



Economic and Social Council

Distr.: General
28 July 2016

Original: English

Economic Commission for Europe

Inland Transport Committee

World Forum for Harmonization of Vehicle Regulations

Working Party on General Safety Provisions

111th session

Geneva, 11–14 October 2016

Item 13 of the provisional agenda

Accident Emergency Call Systems (AECS)

Proposal for a new Regulation on Accident Emergency Call Systems

Submitted by the Chair of the Informal Working Group on Accident Emergency Call Systems*

The text reproduced below was prepared by the Chair of the Informal Working Group on Accident Emergency Call Systems (AECS) and proposes a draft UN Regulation on new provisions for AECS. It is mainly based on informal document GRSG-110-15, distributed during the 110th session of the Working Party on General Safety Provisions (GRSG) (see report ECE/TRANS/WP.29/GRSG/89, para. 47).

* In accordance with the programme of work of the Inland Transport Committee for 2016–2017 (ECE/TRANS/254, para. 159 and ECE/TRANS/2016/28/Add.1, cluster 3.1), the World Forum will develop, harmonize and update Regulations in order to enhance the performance of vehicles. The present document is submitted in conformity with that mandate.



Regulation No. XXX**Uniform provisions concerning:**

- I. Accident Emergency Call Devices (AECD) which are intended to be fitted to vehicles of categories M₁ and N₁**
- II. Vehicles with regard to the installation of an AECD of an approved type**
- III. Vehicles with regard to their Accident Emergency Call Systems (AECS)**

Contents*Page*

Regulation

1.	Scope	4
2.	Definitions - General	5
	Part I - Approval of Accident Emergency Call Devices (AECD) which are intended to be fitted to vehicles of categories M ₁ and N ₁	7
3.	Definitions	7
4.	Application for approval	7
5.	Markings	7
6.	Approval	8
7.	Requirements	8
8.	Modifications of a type of AECD and extension of approval	13
9.	Conformity of production	13
10.	Penalties for non-conformity of production	14
11.	Production definitively discontinued	14
12.	Names and addresses of Technical Services responsible for conducting approval tests, and of Type Approval Authorities	14
	Part II - Approval of vehicles with regard to the installation of an AECD of an approved type	14
13.	Definitions	14
14.	Application for approval	15
15.	Approval	15
16.	Requirements	16
17.	Modifications and extension of approval of a vehicle type equipped with an AECD which has been approved to Part I of this Regulation	22
18.	Conformity of production	23
19.	Penalties for non-conformity of production	23
20.	Production definitively discontinued	24

21.	Names and addresses of Technical Services responsible for conducting approval tests, and of Type Approval Authorities	24
	Part III - Approval of vehicles with regard to their AECS when equipped with an AECD which has not been separately approved according to Part I of this Regulation	24
22.	Definitions	24
23.	Application for approval of a vehicle type equipped with an AECS	25
24.	Approval	25
25.	Requirements	26
26.	Modifications and extension of approval of a vehicle type equipped with an AECS	33
27.	Conformity of production	33
28.	Penalties for non-conformity of production	34
29.	Production definitively discontinued	34
30.	Names and addresses of Technical Services responsible for conducting approval tests, and of Type Approval Authorities	34

Annexes

1	Communication concerning the approval or extension or refusal or withdrawal of approval or production definitively discontinued of a type of AECD intended to be fitted to vehicles of categories M ₁ and N ₁ pursuant Part I of Regulation No. XXX	35
2	Communication concerning the approval or extension or refusal or withdrawal of approval or production definitively discontinued of a type of vehicle of category M ₁ and N ₁ pursuant to Part II to Regulation No. XXX, fitted with an AECD approved pursuant to Part I of Regulation No. XXX	37
3	Communication concerning the approval or extension or refusal or withdrawal of approval or production definitively discontinued of a type of vehicle of category M ₁ or N ₁ approved pursuant to Part III to Regulation No. XXX	39
4	Information document on the type approval of an Accident Emergency Call Devices (AECD)	41
5	Information document on the type approval of a vehicle with regard to the installation of an Accident Emergency Call Devices (AECD) of an approved type	42
6	Information document on the type approval of a vehicle with regard to Accident Emergency Call System (AECS)	43
7	Test method for resistance to mechanical impact	44
8	Test methods for the navigation solutions	46
9	Test method for AECD/AECS post-crash performance	59
	Appendix: Language and sentences for hands-free voice assessment	61
10	Definition of Minimum Set of Data (MSD)	68

1. Scope

1.1. This Regulation applies to:

- (a) Part I: the approval of Accident Emergency Call Devices (AECD) which are intended to be fitted to vehicles of categories M₁ and N₁¹;
- (b) Part II: the approval of vehicles of categories M₁ and N₁¹ with regard to the installation of an AECD which has been approved to Part I of this Regulation.
- (c) Part III: the approval of vehicles of categories M₁ and N₁¹ with regard to their Accident Emergency Call System (AECS) or with regard to the installation of an AECD 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 additional data to the Minimum Set of Data (MSD) to be conveyed to Public Service Answering Party (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 (PTI).

1.3. Vehicles,

- (a) in the scope of neither Regulation No. 94 nor Regulation No. 95 and not fitted with an automatic triggering system;
- (b) of category M₁ in the scope of Regulation No. 94 and not equipped with frontal airbag;
- (c) of category N₁ in the scope of Regulation No. 95 and not equipped with side airbag; or
- (d) of category M₁ with a total permissible mass above 3.5 t; and
- (e) armoured vehicles¹

shall be excluded from the scope of this Regulation.

1.4. Global Navigation Satellite System (GNSS) position determination may be approved at the request of the applicant.

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

¹ As defined in Section 2 of the Consolidated Resolution on the Construction of Vehicles (R.E.3) (document ECE/TRANS/WP.29/78/Rev.4) – www.unece.org/trans/main/wp29/wp29wgs/wp29gen/wp29resolutions.html.

- 1.5. Pre-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.

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 Public Land Mobile Network (PLMN).
- 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 a 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 or 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. "*Power supply*" means the component that supplies power to the AECD.
- 2.7. "*Back-up power supply*" means the component(s) that supplies(y) power to the AECD when the main power supply fails.
- 2.8. "*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 at any point of the Earth surface.
- 2.9. "*Global Navigation Satellite System receiver (GNSS receiver)*" means a component of an AECD 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 module, as long as the AECD ensures its ability to provide the vehicle positioning information in case of an event.
- 2.10. "*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. (e.g. EGNOS, WAAS, QZSS).
- 2.11. "*GLONASS*" means the Global Navigation Satellite System (GNSS) owned by the Russian Federation.
- 2.12. "*GALILEO*" means the Global Navigation Satellite System (GNSS) owned by the European Union.

- 2.13. *"GPS"* means the Global Navigation Satellite System (GNSS) owned by the United States of America.
- 2.14. *"NMEA-0183 protocol"* means a combined electrical and data specification developed by the National Marine Electronics Association (NMEA) based on ASCII and a serial communication protocol, which has been adopted given its simplicity as a voluntary standard in many industries, including GNSS receivers.
- 2.15. *"Position Dilution Of Precision (PDOP)"* means a continuous measurement of how the geometry of the satellites' position negatively affects a final position determination of the GNSS receiver; by the combination of both the horizontal and vertical error components.
- 2.16. *"WGS-84 coordinate system"* means the most popular and recommended global geodetic reference system for the Earth; initially developed for the GPS by the US National Geospatial-Intelligence Agency and extensively used in the GNSS receiver industry.
- 2.17. *"Open sky"* means a scenario reproducing the satellite visibility conditions in rural and sub-urban areas; in which the GNSS signals are not affected by buildings, trees, etc. making them easy to reach the GNSS receiver.
- 2.18. *"Urban canyon"* means a scenario reproducing the satellite visibility conditions in urban areas; in which the GNSS signals are affected by buildings, trees, etc. making them difficult to reach the GNSS receiver.
- 2.19. *"Sensitivity"* means the GNSS performance indicator to evaluate the minimum power of the signal per one satellite at the antenna input that makes the GNSS receiver able to fix a position.
- 2.20. *"L1/E1 band"* means the radio frequency spectrum portion destined to radio navigation satellite service, as defined by the International Telegraph Union (ITU) between 1,559 and 1,591 MHz; and centred at 1,575.42 MHz.
- 2.21. *"Time to first fix"* means the time delay between the activation of a GNSS receiver and the start of output of the valid navigation information.
- 2.22. *"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.
- 2.23. *"AECD (Accident Emergency Call Device)"* means a unit or a set of units performing at least the following functions:
- (a) receiving and/or generating the automatic and manual triggering signals; and
 - (b) sending a Minimum Set of Data (MSD).
- It may in addition perform any of the following functions:
- (a) receiving or determining the vehicle location;
 - (b) providing a warning signal; and
 - (c) allowing bidirectional audio signals for voice communication,
- unless specified otherwise in this Regulation.
- 2.24. *"AECS (Accident Emergency Call System)"* means an AECD when installed in a vehicle.

- 2.25. *"Triggering signal"* means a logic signal that requests emergency call transaction.
- 2.26. *"Minimum Set of Data (MSD)"* means a set of data as defined in Annex 10.
- 2.27. *"Control module"* means a component of an AECD designed to ensure the combined functioning of all components of the AECD.

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 purposes of Part I of this Regulation:

- 3.1. *"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.
- 3.2. *"AECD information signal device"* means a device that provides information on the status of the emergency call transaction.
- 3.3. *"AECD warning signal device"* means a tell-tale that provides a failure indication of the AECD.

