galileo, GPS GNSS and SBAS signals.

T a b l e 5 – Main parameters of simulation script for static scenario

Simulated parameter	Value
Test duration, hh:mm:ss	01:00:00
Output frequency	1 Hz
AECD/AECS location:	Any specified land point between latitude range 80°N and 80°S in coordinate system WGS84
Troposphere: Ionosphere:	Standard predefined model by the GNSS simulator  Standard predefined model by the GNSS simulator
PDOP value	$\geq 2.5$ in the test time interval
Simulated signals	- GNSS GLONASS (L1 frequency band CT code); - GNSS Galileo (E1 frequency band OS); - GNSS GPS (L1 frequency band C/A code); - Combined GNSS GLONASS/Galileo/GPS/SBAS.
Signal strength: - GNSS GLONASS; - GNSS Galileo; - GNSS GPS	minus 141 dBm; minus 135 dBm; minus 138,5 dBm.
Number of simulated satellites:	- at least 6 GLONASS satellites; - at least 6 Galileo satellites; - at least 6 GPS satellites; - at least 2 SBAS satellites

- 3.1.4 By means of corresponding serial interface set the connection between the AECD/AECS and PC. Control the possibility of receiving navigation information via NMEA-0183 protocol. The value of field 6 in the GGA messages is set to “2”.
- 3.1.5 Test results are considered successful if navigation information via NMEA-0183 protocol is received **in all the AECD/AECS samples**.
- 3.1.6 **The test of NMEA-0183 messages output and the assessment of the positioning accuracy in autonomous static mode can be combined.**
- 3.2 Assessment of positioning accuracy in autonomous static mode.
- 3.2.1 Make connections according to Figure 2.

- 3.2.2 Prepare and turn on the AECD/AECS. By means of developer software make sure that GNSS receiver is set up for receiving GNSS GLONASS, Galileo, GPS and SBAS combined signals. Set up navigation the GNSS receiver to output messages according to the NMEA-0183 protocol (GGA, RMC, VTG, GSA and GSV messages)
- 3.2.3 Set up the simulator in accordance with its operational manual. Start simulation of for combined GNSS GLONASS, Galileo, GPS and SBAS signals script with set parameters, given in Table 5.
- 3.2.4 Set up the recording of NMEA-0183 messages after receiving the navigation solution. Up to the moment the simulation script is complete, the NMEA-0183 messages are output by the GNSS receiver to a file.
- 3.2.5 Upon receiving the navigation solution set up recording of NMEA-0183 messages output by **GNSS receiver** to a file, up to the moment the simulation script is complete.
- 3.2.6 Extract coordinates: latitude (B) and longitude (L) contained in GGA (RMC) messages.
- 3.2.7 Calculate the systematic inaccuracy of coordinate's determination on stationary intervals according to formulas (1), (2), for example for latitude coordinate (B):

$$(1) \Delta B(j) = |B(j) - B_{truej}|,$$

$$(2) dB = \frac{1}{N} \cdot \sum_{j=1}^N \Delta B(j),$$

Where

- Btruej is the actual value of B coordinate in "j" time moment, in angle seconds.;
- B(j) is the determined by the GNSS receiver value of B coordinate in "j" time moment, angle seconds;
- N is the amount of GGA (RMC) messages, received during the test of GNSS receiver.

Similarly calculate the systematic inaccuracy of L (longitude) coordinate.

- 3.2.8 Calculate Standard Deviation (SD) value according to formula (3) for B coordinate:

$$(3) \sigma_B = \sqrt{\frac{\sum_{j=1}^N (\Delta B(j) - dB)^2}{N - 1}},$$

Similarly calculate the (SD) value for L (longitude) coordinate.

- 3.2.9 Convert calculated SD values of latitude and longitude determination from angle seconds to meters according to formulas (4) – (5):

- for latitude:

$$(4) dB(m) = 2 \cdot \frac{a(1 - e^2)}{(1 - e^2 \sin^2 \varphi)^{3/2}} \cdot \frac{0,5'' \cdot \pi}{180 \cdot 3600''} \cdot dB,$$

- for longitude:

$$(5) \quad dL(\mathcal{M}) = 2 \cdot \frac{a \cdot \cos \varphi}{\sqrt{1 - e^2 \sin^2 \varphi}} \cdot \frac{0,5'' \cdot \pi}{180 \cdot 3600''} \cdot dL,$$

Where

- a is the major semiaxis of ellipsoid, m
- e is the first eccentricity
- φ is the current latitude, in radian.