4. Application for approval

- 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 their 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

- 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 GNSS receiver and communication module (if any). It shall be clearly legible and be indelible.
- 5.2. The unit(s) containing the GNSS 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. 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 Contracting Parties to the Agreement which apply this Regulation by means of a form conforming to the model in Annex 1 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 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. Requirements

- 7.1. General

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 the case it was not possible to establish voice connection and/or send data using PLMN, the AECD shall store the data in non-volatile memory and attempt re-transmission of the data and to establish a voice connection.
- 7.2. 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.
- 7.3. Position determination

If the AECD is fitted, in accordance with paragraph 1.4., with a GNSS receiver supporting at least three GNSS including GLONASS, GALILEO and GPS, and is able to receive and process SBAS signals, then the AECD shall comply with the requirements of paragraphs 7.3.1. to 7.3.11.

AECD compliance with respect to positioning capabilities shall be demonstrated by performing the test methods described in Annex 8: Test

- methods for the navigation solutions. It shall be indicated in the communication document of Annex 1, item 11.
- 7.3.1. 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 shall be described in the operation manual.
 - 7.3.2. The GNSS receiver as a part of the AECD shall be able to receive and process individual GNSS signals in L1/E1 band from at least three global navigation satellite systems, including GLONASS, GALILEO and GPS.
 - 7.3.3. The GNSS receiver as a part of the AECD shall be able to receive and process combined GNSS signals in L1/E1 band from at least three global navigation satellite systems, including GLONASS, GALILEO, GPS, and SBAS.
 - 7.3.4. The GNSS receiver as a part of the AECD shall be able to provide positioning information in the WGS-84 coordinate system.
 - 7.3.5. The GNSS receiver shall be able to obtain a position fix at least every second.
 - 7.3.6. Horizontal position error shall not exceed:
 - (a) under open sky conditions: 15 m at a confidence level of 0.95 probability with a PDOP in the range from 2.0 to 2.5;
 - (b) in urban canyon conditions: 40 m at a confidence level of 0.95 probability with a PDOP in the range from 3.5. to 4.
 - 7.3.7. The specified requirements for accuracy shall be provided:
 - (a) at speed range from 0 to 140 km/h;
 - (b) linear acceleration range from 0 to 2 G.
 - 7.3.8. Cold start time to first fix shall not exceed:
 - (a) 60 s for signal level down to minus 130 dBm;
 - (b) 300 s for signal level down to minus 140 dBm.
 - 7.3.9. 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.
 - 7.3.10. Sensitivity at receiver input shall be:
 - (a) GNSS signals detection (cold start) do not exceed 3,600 s at signal level on the antenna input of the AECD of minus 144 dBm;
 - (b) GNSS signals tracking and navigation solution calculation is available for at least 600 s at signal level on the antenna input of the AECD of minus 155 dBm;
 - (c) 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.
 - 7.3.11. The testing procedures in Annex 8 can be performed either on the AECD unit including post processing ability or directly on the GNSS receiver as a part of the AECD.
 - 7.4. Means of access to PLMN

The AECD shall be fitted with an embedded hardware allowing registration/authentication on, and access to PLMN.

7.5. 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 provisions of paragraphs 7.5.1. to 7.5.3. shall apply. It shall be indicated in the communication document of Annex 1, item 12. If the information and warning signals verification is not part of AECD approval (Part I), then it shall be subject to Part II approval.

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

- (a) system is processing (accident emergency call is triggered, connection is being set up or data transmission is in progress or completed);
- (b) transmission failed (connection failed or data transmission failed).

7.5.2. 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 (whichever is applicable).

7.5.2.1. The manufacturer shall provide the Type Approval Authority with an explanation and technical documentation which shows, in overall terms, how the malfunction indication strategy 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 shall at least cover the following items:

Table 1
Template of information for self-test function

<i>Item</i>		<i>Note</i>
<i>Component</i>	<i>Failure type</i>	
AECD Control module	Internal failure	Internal failure means e.g. hardware failure, watch-dog, software checksum, software image integrity, ...
PLMN 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 module and the module.
	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	
	Internal failure	
PLMN communication antenna	Electrical connection	
GNSS antenna	Electrical connection	
Crash Control Unit (CCU)	Electrical connection	e.g. crash detection sensor system, triggering device, ...
	Internal failure	If not in good condition, then the automatic emergency call is not possible.
Power supply	Electrical connection	Dedicated battery is connected.
Subscriber Identity Module (SIM)	not present	This item only applies if a removable SIM card is used.
Back-up power supply	The state of charge, threshold for warning at the discretion of the manufacturer	Failure if the state of charge is at a critical level according to the manufacturer.

7.5.2.2. Test procedure

Self-test function verification test

- 7.5.2.2.1. The following test shall be performed on an AECD on a representative arrangement of components.
- 7.5.2.2.2. Simulate a malfunction of the AECD 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.
- 7.5.2.2.3. Power the AECD up and verify that the AECD warning signal device illuminates or the electrical signal is generated, whichever is relevant.
- 7.5.2.2.4. Power the AECD down and restore it to normal operation.
- 7.5.2.2.5. Power the AECD up and verify that the AECD warning signal device 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.

- 7.5.3. Instead of providing information or a warning signal, the AECD may provide the electrical signal to other vehicle components, e.g. instrument panel, which provides the information or warning signal.
- 7.6. Power supply
 - 7.6.1. Perform the sled test described in Annex 7.
 - 7.6.2. Immediately after the sled test, simulate the trigger so as to emit the MSD.
 - 7.6.3. 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 paragraph 2. of Annex 9.
 - 7.6.2.1. 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. It shall be indicated in the communication document of Annex I, item 10.
 - 7.6.3. The absence/presence of a back-up power supply shall be clearly indicated in the information document of Annex 4, item 10.
- 7.7. Resistance to impact

The AECD shall remain operational after impact. This shall be demonstrated according to Annex 7 and a verification of the MSD and HMI functionality according to paragraph 2. of Annex 9.

 - 7.7.1. The following AECD components shall be tested according to Annex 7:
 - (a) Control module;
 - (b) Communication module excluding microphones and loudspeakers;
 - (c) Back-up power supply (if fitted);
 - (d) Connectors ²;
 - (e) Network access antenna.
 - 7.7.2. If the applicant for approval so requests, the following AECD components may be tested to Annex 7:
 - (a) AECD warning signal device;
 - (b) Hands-free audio equipment (microphones and loudspeakers);
 - (c) AECD information signal device;
 - (d) Power supply other than back-up power supply mentioned in paragraph 7.7.1.;
 - (e) GNSS antenna;
 - (f) GNSS receiver.

² 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.

8. Modifications of a type of AECD and extension of approval

- 8.1. Every modification to an existing AECD type, shall be notified to the Type Approval Authority which approved the AECD type. The Type Approval Authority shall then either:
- (a) decide, in consultation with the manufacturer, that a new type approval is to be granted; or
 - (b) apply the procedure contained in paragraph 8.1.1. (Revision) and, if applicable, the procedure contained in paragraph 8.1.2. (Extension).
- 8.1.1. **Revision**
- When particulars recorded in the information documents of Annex 4 have changed and the Type Approval Authority considers that the modifications made are unlikely to have appreciable adverse effect, and that in any case the vehicle still meets the requirements, the modification shall be designated a "revision".
- In such a case, the Type Approval Authority shall issue the revised pages of the information documents of Annex 4 as necessary, marking each revised page to show clearly the nature of the modification and the date of re-issue. A consolidated, updated version of the information documents of Annex 4, accompanied by a detailed description of the modification, shall be deemed to meet this requirement.
- 8.1.2. **Extension**
- The modification shall be designated an "extension" if, in addition to the change of the particulars recorded in the information folder:
- (a) further inspections or tests are required; or
 - (b) any information on the communication document (with the exception of its attachments) has changed; or
 - (c) approval to a later series of amendments is requested after its entry into force.
- 8.2. Notice of confirmation, extension, or refusal of approval shall be communicated by the procedure specified in paragraph 6.3. above, to the Contracting Parties to the Agreement which apply this Regulation. In addition, the index to the information documents and to the test reports, attached to the communication document of Annex 1, shall be amended accordingly to show the date of the most recent revision or extension.
- 8.3. The competent authority issuing the extension of approval shall assign a series number to each communication form drawn up for such extension.

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 Contracting 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, they shall so inform the authority which granted the approval. Upon receiving the relevant communication, that authority shall inform thereof the other Contracting 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 Type Approval Authorities

The Contracting Parties to the Agreement applying 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 Type Approval Authorities which grant approval and to which forms certifying approval or extension or refusal 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.
- 13.2. "*Total permissible mass*" means the vehicle's technically permissible maximum mass stated by the manufacturer.

- 13.3. *"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.
- 13.4. *"AECS (Accident Emergency Call System)"* means an AECD approved to Part I, when installed in a vehicle.
- 13.5. *"Multi-task display"* means a display on which more than one message can be shown simultaneously.
- 13.6. *"AECS information signal device"* means a device that provides information on the status of the emergency call transaction.
- 13.7. *"AECS warning signal device"* means a tell-tale that provides a failure indication of the AECS.

14. Application for approval

- 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 their duly accredited representative.
- 14.2. A model of the information document is given in Annex 5.
- 14.3. For each vehicle type equipped with an AECD, the application shall be accompanied by samples of vehicles representative of the type to be approved and where appropriate, samples of components, 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 16. 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 7.7.2., this shall be tested according to Annex 7 for this part.
- 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 Contracting Parties to the Agreement which apply this Regulation by means of a form conforming to the model in Annex 2 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. 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 PLMN.

The applicant shall provide the relevant information about the PLMN and GNSS receiver 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.

- 16.2. The installation of the AECD shall be such to receive a trigger signal during a severe vehicle impact. This shall be verified during the vehicle impact test described in this paragraph.

Upon receiving a trigger signal, the AECS shall perform an emergency call transaction. This shall be verified by one of the test methods described in Annex 9.