3.2.10 Calculate horizontal coordinates error (at confidence level 0.95) according to formula (6):

$$(6) \quad \Pi = \sqrt{dB^2(m) + dL^2(m)} + 2 \cdot \sqrt{\sigma_B^2(m) + \sigma_L^2(m)},$$

3.2.11 Repeat test procedures according to 3.2.3 – 3.2.9 only for GLONASS GNSS signals with simulation parameters, given in Table 5.

3.2.12 Repeat test procedures according to 3.2.3 – 3.2.9. only for GPS GNSS signals with simulation parameters, given in Table 5.

3.2.13 Repeat test procedures according to 3.2.3 – 3.2.9. for Galileo GNSS signals with simulation parameters, given in Table 5.

3.2.14 Repeat test procedures according to 3.2.3 – 3.2.9. with other AECD/AECS samples, provided for the test.

3.2.15 Determine average values according to (6) obtained for all tested AECD/AECS samples.

3.2.16 Tests results are considered satisfactory if horizontal position errors as defined by formula (6) obtained with all AECD/AECS samples do not exceed 15 m under open sky conditions at confidence level 0.95 for all simulation scripts.

3.3 Assessment of positioning accuracy in autonomous dynamic mode.

3.3.1 Repeat test procedures described in paragraph 3.2, but 3.2.10 - 3.2.12 with simulation script for manoeuvring movement given in Table 6

Table 6 – Main parameters of simulation script for manoeuvring movement

Simulated parameter	Value
Test duration, hh:mm:ss	01:00:00
Output frequency	1 Hz
AECD location: - CS WGS-84;	Any specified land point between latitude range 80°N and 80°S in coordinate system WGS84
Model of movement: - speed, km/h; turn radius, m;	Manoeuvring movement 140 500

- turn acceleration, m/s <sup>2</sup>	0,2
Troposphere: Ionosphere:	Standard predefined model by the GNSS simulator Standard predefined model by the GNSS simulator
PDOP value	<b>2,0 ≤ PDOP ≤ 2.5</b> in the test time interval
Simulated signals	Combined GLONASS / Galileo / GPS / SBAS.
Signal strength: - GNSS GLONASS; - GNSS Galileo; - GNSS GPS	minus 141 dBm; minus 135 dBm; minus 138,5 dBm.
Number of simulated satellites:	- at least 6 GLONASS satellites; - at least 6 Galileo satellites; - at least 6 GPS satellites; - at least 2 SBAS satellites

3.3.2 Determine average values according to (6) obtained for all tested AECD/AECS samples.

3.3.3 Tests results are considered satisfactory if horizontal positions errors obtained with all AECD/AECS samples do not exceed 15 m under open sky conditions at confidence level 0.95.

3.4 Movement in shadow areas, areas of intermittent reception of navigation signals and urban canyons.

3.4.1 Repeat test procedures described in section 3.3 for simulation script for movement in shadow areas and areas of intermittent reception of navigation signals (Table 7) with an urban canyon signal pattern described in Fig.3.

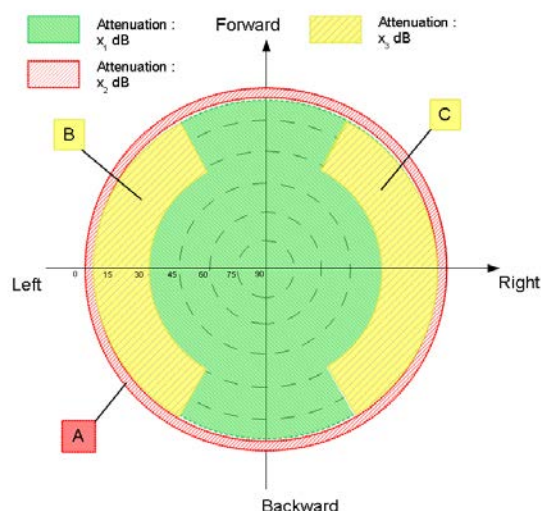
Table 7 – Main parameters of movement in shadow areas and areas of intermittent reception of navigation signals

Simulated parameter	Value
Test duration, hh:mm:ss	01:00:00
Output frequency	1 Hz

Simulated parameter	Value
AECD/AECS location	Any specified land point between latitude range 80°N and 80°S in coordinate system WGS84
Model of movement: - speed, km/h; turn radius, m; - turn acceleration, m/s <sup>2</sup>	Maneuvering movement 140 500 0,2
Satellite visibility: - signal visibility intervals, s; - signal absence intervals, s.	300 600
Troposphere: Ionosphere:	Standard predefined model by the GNSS simulator Standard predefined model by the GNSS simulator
PDOP value	<b>3,5 ≤ PDOP ≤ 4</b> in the test time interval
Simulated signals	Combined GLONASS / Galileo / GPS / SBAS.
Signal strength: - GNSS GLONASS; - GNSS Galileo; - GNSS GPS	minus 141 dBm; minus 135 dBm; minus 138,5 dBm.
Number of simulated satellites:	- at least 6 GLONASS satellites; - at least 6 Galileo satellites; - at least 6 GPS satellites; - at least 2 SBAS satellites

Figure 3: Urban canyon definition

Zone	Elevation range (deg)	Azimuth range (deg)
A	0 – 5	0 – 360
B	5 - 30	210 – 330
C	5 - 30	30 - 150
Background	Area out of Zones A, B, C	



2) Urban canyon plot attenuation:

	0 dB
B	-40 dB
C	-40 dB
A	-100dB or signal is switched off

- 3.4.2 Tests results are considered satisfactory if horizontal coordinates errors obtained with all AECD samples do not exceed 40 m in urban canyon conditions at confidence level 0.95.
- 3.5 Cold start time to first fix test.
- 3.5.1 Prepare and turn on the AECD/AECS. By means of developer software make sure that GNSS module is set to receive GNSS GLONASS, Galileo and GPS signals.
- 3.5.2 Delete all position, velocity, time, almanac and ephemeris data from the ~~GNSS navigation~~ receiver.
- 3.5.3 Set up the simulator according to the simulator user guide. Initialize simulator script with the parameters, given in Table 5 for GNSS GLONASS, Galileo and GPS signals with signal level minus 130 dBm.
- 3.5.4 By means of a stop watch measure time interval between signal simulation start and the first navigation solution result.
- 3.5.5 Conduct test procedures according to 3.5.2 – 3.5.4 at least 10 times.
- 3.5.6 Calculate average time to first fix in cold start mode based on measurements for all AECD/AECS samples, provided for the test.
- 3.5.7 The test result is considered to be positive, if average values of time to first fix, calculated as described in 3.5.6 do not exceed 60 s for signal level down to minus 130 dBm for all the simulated signals.
- 3.5.8 Repeat test procedure according to 3.5.1-3.5.5 with signal level minus 140 dBm.

- 3.5.9 The test result according to 3.5.8 is considered to be positive, if average values of time to first fix, calculated as described in 3.5.6 do not exceed 300 s for signal level down to minus 140 dBm for all the simulated signals.
  
- 3.6 Test of re-acquisition time of tracking signals after block out of 60 s.
- 3.6.1 Prepare and turn on the AECD according to operational manual. By means of developer software make sure that the GNSS receiver is set up to receive GNSS GLONASS, Galileo and GPS signals.
- 3.6.2 Set up the simulator according to the simulator user guide. Initialize simulator script with the parameters, given in Table 5 for GNSS GLONASS, Galileo and GPS signals with signal level minus 130 dBm.
- 3.6.3 Wait for 15 minutes and make sure the GNSS receiver has calculated AECD/AECS position.
- 3.6.4 Disconnect the GNSS antenna cable from the AECD/AECS and connect it again after time interval of 60 s.  
  
By means of stopwatch determine time interval between cable connection moment and restoration of satellites tracking and calculation of the navigation solution.
- 3.6.5 Repeat test procedure according to 3.6.4 at least 10 times.
- 3.6.6 Calculate average value of re-acquisition time of satellite tracking signals by the AECD/AECS for all performed measurements and all AECD/AECS samples provided for the test.
- 3.6.7 The test result is considered to be positive, if average values of re-acquisition time after block out of 60 s measured as described in 3.6.6 do not exceed 20 seconds.
- 3.7 Test of ~~GNSS navigation~~ receiver sensitivity in cold start mode, tracking mode, and re-acquisition scenario.
- 3.7.1 Turn on the vector network analyser. Calibrate the network vector analyser according to its operational manual.
- 3.7.2 Set up the diagram according to Figure 4.

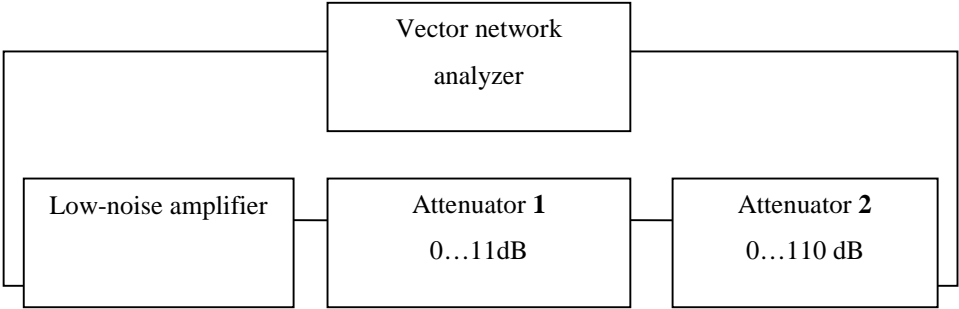


Figure 4 – Diagram of path calibration

- 3.7.3 Set zero signal path attenuation on attenuators. Measure the frequency response for a given signal path in the L1/E1 band of GNSS GLONASS/Galileo/GPS. Record the average path transmission factor in [dB] in this frequency band.
- 3.7.4 Assemble the circuit shown in Figure 5.