- 16.2.1. Vehicles of category M_1 shall be subject to the following:

- 16.2.1.1. Vehicles of category M_1 with a total permissible mass less than or equal to 2.5 tons and R-point height at or below 700 mm, verification of the trigger signal:

- 16.2.1.1.1. when performing a collision of the vehicle according to Annex 3 to Regulation No. 94 (Frontal collision) and Annex 4 to Regulation No. 95 (Lateral collision); or

- 16.2.1.1.2. in the case of the extension of type approvals to this Regulation, or in the case of the approval of vehicle types already approved to Regulations Nos. 94 or 95 prior the entry into force of this Regulation, when demonstrating with existing documentation (report, images, simulation data or equivalent) that during a Regulation No. 94 (Frontal collision) and Regulation No. 95 (Lateral collision) impact:

- (a) a triggering signal was generated;
- (b) the installation of AECD is not adversely affected by the impact to the vehicle.

- 16.2.1.2. Vehicles of category M_1 with a total permissible mass less than or equal to 2.5 tons and R-point height above 700 mm, verification of the trigger signal:

- 16.2.1.2.1. when performing a collision of the vehicle according to Annex 3 to Regulation No. 94 (Frontal collision); or
- 16.2.1.2.2. in the case of the extension of type approvals to this Regulation, or in the case of the approval of vehicle types already approved to Regulations Nos. 94 or 95 prior the entry into force of this Regulation, when demonstrating with existing documentation (report, images, simulation data or equivalent) that during a Regulation No. 94 (Frontal collision) impact:
 - (a) a triggering signal was generated;
 - (b) the installation of AECD is not adversely affected by the impact to the vehicle.
- 16.2.1.3. Vehicles of category M_1 with a total permissible mass above 2.5 tons and R-point height less than or equal to 700 mm, verification of the trigger signal:
 - 16.2.1.3.1. when performing a collision of the vehicle according to Annex 4 to Regulation No. 95 (Lateral collision); or
 - 16.2.1.3.2. in the case of the extension of type approvals to this Regulation, or in the case of the approval of vehicle types already approved to Regulations Nos. 94 or 95 prior the entry into force of this Regulation, when demonstrating with existing documentation (report, images, simulation data or equivalent) that during a Regulation No. 95 impact:
 - (a) a triggering signal was generated;
 - (b) the installation of AECD is not adversely affected by the impact to the vehicle.
- 16.2.1.4. Vehicles of category M_1 with a total permissible mass above 2.5 tons and R-point height above 700 mm:
 - 16.2.1.4.1. the manufacturer shall demonstrate with existing documentation (report, images, drawing or equivalent) that a triggering signal is available for the purpose of AECS.
- 16.2.2. Vehicles of category N_1 shall be subject to the following:
 - 16.2.2.1. Vehicles of category N_1 with a R-point height at or below 700 mm, verification of the trigger signal:
 - 16.2.2.1.1. when performing a collision of the vehicle according to Regulation No. 95 (Lateral collision); or
 - 16.2.2.1.2. in the case of the extension of type approvals to this Regulation, or in the case of the approval of vehicle types already approved to Regulations Nos. 94 or 95 prior the entry into force of this Regulation, when demonstrating with existing documentation (report, images, simulation data or equivalent) that during a Regulation No. 95 (Lateral collision) test:
 - (a) a triggering signal was generated;
 - (b) the installation of AECD is not adversely affected by the impact to the vehicle.
 - 16.2.2.2. Vehicles of category N_1 with a R-point height above 700 mm:
 - 16.2.2.2.1. the manufacturer shall demonstrate with existing documentation (report, images, drawing or equivalent) that a triggering signal is available for the purpose of AECS.

16.3. 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 able to receive and process SBAS signals, then the AECS shall comply with the requirements of paragraphs 16.3.1. to 16.3.11.

AECS compliance with respect to positioning capabilities shall be demonstrated by performing test methods described in Annex 8: Test methods for the navigation module. It shall be indicated in the communication document of Annex 2, item 11.

- 16.3.1. 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.
- 16.3.2. The AECS shall be able to receive and process individual GNSS signals of standard accuracy in L1/E1 band from at least three global navigation satellite systems, including GLONASS, GALILEO, GPS.
- 16.3.3. The AECS shall be able to receive and process combined GNSS signals of standard accuracy in L1/E1 band from at least three global navigation satellite systems, including GLONASS, GALILEO, GPS and SBAS.
- 16.3.4. The AECS shall be able to provide positioning information in WGS-84 coordinate systems.
- 16.3.5. The GNSS receiver shall be able to obtain a position fix at least every second.
- 16.3.6. Horizontal position error shall not exceed:
 - (a) under open sky conditions: 15 m at confidence level of 0.95 probability with a PDOP in the range from 2.0 to 2.5;
 - (b) in urban canyon conditions: 40 m at confidence level of 0.95 probability with a PDOP in the range from 3.5. to 4.
- 16.3.7. The specified requirements for accuracy shall be provided:
 - (a) at speed range from 0 to 140 km/h;
 - (b) linear acceleration range from 0 to 2 G.
- 16.3.8. Cold start time to first fix shall not exceed:
 - (a) 60 s for signal level down to minus 130 dBm;
 - (b) 300 s for signal level down to minus 140 dBm.
- 16.3.9. 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.
- 16.3.10. Sensitivity at receiver input shall be:
 - (a) GNSS signals detection (cold start) do not exceed 3,600 s at signal level on the antenna input of the AECS of minus 144 dBm;
 - (b) GNSS signals tracking and navigation solution calculation is available for at least 600 s at signal level on the antenna input of the AECS of minus 155 dBm;

- (c) 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 AECS of minus 150 dBm.
- 16.3.11. The testing procedures in Annex 8 can be performed either on the AECS including post-processing ability or directly on the GNSS receiver as a part of the AECS.
- 16.4. AECS control
 - The vehicle subject to approval shall be equipped with an AECS control.
- 16.4.1. The AECS control shall be installed so as to comply with the relevant requirements and transitional provisions of Regulation No. 121, 01 series of amendments or any later series of amendments.
- 16.4.2. The AECS control shall be designed and/or placed in such a way that the risk of an inadvertent activation is reduced.
- 16.4.3. If the AECS control is embedded into a multi-task display, its operation shall be possible with two deliberate actions or less.
- 16.4.4. If the AECS control assessment is not part of the AECD approval per Part I of this Regulation, the AECS control functionality shall be subject to Annex 9, paragraph 1.
- 16.4.5. It shall not be possible to deactivate the AECS by the means of HMI. A temporary deactivation function shall be permitted for the purpose of maintenance and repair.
- 16.5. 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 according to Part I of this Regulation.
- 16.5.1. The AECS information and/or warning signal shall be installed so as to comply with the relevant installation requirements of Regulation No. 121, 01 series of amendments or any later series of amendments.
- 16.5.2. The following information shall be provided on the status of the emergency call transaction when the AECS is automatically or manually activated:
 - (a) system is processing (emergency call is triggered, connection is being set up, data transmission is in progress or completed, or voice call is in progress);
 - (b) transmission failed (connection failed or data transmission failed).

This shall be verified by compliance with the provisions of Annex 9, respectively paragraphs 1. and 2.
- 16.5.3. 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 (whichever is applicable).
- 16.5.3.1. The manufacturer shall provide the Type Approval Authority with an explanation and technical documentation which shows, in overall terms, how the malfunction indication strategy is achieved. This documentation shall be maintained by the manufacturer and shall be available for inspection by the Technical Service at the time of the type approval.

This shall at least cover the following items:

Table 2

Template of information for self-test function

<i>Item</i>		<i>Notes</i>
<i>Component</i>	<i>Failure type</i>	
AECS Control module	Internal failure	Internal failure means 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 module and the module.
	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	
	Internal failure	
PLMN communication antenna	Electrical connection	
GNSS antenna	Electrical connection	
Crash Control Unit (CCU)	Electrical connection	e.g. crash detection sensor system, triggering device, ...
	Internal failure	If not in good condition, then the automatic emergency call 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). When CCU is not part of the AECD, this requirement is deemed to be fulfilled if: (a) the indication of a malfunction for an internal CCU failure is provided by the vehicle; and (b) the warning strategy on AECD is explained to the driver.
Power supply	Electrical connection	dedicated power supply is connected
SIM	not present	This item only applies if a removable SIM card is used.
Back-up power supply	The state of charge, threshold for warning at the discretion of the manufacturer	Failure if the state of charge is at a critical level according to the manufacturer.

16.5.3.2. Test procedure

Self-test function verification test

- 16.5.3.2.1. The following test shall be performed on a vehicle with an AECS in-vehicle system installed or on a representative arrangement of components.

- 16.5.3.2.2. Simulate a malfunction of the AECS 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.
- 16.5.3.2.3. Power the AECS master control switch, as applicable, and verify that the AECS warning signal device illuminates.
- 16.5.3.2.4. Power the AECS down (e.g. by switching the ignition 'off' or deactivating the vehicle's master control switch, as applicable) and restore it to normal operation.
- 16.5.3.2.5. Power the AECS up and verify that the malfunction indicator does not illuminate or extinguishes shortly after illuminating initially.
- 16.6. Hands-free audio performance
- The AECS shall provide sufficient voice intelligibility for the vehicle driver.
- 16.6.1. Subject to paragraph 1.5., pre-crash voice intelligibility shall be demonstrated by proving compliance with standard ITU-T P.1140 06/15 in a vehicle prior to conducting any of the tests according to Regulations Nos. 94 and/or 95 whichever is relevant.
- AECS compliance shall be checked based on ITU-T P.1140 06/15 with the following additions to paragraphs 8.8.1. and 8.8.3. of this ITU standard:
- (a) TCLw: TCLw³ should be at least 46 dB for all settings of the AGC⁴ which shall be verified by the manufacturer of the IVS system⁵. During testing the maximum setting of the volume control cannot be reliably determined due to activated AGC. Therefore, the test is conducted with the nominal system setting in quiet mode as described in paragraph 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 an 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).
- 16.6.2. Post-crash voice intelligibility shall be demonstrated by subjective testing in accordance with paragraph 16.6.3. after performing tests according to Regulations Nos. 94 and/or 95 whichever is relevant.
- 16.6.3. Testing languages
- 16.6.3.1. The languages used in the post-crash hands-free audio performance intelligibility test shall be those of one of the Contracting Parties as identified in the appendix of Annex 9 to this Regulation, with the sentences being voiced in good, clear pronunciation. The language used for the testing shall be noted in the test report.
- 16.6.3.2. The vehicle manufacturer shall demonstrate, through the use of documentation, compliance with all the other languages identified in the

³ TCLw means "Terminal Coupling Loss as a function of time".

⁴ AGC means "Automatic Gain Control".

⁵ IVS means "Interactive Voice System".

appendix of Annex 9 to this Regulation. Any such documentation shall be appended to the test report.

- 16.6.3.3. In the case the vehicle type is 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.

16.7. 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.

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

- 16.7.1.1. Before the impact test under Regulations Nos. 94 and/or 95, whichever is 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 (Regulations Nos. 94 and/or 95 whichever is relevant), taking into account the vehicle's power management strategy.

- 16.7.1.2. After the impact test under Regulations Nos. 94 and/or 95, whichever is relevant, the AECS back-up power supply shall be able to supply power to the AECS. This may be verified by one of the methods described in Annex 9 to this Regulation.

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

- 16.7.2.1. The absence of back-up power supply shall be clearly indicated in the information document of Annex 5 to this Regulation.

- 16.7.2.2. Before the impact test under Regulations Nos. 94 and/or 95 whichever is 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 (Regulations Nos. 94 and/or 95), taking into account the vehicle's power management strategy.

- 16.7.2.3. After the impact test under Regulations Nos. 94 and/or 95 whichever is relevant, the AECS back-up power supply shall be able to supply power to the AECS. This may be verified by one of the methods described in Annex 9 to this Regulation.

17. Modifications and extension of approval of a vehicle type equipped with an AECD which has been approved to Part I of this Regulation

- 17.1. Every modification to the existing type of vehicle with regard to its AECD shall be notified to the Type Approval Authority which approved the vehicle type. The Type Approval Authority shall then either:

- (a) decide, in consultation with the manufacturer, that a new type approval is to be granted; or
- (b) apply the procedure contained in paragraph 17.1.1. (Revision) and, if applicable, the procedure contained in paragraph 17.1.2. (Extension).

17.1.1. Revision

When particulars recorded in the information documents of Annex 5 have changed and the Type Approval Authority considers that the modifications made are unlikely to have appreciable adverse effect, and that in any case the vehicle still meets the requirements, the modification shall be designated a "revision".

In such a case, the Type Approval Authority shall issue the revised pages of the information documents of Annex 5 as necessary, marking each revised page to show clearly the nature of the modification and the date of re-issue. A consolidated, updated version of the information documents of Annex 5, accompanied by a detailed description of the modification, shall be deemed to meet this requirement.

17.1.2. Extension

The modification shall be designated an "extension" if, in addition to the change of the particulars recorded in the information folder:

- (a) further inspections or tests are required; or
- (b) any information on the communication document (with the exception of its attachments) has changed; or
- (c) approval to a later series of amendments is requested after its entry into force.

17.2. Notice of confirmation, extension, or refusal of approval shall be communicated by the procedure specified in paragraph 15.3. above, to the Contracting Parties to the Agreement which apply this Regulation. In addition, the index to the information documents and to the test reports, attached to the communication document of Annex 2, shall be amended accordingly to show the date of the most recent revision or extension.

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

18. Conformity of production

18.1. 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).

18.2. 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.

19. Penalties for non-conformity of production

19.1. The approval granted in respect of a vehicle type pursuant to this Regulation may be withdrawn if the requirement laid down in paragraph 18.1. above is

not complied with or if the vehicle fails to pass the checks prescribed in paragraph 18.2. above.

- 19.2. If a Contracting 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".

20. Production definitively discontinued

If the holder of the approval completely ceases to manufacture a vehicle type approved in accordance with this Regulation, they 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".

21. Names and addresses of Technical Services responsible for conducting approval tests, and of Type Approval Authorities

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 when equipped with an AECD which has not been separately approved according to Part I of this Regulation

22. Definitions

For the purposes of Part III of this Regulation:

- 22.1. "*Type of vehicle*" with regard to its AECS means vehicles that do not differ in such essential respects as:
- (a) their manufacturer;
 - (b) the type of their AECS; or
 - (c) vehicle features which significantly influence the performances of the AECS.
- 22.2. "*AECS*" (Accident Emergency Call System) means an AECD not approved to Part I of this Regulation, when installed in a vehicle.
- 22.3. "*Multi-task display*" means a display on which more than one message can be shown simultaneously.

- 22.4. *"Total permissible mass"* means the vehicle's technically permissible maximum mass stated by the manufacturer.
- 22.5. *"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.
- 22.6. *"AECS information signal device"* means a device that provides information on the status of the emergency call transaction.
- 22.7. *"AECS warning signal device"* means a tell-tale that provides a failure indication of the AECD.
- 22.8. *"Control module"* means a component of an AECS designed to ensure the combined functioning of all components of the AECS.
- 22.9. *"AECS control"* means a hand-operated part of the AECS that enables the driver to manually generate the triggering signal.

23. Application for approval of a vehicle type equipped with an AECS

- 23.1. 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 their duly accredited representative.
- 23.2. A model of the information document is given in Annex 6 to this Regulation.
- 23.3. For each vehicle type equipped with an AECS, the application shall be accompanied by samples of vehicles representative of the type to be approved and where appropriate, samples of components, 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.

24. Approval

- 24.1. If the vehicle type submitted for approval in accordance with paragraph 23. above meets the requirements of paragraph 25. of this Regulation, approval shall be granted.

Before granting approval for a vehicle type, the competent authority shall ensure that all the parts listed in paragraph 7.6.1. are tested to Annex 7. If the AECS is fed by a power supply other than the back-up power supply described in paragraph 7.6.2., this power supply shall also be tested to Annex 7 to this Regulation.
- 24.2. 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.
- 24.3. 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.

- 24.4. 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:
 - 24.4.1. A circle surrounding the letter "E" followed by the distinguishing number of the country which has granted approval;
 - 24.4.2. 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 24.4.1.
- 24.5. The approval mark shall be clearly legible and be indelible.

25. Requirements

- 25.1. General
 - 25.1.1. The AECD installed in the vehicle shall not be of a type approved under Part I of this Regulation.
 - 25.1.2. 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 power source (if fitted) is charged.
 - 25.1.3. The installation of the AECD shall be such to obtain reception of the GNSS signal, and to access a PLMN.

The applicant shall provide the relevant information about the PLMN and GNSS receiver to which the AECS is intended.
 - 25.1.4. Upon reception of a triggering signal, the AECS shall send data and establish voice connection with the PSAP.

If the sending of data fails, then the AECS shall retry sending the data.

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

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

If the AECS is fitted, in accordance with paragraph 1.4., with GNSS receiver supporting at least three GNSS including GLONASS, GALILEO and GPS, and is able to receive and process SBAS signals, then the AECS shall comply with the requirements of paragraphs 25.3.1. to 25.3.10.

AECS compliance with respect to positioning capabilities shall be demonstrated by performing test methods described in Annex 8: Test methods for the navigation solutions. It shall be indicated in the communication document of Annex 3, paragraph 11.
- 25.3.1. 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 AECS setup for NMEA-0183 messages output shall be described in the operation manual.
- 25.3.2. The GNSS receiver as a part of the AECS shall be able to receive and process individual GNSS signals in L1/E1 band from at least three global navigation satellite systems, including GLONASS, GALILEO and GPS.
- 25.3.3. The GNSS receiver as a part of the AECS shall be able to receive and process combined GNSS signals in L1/E1 band from at least three global navigation satellite systems, including GLONASS, GALILEO, GPS and SBAS.
- 25.3.4. The GNSS receiver as a part of the AECS shall be able to provide positioning information in WGS-84 coordinate system.
- 25.3.5. The GNSS receiver shall be able to obtain a position fix at least every second.
- 25.3.6. Horizontal position error shall not exceed:
- (a) under open sky conditions: 15 m at confidence level 0.95 probability with a PDOP in the range from 2.0 to 2.5;
 - (b) in urban canyon conditions: 40 m at confidence level 0.95 probability with a PDOP in the range from 3.5. to 4.
- 25.3.7. The specified requirements for accuracy shall be provided:
- (a) at speed range from 0 to 140 km/h;
 - (b) linear acceleration range from 0 to 2 G.
- 25.3.8. Cold start time to first fix shall not exceed
- (a) 60 s for signal level down to minus 130 dBm;
 - (b) 300 s for signal level down to minus 140 dBm.
- 25.3.9. 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.
- 25.3.10. Sensitivity at receiver input shall be:
- (a) GNSS signals detection (cold start) do not exceed 3,600 s at signal level on the antenna input of the AECS of minus 144 dBm;
 - (b) GNSS signals tracking and navigation solution calculation is available for at least 600 sec s at signal level on the antenna input of the AECS of minus 155 dBm;
 - (c) 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 AECS of minus 150 dBm.
- 25.3.11. The testing procedures in Annex 8 to this Regulation can be performed either on the AECS unit including post processing ability or directly on the GNSS receiver as a part of the AECS.
- 25.4. Mean of access to PLMN
- The AECS shall be fitted with an embedded hardware allowing registration/authentication on, and access to a PLMN.
- 25.5. The installation of the AECS shall be such to receive a trigger signal during a severe vehicle impact. This shall be verified during the vehicle impact test described in this paragraph.

Upon receiving a trigger signal, the AECS shall perform an emergency call transaction. This shall be verified by one of the test methods described in Annex 9 to this Regulation.