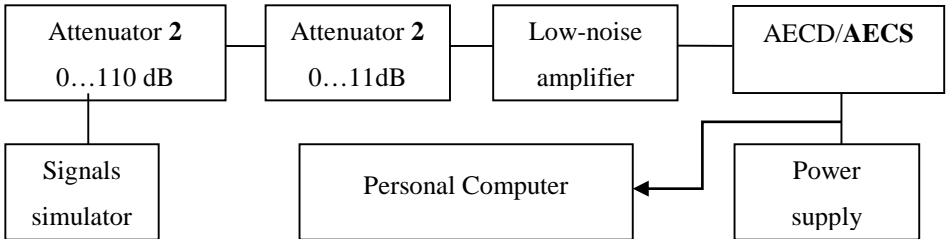




Figure 5 – Arrangement for evaluation of GNSS module sensitivity

- 3.7.5 Prepare and turn on AECD/AECS according to operational manual. By means of developer software make sure that GNSS receiver is set to receive GNSS GLONASS, Galileo and GPS signals. Clear the navigation module RAM such that the “cold” start mode of the navigation module of the AECD/AECS is achieved. Check that the position, velocity and time information is reset.
- 3.7.6 Prepare GNSS signals simulator according to its operation manual. Start GNSS GLONASS/Galileo/GPS signals simulation script, with parameters given in Table 5. Set output power level of the simulator to minus 144 dBm..
- 3.7.7 By means of a stopwatch, measure time interval between signal simulation start and the first navigation solution result.
- 3.7.8 Set the signal path attenuation on attenuators such that the signal on AECD/AECS antenna input is equal to minus 155 dBm
- 3.7.9 By means of a stopwatch, verify that AECD/AECS still provides navigation solution for at least 600 s.
- 3.7.10 Set the signal path attenuation on attenuators such that the signal on AECD/AECS antenna input is equal to minus 150 dBm.
- 3.7.11 Disconnect the GNSS antenna cable from the AECD/AECS and connect it again after time interval of 20 s.
- 3.7.12 By means of stopwatch, determine time interval between cable connection moment and restoration of satellites tracking and calculation of the navigation solution.
- 3.7.13 The test result is considered to be positive, if
- The value of time to first fix in “cold” start mode as measured in 3.7.7 do not exceed 3600 s at signal level on the antenna input of the AECD/AECS of minus 144 dBm **in all the AECD/AECS samples,**
  - The GNSS navigation solution is available for at least 600 s at signal level on the antenna input of the AECD/AECS of minus 155 dBm as measured in 3.7.9 **in all the AECD/AECS samples,** and
  - The re-acquisition of GNSS signals and calculation of the navigation solution at signal level on the antenna input of the AECD/AECS of minus 150 dBm is possible and time interval measured in 3.7.12 does not exceed **60 ~~20~~ s in all the AECD/AECS samples.**