- 25.5.1. Vehicles of category M₁ shall be subject to the following:
 - 25.5.1.1. Vehicles of category M₁ with a total permissible mass less than or equal to 2.5 tons and R-point height at or below 700 mm, verification of the trigger signal:
 - 25.5.1.1.1. when performing a collision of the vehicle according to Annex 3 of Regulation No. 94 (Frontal collision) and Annex 4 to Regulation No. 95; or
 - 25.5.1.1.2. In the case of the extension of type approvals to this Regulation, or in the case of the approval of vehicle types already approved to Regulations Nos. 94 or 95 prior the entry into force of this Regulation, when demonstrating with existing documentation (report, images, simulation data or equivalent) that during a Regulation No. 94 (Frontal collision) and Regulation No. 95 (Lateral collision) impact:
 - (a) a triggering signal was generated;
 - (b) the installation of AECS is not adversely affected by the impact to the vehicle.
 - 25.5.1.2. Vehicles of category M₁ with a total permissible mass less than or equal to 2.5 tons and R-point height above 700 mm, verification of the trigger signal:
 - 25.5.1.2.1. when performing a collision of the vehicle according to Annex 3 to Regulation No. 94 (Frontal collision), or
 - 25.5.1.2.2. In the case of the extension of type approvals to this Regulation, or in the case of the approval of vehicle types already approved to Regulations Nos. 94 or 95 prior the entry into force of this Regulation, when demonstrating with existing documentation (report, images, simulation data or equivalent) that during a Regulation No. 94 (Frontal collision) impact:
 - (a) a triggering signal was generated;
 - (b) the installation of AECS is not adversely affected by the impact to the vehicle.
 - 25.5.1.3. Vehicles of category M₁ with a total permissible mass above 2.5 tons and R-point height less than or equal to 700 mm, verification of the trigger signal:
 - 25.5.1.3.1. when performing a collision of the vehicle according to Annex 4 to Regulation No. 95 (Lateral collision), or
 - 25.5.1.3.2. in the case of the extension of type approvals to this Regulation, or in the case of the approval of vehicle types already approved to Regulations Nos. 94 or 95 prior the entry into force of this Regulation, when demonstrating with existing documentation (report, images, simulation data or equivalent) that during a Regulation No. 95 (Lateral collision) impact:
 - (a) a triggering signal was generated;
 - (b) the installation of AECS is not adversely affected by the impact to the vehicle.
 - 25.5.1.4. Vehicles of category M₁ with a total permissible mass above 2.5 tons and R-point height above 700 mm:

- 25.5.1.4.1. the manufacturer shall demonstrate with existing documentation (report, images, drawing or equivalent) that a triggering signal is available for the purpose of AECS.
- 25.5.2. Vehicles of category N₁ shall be subject to the following:
 - 25.5.2.1. Vehicles of category N₁ with a R-point height at or below 700 mm, verification of the trigger signal:
 - 25.5.2.1.1. when performing a collision of the vehicle according to Regulation No. 95 (Lateral collision), or
 - 25.5.2.1.2. In the case of the extension of type approvals to this Regulation, or in the case of the approval of vehicle types already approved to Regulations Nos. 94 or 95 prior the entry into force of this Regulation, when demonstrating with existing documentation (report, images, simulation data or equivalent) that during a Regulation No. 94 and Regulation No. 95 test:
 - (a) a triggering signal was generated;
 - (b) the installation of AECD is not adversely affected by the impact to the vehicle.
 - 25.5.2.2. Vehicles of category N₁ with a R-point height above 700 mm:
 - 25.5.2.2.1. the manufacturer shall demonstrate with existing documentation (report, images, drawing or equivalent) that a triggering signal is available for the purpose of AECS.
- 25.6. AECS control

The vehicle subject to approval shall be equipped with an AECS control

 - 25.6.1. 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.
 - 25.6.2. The AECS control shall be designed and/or placed in such a way that the risk of an inadvertent activation is reduced.
 - 25.6.3. If the AECS control is embedded into a multi-task display, its operation shall be possible with two deliberate actions or less.
 - 25.6.4. The AECS control functionality shall be subject to Annex 9, paragraph 1.
 - 25.6.5. It shall not be possible to deactivate the AECS by the means of HMI. A temporary deactivation function shall be permitted for the purpose of maintenance and repair.
- 25.7. AECS information and warning signal
 - 25.7.1. 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.
 - 25.7.2. The following information shall be provided regarding the status of the emergency call transaction when the AECS is automatically or manually activated:
 - (a) system is processing (emergency call is triggered, connection is being set up, data transmission is in progress or completed, or voice call is in progress);
 - (b) transmission failed (connection failed or data transmission failed).

This shall be verified by compliance with the provisions of Annex 9, respectively paragraphs 1. and 2.

25.7.3. A warning signal shall be provided in case of AECS internal malfunction. Visual indication of the AECS 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 (whichever is applicable).

25.7.3.1. The manufacturer shall provide the Type Approval Authority with an explanation and technical documentation which shows, in overall terms, how the malfunction indication strategy 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:

Table 3

Template of information for self-test function

<i>Item</i>		<i>Notes</i>
<i>Component</i>	<i>Failure type</i>	
AECS Control module	Internal failure	Internal failure means e.g. hardware failure, watch-dog, software checksum, software image integrity, ...
PLMN 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 module and the module.
	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 approval optional in this Regulation.
	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 (CCU)	Electrical connection	e.g. crash detection sensor system, triggering device, ...
	Internal failure	If not in good condition, then the automatic emergency call is not possible.
Power supply	Electrical connection	Back-up power supply is connected.
Subscriber Identity Module (SIM)	Not present	This item only applies if a removable SIM card is used.
Back-up power supply	The state of charge, threshold for warning at the discretion of the manufacturer	Failure if the state of charge is at a critical level according to the manufacturer.

25.7.3.2. Test procedure

Self-test function verification test

- 25.7.3.2.1. The following test shall be performed on an AECS on a representative arrangement of components.
- 25.7.3.2.2. Simulate a malfunction of the AECS 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.
- 25.7.3.2.3. Power the AECS up and verify that the AECS warning signal device illuminates.
- 25.7.3.2.4. Power the AECS down and restore it to normal operation.
- 25.7.3.2.5. Power the AECS up and verify that the AECS warning signal device does not illuminate or extinguishes shortly after illuminating initially.
- 25.8. Hands-free audio performance

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

 - 25.8.1. Subject to paragraph 1.5., this can 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 Nos. 94 and/or 95 whichever is relevant.

AECS compliance shall be checked based on ITU-T P.1140 06/15 with the following additions to paragraphs 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 shall 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 mode 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).
 - 25.8.2. Post-crash voice intelligibility shall be demonstrated by subjective testing in accordance with paragraph 25.8.3. after performing tests according to Regulations Nos. 94 and/or 95 whichever is relevant.
 - 25.8.3. Testing languages
 - 25.8.3.1. The languages used in the post-crash hands-free audio performance intelligibility test shall be those of one of the Contracting Parties as identified in the appendix of Annex 9 to this Regulation, with the sentences voiced in good, clear pronunciation. The language used for the testing shall be noted in the test report.
 - 25.8.3.2. The vehicle manufacturer shall demonstrate, through the use of documentation, compliance with all the other languages identified in the Appendix to Annex 9 to this Regulation. Any such documentation shall be appended to the test report.

- 25.8.3.3. 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.
- 25.9. Verification of AECS power supply performance
- 25.9.1. Before the impact test under Regulations Nos. 94 and/or 95 whichever is 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 (Regulations Nos. 94 and/or 95 whichever is relevant), taking into account the vehicle's power management strategy.
- 25.9.2. After the impact test under Regulations Nos. 94 and/or 95 whichever is relevant, the AECS power supply shall be able to supply power to the AECS. This may be verified by one of the methods described in Annex 9 to this Regulation.
- 25.10. Resistance to impact
- The AECS shall remain operational after impact. This shall be demonstrated according to Annex 7 and a verification of the MSD and HMI functionality according to paragraph 2. of Annex 9 to this Regulation.
- 25.10.1. The following AECS components shall be tested to Annex 7:
- (a) Control module;
 - (b) Communication module excluding microphones and loudspeakers;
 - (c) Back-up power supply (if fitted);
 - (d) Connectors⁶;
 - (e) Network access antenna.
- 25.10.2. If the applicant for approval so requests, the following AECS components may be tested to Annex 7 to this Regulation:
- (a) AECS warning signal device;
 - (b) Hands-free audio equipment (microphones and loudspeakers);
 - (c) AECS information signal device;
 - (d) Power supply other than back-up power supply mentioned in paragraph 25.10.1.;
 - (e) GNSS antenna;
 - (f) GNSS receiver.

⁶ Only connectors of 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.

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

- 26.1. Every modification to the existing vehicle type or of its AECS shall be notified to the Type Approval Authority which approved the vehicle type. The Type Approval Authority shall then either:
- (a) decide, in consultation with the manufacturer, that a new type approval is to be granted; or
 - (b) apply the procedure contained in paragraph 26.1.1. (Revision) and, if applicable, the procedure contained in paragraph 26.1.2. (Extension).
- 26.1.1. Revision
- When particulars recorded in the information documents of Annex 6 to this Regulation have changed and the Type Approval Authority considers that the modifications made are unlikely to have appreciable adverse effect, and that in any case the vehicle still meets the requirements, the modification shall be designated a "revision".
- In such a case, the Type Approval Authority shall issue the revised pages of the information documents of Annex 6 as necessary, marking each revised page to show clearly the nature of the modification and the date of re-issue. A consolidated, updated version of the information documents of Annex 6, accompanied by a detailed description of the modification, shall be deemed to meet this requirement.
- 26.1.2. Extension
- The modification shall be designated an "extension" if, in addition to the change of the particulars recorded in the information folder,
- (a) further inspections or tests are required; or
 - (b) any information on the communication document (with the exception of its attachments) has changed; or
 - (c) approval to a later series of amendments is requested after its entry into force.
- 26.2. Notice of confirmation, extension, or refusal of approval shall be communicated by the procedure specified in paragraph 25.3. above, to the Contracting Parties to the Agreement which apply this Regulation. In addition, the index to the information documents and to the test reports, attached to the communication document of Annex 3 to this Regulation, shall be amended accordingly to show the date of the most recent revision or extension.

27. Conformity of production

- 27.1. 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).
- 27.2. 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 25. above.

28. Penalties for non-conformity of production

- 28.1. The approval granted in respect of a vehicle type pursuant to this Regulation may be withdrawn if the requirement laid down in paragraph 27.1. above is not complied with or if the vehicle fails to pass the checks prescribed in paragraph 27.2. above.
- 28.2. If a Contracting 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".

29. Production definitively discontinued

If the holder of the approval completely ceases to manufacture a vehicle type approved in accordance with this Regulation, they shall so inform the authority which granted the approval. Upon receiving the relevant communication, that authority shall inform thereof the other Contracting 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".

30. Names and addresses of Technical Services responsible for conducting approval tests, and of Type Approval Authorities

The Contracting 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:

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

concerning²:

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 to Part I of Regulation No. XXX

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/no²

Hands-free audio equipment (micros and speakers): yes/no²

Back-up power supply: yes/no²

Network access device antenna: yes/no²

GNSS antenna: yes/no²

GNSS receiver: yes/no²

10. Component was tested according to the sled test of Annex 7:

AECD warning signal: yes/no²

Hands-free audio equipment (micros and speakers): yes/no²

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

² Strike out what does not apply.

Power supply other than back-up battery: yes/no²

AECD information signal device: yes/no²

GNSS antenna (when external to the AECD control module): yes/no²

GNSS receiver (when external to the AECD control module): yes/no²

Position and orientation of the components:

Back-up power supply performance was checked in accordance with paragraph 7.6.:
yes/no²

11. AECD was tested in accordance with Annex 8 (navigation solution): yes/no²
12. AECD was tested in accordance with paragraph 7.5. (information and warning signal): yes/no²
13. Position of the approval mark:
14. Reason(s) for extension (if applicable):
15. Approval granted/refused/extended/withdrawn²:
16. Place:
17. Date:
18. Signature:
19. 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:

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

concerning²:

Approval granted
Approval extended
Approval refused
Approval withdrawn
Production definitively discontinued

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

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. AECS information and warning signal: yes/no²
11. AECS was tested in accordance with Annex 8 (navigation solution): yes/no²
12. AECS was tested in accordance with paragraph 16.6.1. (pre-crash hands-free audio performance): yes/no²
13. Position of the approval mark:
14. Reason(s) for extension (if applicable):
15. Approval granted/refused/extended/withdrawn²:

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

² Strike out what does not apply.

16. Place:.....
17. Date:.....
18. Signature:
19. 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 3

Communication

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



issued by :

Name of administration:

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

concerning²: Approval granted
Approval extended
Approval refused
Approval withdrawn
Production definitively discontinued

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

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. AECS information and warning signal: yes/no²
11. AECS was tested in accordance with Annex 8 (navigation solution): yes/no²
12. AECS was tested in accordance with paragraph 25.8.1. (pre-crash hands-free audio performance):yes/no²
13. Position of the approval mark:
14. Reason(s) for extension (if applicable):
15. Approval granted/refused/extended/withdrawn²:

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

² Strike out what does not apply.

16. Place:.....
17. Date:.....
18. Signature:
19. 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 4

Information document on the type approval of an Accident 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 shall be indicated on the drawings:
10. Back-up power supply: yes/no¹
11. Internal crash control unit: yes/no¹

¹ Strike out what does not apply.

Annex 5

Information document on the type approval of a vehicle with regard to the installation of an Accident Emergency Call Device (AECD) of an approved type

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. AECD
 - 10.1. Type and general commercial description(s):
 - 10.2. Arrangement (indicate components included in delivery):
 - 10.3. Description of automatic triggering mechanism:
 - 10.4. Description of method(s) of attachment to the vehicle:
 - 10.5. Drawing(s) showing the position of the AECD:
 - 10.6. Type Approval Number (if relevant):
11. Approval procedure:
 - type approval: yes/no¹
 - extension of type approval to this Regulation yes/no¹
 - vehicle already approved to Regulations Nos. 94 or 95 prior the entry into force of this Regulation yes/no¹
12. Internal crash control unit: yes/no¹

¹ Strike out what does not apply.

Annex 6

Information document on the type approval of a vehicle with regard to Accident Emergency Call System (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. AECS
- 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 automatic triggering mechanism:
11. Approval procedure:
 - type approval: yes/no¹
 - extension of type approval to this Regulation yes/no¹
 - vehicle already approved to Regulations Nos. 94 or 95 prior the entry into force of this Regulation yes/no¹

¹ Strike out what does not apply.

Annex 7

Test method for resistance to mechanical impact

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., in accordance with paragraph 15.1.

2.2. The tested 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 ± 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 4 of this annex, and the total velocity change ΔV 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 ΔV 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, item 10.

Figure 1
Generic description of test pulses

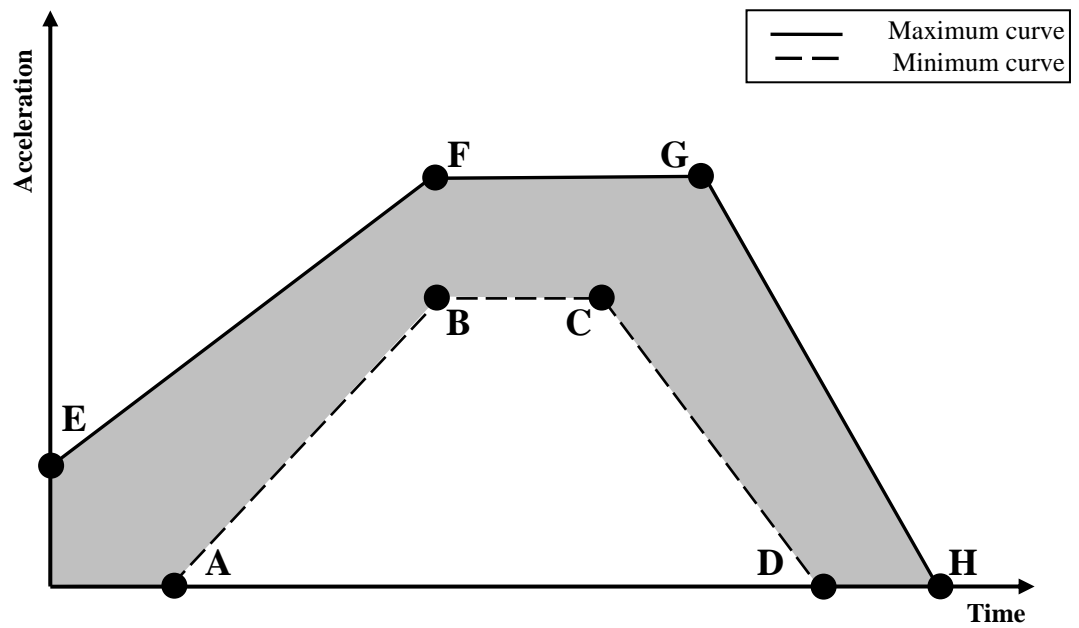


Table 4 for M₁ and N₁ vehicles:

Point	Time (ms)	Acceleration (g)
A	10	0
B	32	60
C	35	60
D	46	0
E	0	16
F	25	77
G	47	77
H	60	0

Annex 8

Test methods for the navigation solutions

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.

1. Test conditions
 - 1.1. The test object is the AECD/AECS, which includes a GNSS receiver and a GNSS antenna, specifying navigation characteristics and features of the tested system.
 - 1.1.1. The number of the AECD/AECS test samples shall be at least 3 pieces and the testing can be performed in parallel.
 - 1.1.2. The AECD/AECS is provided for the test with the installed SIM-card, operation manual and the software (provided on electronic media).
 - 1.1.3. The attached documents shall contain the following data:
 - (a) device serial number;
 - (b) hardware version;
 - (c) software version;
 - (d) device provider identification number;
 - (e) the relevant technical documentation to perform the tests.
 - 1.1.4. Tests are carried out in normal climatic conditions in accordance with standard ISO 16750-1:2006:
 - (a) air temperature (23 ± 5) °C; and
 - (b) relative air humidity of 25 per cent to 75 per cent.
 - 1.1.5. Tests of the AECD/AECS in respect of its GNSS receiver shall be performed with test and auxiliary equipment specified in Table 5.

Table 5

Recommended list of measurement instruments, test and auxiliary equipment

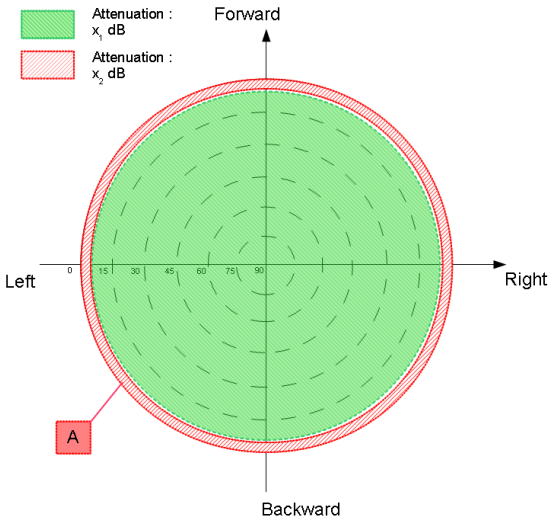
<i>Equipment name</i>	<i>Required technical characteristics of test equipment</i>	
	<i>Scale range</i>	<i>Scale accuracy</i>
Global navigation satellite system simulator of GLONASS, Galileo and GPS signals	Number of simulated signals: at least 18	Mean square deviation of random accuracy component of pseudo-range to GLONASS / Galileo / GPS satellites not more: - stadiometric code phase: 0.1 m; - communication carrier phase: 0.001 m; - pseudovelocity: 0.005 m/s.
Digital stopwatch	Maximum count volume: 9h 59 min. 59.99 s	Daily variation (at 25 ± 5 °C): not more + 1.0 s; Time discreteness: 0.01 s
Vector network analyzer	Frequency range: 300 kHz ... 4000 kHz Dynamic range: (minus 85 ... 40) dB	Accuracy F $1 \cdot 10^{-6}$ Accuracy D (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	Accuracy ± 0.5 dB
Attenuator 2	Dynamic range: (0 ... 110) dB	Accuracy ± 0.5 dB
Power source	Range of direct current voltage setting from 0.1 to 30 V Current intensity of output voltage at least 3 A	Accuracy V $\pm 3\%$ Accuracy A $\pm 1\%$

Note: It is allowed to apply other similar types of equipment providing determination of characteristics with the required accuracy.