## Annex 9

### Test method for emergency call (paragraphs 7.6, 16.3.3, 17.3.3, and 17.5.)

1. The functional check of the in-vehicle system shall be performed via one out of the [four/five] methods laid down in paragraphs 1.1. and [1.2./1.3.] below.  
These methods shall be chosen by agreements between the test services and the applicant.
  - 1.1 Technique to use the real electric radio wave at the time of a collision test in the open environment.
    - 1.1.1 Functional check via real PLMN (public Land Mobile network) and confirms it and examines the availability.
    - 1.1.2 Functional check using simulator to receive an electric wave signal and confirms it and examines the availability.
  - 1.2 Technique not to use the real electric radio wave at the time of a collision test in the open environment:
    - 1.2.1 Functional check by connecting AECS and a simulator with wire cable after a collision test without sending an electric wave at the time of a collision test and using a simulator to receive a signal and confirm availability<sup>10</sup>
    - 1.2.2 Functional check by carrying vehicle to the electric wave shield room after a collision test without sending an electric wave at the time of a collision test and using a simulator to receive radio wave and confirms availability.
  - 1.3 [Verification of functional state of the in-vehicle system by using HMI (visual control of tell-tale)  
When the in-vehicle AECD is capable
    - to check and diagnose the function of all devices belonging to the AECD scope (Antennas, power supply, microphone, speaker) and
    - to discriminate a network failure (\*) from an internal failure of the AECD Unit, the communication with GNSS and mobile networks and PSAP is deemed to be compliant if no failure warning is indicated by the HMI.]
2. Post-crash assessment of the AECS operation shall include the following:
  - 2.1 MSD emission assessment shall include verification of at least the following:
    - 2.1.1 Vehicle location data is transmitted correctly,
    - 2.1.2 Time stamp is transmitted correctly, and
    - 2.1.3 Vehicle identification number is transmitted correctly.
  - 2.2 **The** hands-free voice communication assessment (subjective test) shall include verification of the following:
    - 2.2.1 Voice originating inside the vehicle can be clearly heard by the remote listener with satisfactory intelligibility, and
    - 2.2.2 Speech of the remote speaker can be clearly heard in the vehicle with satisfactory intelligibility, **using the** language and sentence used for the test shall be one of those listed in appendix 2 to this Annex.
    - 2.2.3 The rated performance according to appendix 3 to this Annex shall be at least “3”

<sup>10</sup>

Confirmation criteria and the detailed examples of the test techniques in case of paragraph 1.2.1 are described in Appendix 1.

- 2.3 Hands-free voice communication assessment can be performed either:
- 2.3.1 By establishing voice communication to a simulator, or
- 2.3.2 By establishing voice communication via real PLMN
- 2.4 HMI operation assessment shall be verified by checking that the Call status indication is working properly. This is verified by checking that the following statuses are displayed during test according paragraph 2.1 to 2.3 of the current Annex:
- 2.4.1 [Call initiated (dialing)
- 2.4.2 MSD transmitted
- 2.4.3 Waiting for PSAP operator to answer
- 2.4.4 Call in progress]
- In agreement with the testing agency the manufacturer can choose to verify the HMI through a manual activation of the AECS.

[OICA proposal at AECS-12]

1. Table for pre- and post-crash testing

Test method	Pre-crash functional check	Post crash functional check
1	Not required	Functional check using over the air transmission for MSD and voice call via a real PLMN (public Land Mobile network).
2	Not required	Functional check using over the air transmission for MSD and voice call via a network simulator
3	Not required	Functional check using a wired connection to a network simulator
4	Not required	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
[5	<p>Required to perform either:</p> <ul style="list-style-type: none"> <li>- Functional check using over the air transmission for MSD and voice call via a real PLMN (public Land Mobile network), or</li> <li>- Functional check using over the air transmission for MSD and voice call via a network simulator, or</li> <li>- Functional check using a wired connection to a network simulator</li> </ul> <p>For this specific procedure, the subjective voice intelligibility test method can be chosen, with the rated performance at least “3” (appendix 3 to Annex 9), the objective test method can also be chosen at the demand of applicant.</p>	<p>Functional check using the HMI (visual control of tell-tales or displays sequence) if in-vehicle AECD or AECS is capable :</p> <p>1- to check and diagnose the electrical connections between all of the following devices :</p> <ul style="list-style-type: none"> <li>- AECD control module</li> <li>- PLMN communication module + antenna</li> <li>- GNSS receiver + antenna</li> <li>- Power source (from vehicle or back-up source)</li> <li>- Warning/Information device (HMI)</li> <li>- Hand free audio equipment (microphone, speaker)</li> </ul> <p>2- to discriminate a network failure from an internal failure of the AECD Unit, the communication with GNSS and mobile networks and PSAP is deemed to be compliant if no internal failure warning is indicated by the vehicle HMI.]</p>

2. [Pre-requirements for test method 5 :

This test method can be only used if the in-vehicle AECD/AECS is capable:

- a) to check and diagnose the electrical connections between all of the following devices :
  - AECD control module
  - PLMN communication module + antenna
  - GNSS receiver + antenna
  - Power source (from vehicle or back-up source)
  - Warning/Information device (HMI)
  - Hand free audio equipment (microphone, speaker)
- b) to discriminate a network failure from an internal failure of the AECS. The communication with GNSS and mobile networks and PSAP is deemed to be compliant if no internal failure warning is indicated by the vehicle HMI.]