- 1.1.6. 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	

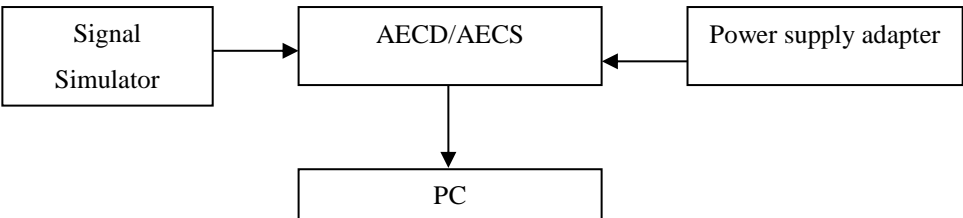


Open Sky plot - Attenuation:

	0 dB
Zone A	-100 dB or signal is switched off

- 2. Test procedures
- 2.1. NMEA-0183 messages output test.
- 2.1.1. Make connections according to Figure 2.

Figure 2
Diagram of test stand



- 2.1.2. 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).
- 2.1.3. Set up the simulator according to the simulator user guide. Initialize simulator script with the parameters, given in Table 6 for GLONASS, Galileo, GPS GNSS and SBAS signals.

Table 6

Main parameters of simulation script for static scenario

<i>Simulated parameter</i>	<i>Value</i>
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:	Standard predefined model by the GNSS simulator
Ionosphere:	Standard predefined model by the GNSS simulator
PDOP value	$2.0 \leq \text{PDOP} \leq 2.5$ in the test time interval
Simulated signals	<ul style="list-style-type: none"> - 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:	
<ul style="list-style-type: none"> - GNSS GLONASS; - GNSS Galileo; - GNSS GPS. 	<ul style="list-style-type: none"> minus 141 dBm; minus 135 dBm; minus 138.5 dBm.
Number of simulated satellites:	<ul style="list-style-type: none"> - at least 6 GLONASS satellites; - at least 6 Galileo satellites; - at least 6 GPS satellites; - at least 2 SBAS satellites.

- 2.1.4. 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 GGA¹ messages is set to "2".

¹ GGA is a protocol format of NMEA-0183 as specified in paragraphs 2.14. and 7.3.1.

- 2.1.5. Test results are considered successful if navigation information is compliant in all the AECD/AECS samples with the requirements defined in paragraphs 7.3.1. to 7.3.5., 16.3.1. to 16.3.5. or 25.3.1. to 25.3.5. of this Regulation.
- 2.1.6. The test of NMEA-0183 messages output and the assessment of the positioning accuracy in autonomous static mode can be combined.
- 2.2. Assessment of positioning accuracy in autonomous static mode.
- 2.2.1. Make connections according to Figure 2.
- 2.2.2. 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).
- 2.2.3. 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.
- 2.2.4. 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.
- 2.2.5. 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.
- 2.2.6. Extract coordinates: latitude (B) and longitude (L) contained in GGA (RMC) messages.
- 2.2.7. 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:

B_{truej} is the actual value of B coordinate in "j" time moment, in arc seconds;

$B(j)$ is the determined value of B coordinate in "j" time moment, by the GNSS receiver, arc 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.

- 2.2.8. 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.

- 2.2.9. Convert calculated coordinates and SD values of latitude and longitude determination from arc-seconds to meters according to formulas (4) to (5):

For latitude:

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

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

$$(4-3) \quad \Delta B(j, \mathcal{M}) = 2 \cdot \frac{a(1-e^2)}{(1-e^2 \sin^2 \varphi)^{3/2}} \cdot \frac{0,5'' \cdot \pi}{180 \cdot 3600''} \cdot \Delta B(j),$$

For longitude:

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

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

$$(5-3) \quad \Delta L(j, \mathcal{M}) = 2 \cdot \frac{a \cdot \cos \varphi}{\sqrt{1-e^2 \sin^2 \varphi}} \cdot \frac{0,5'' \cdot \pi}{180 \cdot 3600''} \cdot \Delta L(j),$$

Where:

a is the semi-major axis of ellipsoid, in m;

e is the first eccentricity;

φ is the determined value of latitude, in radian.

- 2.2.10. Calculate horizontal coordinates error according to formula (6) or linear errors for every measurement according to formula (7):

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

$$(7) \quad \Delta X(j, m) = \sqrt{\Delta B^2(j, m) + \Delta L^2(j, m)}$$

- 2.2.11. Repeat test procedures according to paragraphs 2.2.3. to 2.2.10. only for GLONASS GNSS signals with simulation parameters, given in Table 5.
- 2.2.12. Repeat test procedures according to paragraphs 2.2.3. to 2.2.10. only for GPS GNSS signals with simulation parameters, given in Table 5.
- 2.2.13. Repeat test procedures according to paragraphs 2.2.3. to 2.2.10. for Galileo GNSS signals with simulation parameters, given in Table 5.
- 2.2.14. Repeat test procedures according to paragraphs 2.2.3. to 2.2.10. with other AECD/AECS samples, provided for the test.
- 2.2.15. Determine average values according to formula (6) obtained for all tested AECD/AECS samples.
- 2.2.16. Tests results are considered satisfactory if at least one of the following conditions is satisfied:
- (a) horizontal position errors as defined by formula (6) obtained with all AECD/AECS samples do not exceed 15 m under open sky conditions for all simulation scripts; or
 - (b) linear errors for every measurement as defined by formula (7) obtained with all AECD/AECS samples do not exceed 15 m under open sky conditions for all simulation scripts for at least 95 per cent of all measurements.
- 2.3. Assessment of positioning accuracy in autonomous dynamic mode.
- 2.3.1. Repeat test procedures described in paragraph 2.2., but paragraphs 2.2.11. to 2.2.13. with simulation script for manoeuvring movement given in Table 7.

Table 7

Main parameters of simulation script for manoeuvring movement

<i>Simulated parameter</i>	<i>Value</i>
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; - turn acceleration, m/s ²	Manoeuvring movement: 140 500 0.2
Troposphere: Ionosphere:	Standard predefined model by the GNSS simulator. Standard predefined model by the GNSS simulator.
PDOP value	$2.0 \leq \text{PDOP} \leq 2.5$ 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.

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

2.3.3. Tests results are considered satisfactory if at least one of the following conditions is satisfied:

- (a) horizontal position errors as defined by formula (6) obtained with all AECD/AECS samples do not exceed 15 m under open sky conditions for all simulation scripts; or
- (b) linear errors for every measurement as defined by formula (7) obtained with all AECD/AECS samples do not exceed 15 m under open sky conditions for all simulation scripts for at least 95 per cent of all measurements.

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

2.4.1. Repeat test procedures described in paragraph 2.3. for simulation script for movement in shadow areas and areas of intermittent reception of navigation signals (Table 8) with an urban canyon signal pattern described in Figure 3.

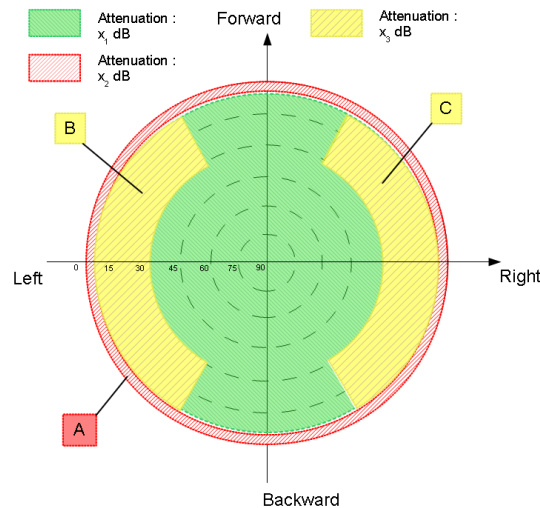
Table 8

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

<i>Simulated parameter</i>	<i>Value</i>
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.
Model of movement: - speed, km/h; - turn radius, m; - turn acceleration, m/s ²	Manoeuvring 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	$3.5 \leq \text{PDOP} \leq 4$ 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	



Urban canyon plot attenuation:

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

2.4.2. Tests results are considered satisfactory if at least one of the following conditions is satisfied:

- (a) horizontal position errors obtained as defined by formula (6) with all AECD samples do not exceed 40 m in urban canyon conditions for all simulation scripts; or
- (b) linear errors for every measurement as defined by formula (7) obtained with all AECD/AECS samples do not exceed 40 m under open sky conditions for all simulation scripts for at least 95 per cent of all measurements.

2.5. Cold start time to first fix test.

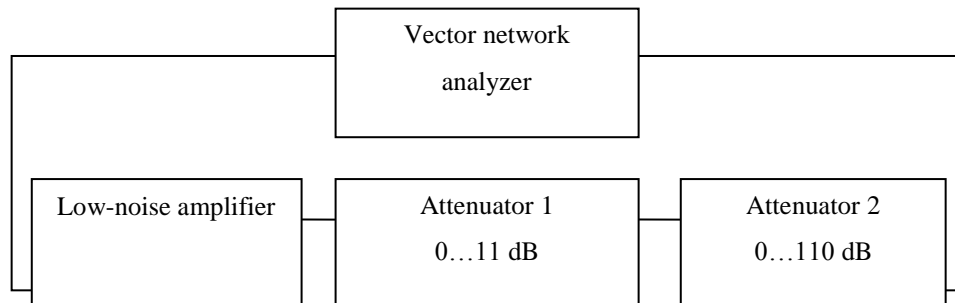
2.5.1. Prepare and turn on the AECD/AECS. By means of developer software make sure that GNSS module is set to receive GNSS GLONASS, Galileo and GPS signals.