3. [Pre-crash assessment of the AECS operation in case of test method 5 shall include the following:

3.1. The MSD emission assessment shall include the verification of at least the following:

- 3.1.1. Vehicle location data is transmitted ~~correctly~~, and
- 3.1.2. Time stamp is transmitted ~~correctly~~, and
- 3.1.3. Vehicle identification number is transmitted ~~correctly~~

3.2. The Hands-free voice communication assessment (subjective test) shall include verification of the following:

- 3.2.1. Voice originating inside the vehicle can be clearly heard by the remote listener with satisfactory intelligibility, and
- 3.2.2. Speech of the remote speaker can be clearly heard in the vehicle with satisfactory intelligibility
- 3.2.3. The language and sentence used for the test shall be one of those listed in appendix 2 to this Annex
- 3.2.4. The rated performance according to appendix 3 to this Annex shall, be at least "3"

To proceed the tests in this paragraph, the test methods as indicated in the table under the headers test method 5 and pre-crash can be used, at the choice of the applicant.]

4. Post-crash assessment of the AECS operation in case of test method 1, 2, 3 and 4 shall include the following:

4.1. The MSD emission assessment shall include the verification of at least the following:

- 4.1.1. Vehicle location data is transmitted correctly, and
- 4.1.2. Time stamp is transmitted correctly, and
- 4.1.3. Vehicle identification number is transmitted correctly

4.2. The Hands-free voice communication assessment (subjective test) shall include verification of the following:

- 4.2.1. Voice originating inside the vehicle can be clearly heard by the remote listener with satisfactory intelligibility, and
- 4.2.2. Speech of the remote speaker can be clearly heard in the vehicle with satisfactory intelligibility
- 4.2.3. The language and sentence used for the test shall be one of those listed in appendix 2 to this Annex

4.3. HMI operation assessment shall include a verification of the emergency call status indication operation. At least the following status shall be observed:

- system is processing (ecall is triggered, connection is being set up or data transmission is in progress or completed or voice call is in progress);
- transmission failed (connection failed or data transmission failed)

In agreement with the testing agency the manufacturer can choose to verify the HMI through a manual activation of the AECS.

4.4. In case of test method 3 additionally the following Mobile network antenna and Mobile network antenna wire check shall be carried out

- Measuring VSWR (Voltage Standing Wave Ratio) and verify that VSWR satisfies the specifications prescribed by the manufacturer for this antennas in the post-crash conditions of the test;

- **Verify that no wire breakage or short-circuit of the antenna feed line occurred for that part of the wiring which is not included in the wired connection to the network simulator**

- 5. **[Post-crash assessment of the AECS operation in case of test method 5 shall include the following:**
  - 5.1. **Verify that the AECS HMI indicates :**
    - 5.1.1. **the HMI sequence defined by the manufacturer is conform**
    - 5.1.2. **no AECS internal failure is shown by the HMI]**

## Annex 9, Appendix 1

## Verification of functional state of the in-vehicle system by functional transmission test with wired procedure

### (for AECS with external antenna)

The functional availability of AECS component parts after crash can be checked by following criteria and confirmation method.

This appendix defines minimum test conditions (as far as applicable) and failures criteria for verification of functional state of the in-vehicle system by functional transmission test with wired procedure (for AECS with external antenna)

The method by which this check is carried out shall be agreed between the vehicle manufacturer and the technical service with the method of assessment and results being appended to the type approval report

#### (1) AECD

Subject	Item subject to confirmation	Criteria	Example of the confirmation method
	Activation of automatic call and dial-up.	Calling sequence to PSAP is performed after collision test	Confirm emergency calling sequence by PSAP simulator.
	Emission of MSD with antenna wire connection to simulator after	MSD has been emitted.	After completion of the emergency calling sequence, confirm the content of MSD

#### (2) Antenna, feeder wire

Subject	Item subject to confirmation	Criteria	Example of the confirmation method
Telephone antenna, feeder wire	- Function - Wire snapping - Wire short-circuit	Do not be abnormal value ( $\infty$ ) of VSWR(Voltage Standing Wave Ratio)	Measure VSWR(Voltage Standing Wave Ratio)

#### (3) Component

Subject	Item subject to confirmation	Criteria	Example of the confirmation method
Tell-tale	Display	Correct operation during and after crash test	Visual observation and check operation
Microphone	Possibility of voice communication	Voice message from vehicle can be confirmed at PSAP simulator.	Confirm voice condition during talking test with wire procedure. - One inspector of the technical

Speaker	Possibility of voice communication	Voice message from PSAP simulator can be confirmed at vehicle side.	service makes telephone call to another inspector of PSAP simulator side through PSAP simulator. - The language and sentence used for the test shall be one of those listed in appendix 1 to this Annex. - The rated performance according to appendix 2 to this Annex shall, be at least “3”
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## Annex 9, appendix 2

### Language and sentence for Hands free voice assessment

Test sentence pairs, as defined in ITU-T P.501, Annex B, shall be used for the exchange of test messages in the send and receive directions.

Test sentence pairs in the language most commonly spoken by the testers shall be selected from a list.

Test sentences

All speech samples shall be processed such that the levels measured using a speech level voltmeter according are equal.

Examples, only languages relevant for Contracting parties signing UNECE AECS are relevant

- B.3.2 Dutch (fullband)

*Female 1:*

Dit produkt kent nauwelijks concurrentie.

Hij kende zijn grens niet.

*Female 2:*

Ik zal iets van mijn carrière vertellen.

Zijn auto was alweer kapot.

*Male 1:*

Zij kunnen de besluiten nemen.

De meeste mensen hadden het wel door.

*Male 2:*

Ik zou liever gaan lopen.

Willem gaat telkens naar buiten.

- B.3.3 English (fullband)

*Female 1:*

These days a chicken leg is a rare dish.

The hogs were fed with chopped corn and garbage.

*Female 2:*

Rice is often served in round bowls.

A large size in stockings is hard to sell.

*Male 1:*

The juice of lemons makes fine punch.

Four hours of steady work faced us.

*Male 2:*

The birch canoe slid on smooth planks.

Glue the sheet to the dark blue background.

- B.3.4 English (American)

*Female 1:*

We need grey to keep our mood healthy.

Pack the records in a neat thin case.

*Female 2:*

The stems of the tall glasses cracked and broke.

The wall phone rang loud and often.

*Male 1:*

The shelves were bare of both jam or crackers.

A joy to every child is the swan boat.

*Male 2:*

Both brothers were the same size.

In some form or other we need fun.

- B.3.5 Finnish (fullband)

*Female 1:*

Ole ääneti tai sano sellaista, joka on parempaa kuin vaikeneminen.



---

Suuret sydämet ovat kuin valtameret, ne eivät koskaan jäädy.

*Female 2:*

Jos olet vasara, lyö kovaa. Jos olet naula pidä pääsi pystyssä.

Onni tulee eläen, ei ostaen.

*Male 1:*

Rakkaus ei omista mitään, eikä kukaan voi sitä omistaa.

Naisen mieli on puhtaampi, hän vaihtaa sitä useammin.

*Male 2:*

Sydämellä on syynsä, joita järki ei tunne.

On opittava kärsimään voidakseen elää.

- B.3.6 French (fullband)

*Female 1:*

On entend les gazouillis d'un oiseau dans le jardin.

La barque du pêcheur a été emportée par une tempête.

*Female 2:*

Le client s'attend à ce que vous fassiez une réduction.

Chaque fois que je me lève ma plaie me tire.

*Male 1:*

Vous avez du plaisir à jouer avec ceux qui ont un bon caractère.

Le chevrier a corné pour rassembler ses moutons.

*Male 2:*

Ma mère et moi faisons de courtes promenades.

La poupée fait la joie de cette très jeune fille.

- B.3.7 German

*Female 1:*

Zarter Blumenduft erfüllt den Saal.

Wisch den Tisch doch später ab.

*Female 2:*

Sekunden entscheiden über Leben.

Flieder lockt nicht nur die Bienen.

*Male 1:*

Gegen Dummheit ist kein Kraut gewachsen.

Alles wurde wieder abgesagt.

*Male 2:*

Überquere die Strasse vorsichtig.

Die drei Männer sind begeistert.

- B.3.8 German (fullband)

*Female 1:*

Im Fernsehen wurde alles gezeigt,

Alle haben nur einen Wunsch.

*Female 2:*

Kinder naschen Süßigkeiten.

Der Boden ist viel zu trocken.

*Male 1:*

Mit einem Male kam die Sonne durch.

Das Telefon klingelt wieder.

*Male 2:*

Sekunden entscheiden über Leben.

Flieder lockt nicht nur die Bienen.

- B.3.9 Italian (fullband)

*Female 1:*

Non bisogna credere che sia vero tutto quello che dice la gente. Tu non conosci ancora gli uomini, non conosci il mondo.

Dopo tanto tempo non ricordo più dove ho messo quella bella foto, ma se aspetti un po' la cerco e te la prendo.

*Female 2:*

Questo tormento durerà ancora qualche ora. Forse un giorno poi tutto finirà e tu potrai tornare a casa nella tua terra.

Lucio era certo che sarebbe diventato una persona importante, un uomo politico o magari un ministro. Aveva a cuore il bene della società.

*Male 1:*

Non bisogna credere che sia vero tutto quello che dice la gente tu non conosci ancora gli uomini, non conosci il mondo.

---

Dopo tanto tempo non ricordo più dove ho messo quella bella foto ma se aspetti un po' la cerco e te la prendo.

*Male 2:*

Questo tormento durerà ancora qualche ora. Forse un giorno poi tutto finirà e tu potrai tornare a casa nella tua terra. Lucio era certo che sarebbe diventato una persona importante, un uomo politico o magari un ministro, aveva a cuore il bene della società.

▪ B.3.10 Japanese (fullband)

*Female 1:*

彼は鮎を釣る名人です。

Kare wa ayu wo tsuru meijin desu.

古代エジプトで十進法の原理が作られました。

Kodai ejipto de jusshinhou no genri ga tsukuraremashita.

*Female 2:*

読書の楽しさを知ってください。

Dokusho no tanoshisa wo shitte kudasai.

人間の価値は知識をどう活用するかで決まります。

Ningen no kachi wa chishiki wo dou katsuyou suruka de kimarimasu.

*Male 1:*

彼女を説得しようとしても無駄です。

Kanojo wo settoku shiyoutoshitemo mudadesu.

その昔ガラスは大変めずらしいものでした。

Sono mukasi garasu wa taihen mezurashii monodeshita.

*Male 2:*

近頃の子供たちはひ弱です。

Chikagoro no kodomo tachi wa hiyowa desu.

イギリス人は雨の中を平気で濡れて歩きます。

Igrisujin wa ameno nakawo heikide nurete arukimasu.

▪ B.3.11 Polish

*Female 1:*

Pielęgniarki były cierpliwe.

Przebiegał szybko przez ulicę.

*Female 2:*

Ona była jego sekretarką od lat.

Dzieci często płaczą kiedy są głodne.

*Male 1:*

On był czarującą osobą.

Lato wreszcie nadeszło.

*Male 2:*

Większość dróg było niezmiernie zatłoczonych.

Mamy bardzo entuzjastyczny zespół.

▪ B.3.12 Spanish (American)

*Female 1:*

No arroje basura a la calle.

Ellos quieren dos manzanas rojas.

*Female 2:*

No cocinaban tan bien.

Mi afeitadora afeitada al ras.

*Male 1:*

Vé y siéntate en la cama.

El libro trata sobre trampas.

*Male 2:*

El trapeador se puso amarillo.

El fuego consumió el papel.

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[Annex 9, appendix 3

Intelligibility/listening effort (ITU P1100)

Description:

The rating table is applied to evaluate the effort required to understand the meaning of words and sentences. The applicable test cases are single talk and the rating scale is given in Table C.5.

The question heading this scale shall be:

*“How would you judge the effort required to understand words and sentences of your remote partner?”*

Table C.5—Intelligibility/listening effort  
Rating description Grade

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## **Annex 10**

## **Annex 11**

### **Definition of Minimum Set of Data – MSD (paragraph 13.7)**

The following table lists the minimum set of data (MSD) that shall be conveyed during the Ecall data transmission to the PSAP.

**Table 1 — Minimum Set of Data (MSD) to be conveyed to PSAP**

<b>Short Name of MSD Element</b>	<b>Description</b>
automaticActivation	Indicates whether a call was automatically or manually triggered
testCall	Indicates whether the call is a test call or a real emergency call
positionCanBeTrusted	Indicates whether the position given in the position elements can be trusted or has only low confidence
vehicleType	Provides a vehicle type
VIN	Vehicle Identification number
vehiclePropulsionStorageType	Provides the propulsion type of the vehicle
timeStamp	Timestamp of the initial data message generation within the current Ecall incident event
positionLatitude	The last known vehicle Latitude position determined at the latest moment possible before message generation
positionLongitude	The last known vehicle Longitude position determined at the latest moment possible before message generation
vehicleDirection	The vehicle's last known real direction of travel determined at the latest moment possible before message generation.

## Annex 12

### TABLE OF TESTS

		M1				N1	
		M1 ≤ 2.5 t		M1 > 2.5 t		R ≤ 700 mm	R > 700 mm
		R ≤ 700 mm § 16.1.5.1.	R > 700 mm § 16.1.5.3.	R ≤ 700 mm § 16.1.5.1.	R > 700 mm § 16.1.5.4.		
UN R94 impact test	§ 17.3.1.		-	-	-	-	
UN R95 impact test	§ 17.3.2.	-	§ 17.3.2.	-	§ 17.3.2.	-	
Documentation	§ 17.3.3.	Frontal impact provisions of § 17.3.3.	Side impact provisions of § 17.3.3.	§ 17.4.	Side impact provisions of § 17.3.3.	Relevant provisions of § 17.4.	
GNSS	§ 16.2.						