- 2.5.2. Delete all position, velocity, time, almanac and ephemeris data from the GNSS receiver.
- 2.5.3. 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.
- 2.5.4. By means of a stop watch measure time interval between signal simulation start and the first navigation solution result.
- 2.5.5. Conduct test procedures according to paragraphs 2.5.2. to 2.5.4. at least 10 times.
- 2.5.6. Calculate average time to first fix in cold start mode based on measurements for all AECD/AECS samples, provided for the test.
- 2.5.7. The test result is considered to be positive, if average values of time to first fix, calculated as described in paragraph 2.5.6. do not exceed 60 s for signal level down to minus 130 dBm for all the simulated signals.
- 2.5.8. Repeat test procedure according to paragraphs 2.5.1. to 2.5.5. with signal level minus 140 dBm.
- 2.5.9. The test result according to paragraph 2.5.8. is considered to be positive, if average values of time to first fix calculated as described in paragraph 2.5.6. of this annex are compliant in all the AECD/AECS samples with the requirements defined in paragraph 7.3.8., 16.3.8. or 25.3.8. of this Regulation.
- 2.6. Test of re-acquisition time of tracking signals after block out of 60 s.
- 2.6.1. 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.
- 2.6.2. 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.
- 2.6.3. Wait for 15 minutes and make sure the GNSS receiver has calculated AECD/AECS position.
- 2.6.4. 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.
- 2.6.5. Repeat test procedure according to paragraph 2.6.4. at least 10 times.
- 2.6.6. 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.
- 2.6.7. The test result is considered to be positive, if average values measured in paragraph 2.6.6. of this annex are compliant in all the AECD/AECS samples with the requirements defined in paragraph 7.3.9., 16.3.9. or 25.3.9. of this Regulation.
- 2.7. Test of GNSS receiver sensitivity in cold start mode, tracking mode, and re-acquisition scenario.
- 2.7.1. Turn on the vector network analyser. Calibrate the network vector analyser according to its operational manual.

2.7.2. Set up the diagram according to Figure 4.

Figure 4

Diagram of path calibration

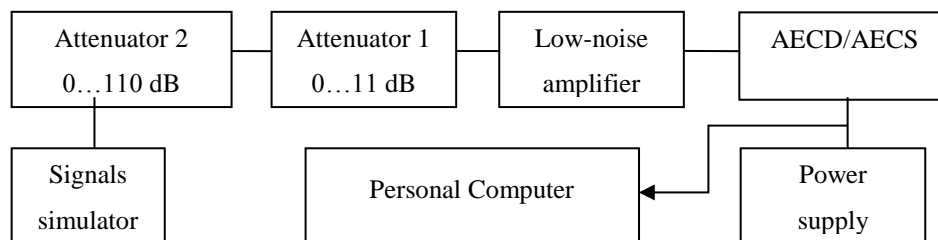


2.7.3. Set zero signal path attenuation on attenuators. Measure the frequency response for a given signal path in the L1/E1 band of GNSS GLONASS/Galileo/GPS. Record the average path transmission factor in [dB] in this frequency band.

2.7.4. Assemble the circuit shown in Figure 5.

Figure 5

Arrangement for evaluation of GNSS module sensitivity



2.7.5. 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 RAM² 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.

2.7.6. 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.

2.7.7. By means of a stopwatch, measure time interval between signal simulation start and the first navigation solution result.

2.7.8. Set the signal path attenuation on attenuators such that the signal on AECD/AECS antenna input is equal to minus 155 dBm.

² RAM means "Random Access Memory".

- 2.7.9. By means of a stopwatch, verify that AECD/AECS still provides navigation solution for at least 600 s.
- 2.7.10. Set the signal path attenuation on attenuators such that the signal on AECD/AECS antenna input is equal to minus 150 dBm.
- 2.7.11. Disconnect the GNSS antenna cable from the AECD/AECS and connect it again after time interval of 20 s.
- 2.7.12. By means of stopwatch, determine time interval between cable connection moment and restoration of satellites tracking and calculation of the navigation solution.
- 2.7.13. The test result is considered to be positive, if the values measured in paragraphs 2.7.7., 2.7.9. and 2.7.12. of this annex are compliant in all the AECD/AECS samples with the requirements defined in paragraph 7.3.10., 16.3.10. or 25.3.10. of this Regulation.

Annex 9

Test method for AECD/AECS post-crash performance

The test methods indicated below shall apply as alternatives to each other.

Table 9

Post-crash testing

Test method	Pre-crash functional check	Post-crash functional check
1	Manual triggering	Functional check using over the air transmission for MSD and voice call via a real PLMN.
2		Functional check using over the air transmission for MSD and voice call via a network simulator.
3		Functional check using a wired connection to a network simulator.
4		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.

1. Pre-crash assessment of AECS operation:
The Technical Service shall verify at least that emergency call process is initiated after operation of the AECS control.
2. Post-crash assessment of the AECS operation shall include the following:
 - 2.1. The MSD emission assessment shall include the verification of at least the following:
 - 2.1.1. Vehicle location data is transmitted correctly, and
 - 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, and
 - 2.2.3. The language and sentence used for the test shall be one of those listed in the Appendix 1 to this annex.
 - 2.3. HMI operation assessment shall include a verification of the emergency call status indication operation. At least the following status shall be observed:
 - (a) system is processing (accident emergency call is triggered, connection is being set up or data transmission is in progress or completed or voice call is in progress);
 - (b) 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.

2.4. In case of test method 3 additionally the following mobile network antenna and mobile network antenna wire check shall be carried out:

- (a) 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;
- (b) 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.

Annex 9 - Appendix

Language and sentences for hands-free voice assessment

Test sentence pairs in the language most commonly spoken by the testers shall be selected from the list below and shall be used for the exchange of test messages in the send and receive directions.

Test sentences: Only languages relevant for Contracting Parties signing this Regulation are relevant.

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.

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.

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.

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.

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.

German

Female 1:

Zarter Blumenduft erfüllt den Saal.

Wisch den Tisch doch später ab.

Female 2:

Sekunden entscheiden über Leben.

Flieger 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.

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.

Flieger lockt nicht nur die Bienen.

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.

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 jussinhou 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。

Igisujin wa ameno nakawo heikide nurete arukimasu.

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.

Spanish (American)

Female 1:

No arroje basura a la calle.

Ellos quieren dos manzanas rojas.

Female 2:

No cocinaban tan bien.

Mi afeitadora afeitó 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.

Russian

Female 1:

Если хочешь быть здоров, советует Татьяна Илье, /чисть зубы пастой «Жемчуг»!

Esli hochesh' byt' zdorov, sovetuet Tatyana Ilye, /chis't' zuby pastoj "Zhemchug"

Вчера на Московском заводе малолитражных автомобилей состоялось собрание молодежи

Vchera na Moskovskom zavode malolitrzhnyh avtomobilej sostoyalos' sobranie molodezhi.

Female2:

В клумбах сочинской здравницы «Пуща», сообщает нам автоинспектор, /обожгли шихту.

V klumbah sochinskoj zdravnitsy "Puscha", soobschaet nam avtoinspektor, /obozhgli shihtu.

Тропический какаду – это крупный попугай? /ты не злословишь?

Tropichesky kakadu – eto krupnyj popugaj? /ty ne zloslovish'?

Male 1:

Актеры и актрисы драматического театра /часто покупают в этой аптеке антибиотики.

Aktery i aktrisy dramaticheskogo teatra /chasto pokupayut v etoj apteke antibiotiki.

Нам с вами сидеть и обсуждать эти слухи некогда!

Nam s vami sidet' i obsuzhdat' eti sluhi nekogda

Male2:

Так ты считаешь, что техникой мы обеспечены на весь сезон?

Tak ty schitaesh, shto tehnikoj my obespecheny na ves' sezon?

Раз. Эти жирные сазаны ушли под палубу.

Raz. Eti zhirnye sazany ushli pod palubu.

Korean

Female 1:

어린이는 세상의 미래입니다.

Eorini neun sesang ui mirae ipnida

우리의 얼굴은 남의 것입니다.

Uri ui eolgul eun nam ui geo ipnida

Female 2:

독서는 마음의 양식입니다.

Dokseo neun maeum neun yangsik ipnida

인간의 가치는 지식을 어떻게 활용 하느냐에 따라 달라집니다.

Ingan ui gachi neun jisik eul eotteoge whalyong haneunaae ddara dalra jipnida.

Male 1:

행복은 나부터 시작됩니다.

Haenguk eun na butteo sijak doebnida

지금 순간이 나에게는 가장 소중한 시간입니다

Gieum sungani na egeneun gajang sojung han sigan ipnida

Male 2:

기회는 새와 같습니다.

Gihoe neun se wa gatseubnida

시련이 있어야 삶이 풍요로워 집니다.

Siryeon i isseoya salmi pungyorowo jipnida

Annex 10

Definition of Minimum Set of Data (MSD)

The following table lists the Minimum Set of Data (MSD) that shall be conveyed during the emergency data transmission to the PSAP.

Table 10

Minimum set of data (MSD) to be conveyed to PSAP

<i>Short Name of MSD Element</i>	<i>Description</i>
Automatic activation	Indicates whether a call was automatically or manually triggered.
Test call	Indicates whether the call is a test call or a real emergency call.
Position can be trusted	Indicates whether the position given in the position elements can be trusted or has only low confidence.
Vehicle type	Provides a vehicle type.
VIN	Vehicle Identification Number.
Vehicle propulsion storage type	Provides the propulsion type of the vehicle.
Time stamp	Timestamp of the initial data message generation within the current accident emergency call incident event.
Position latitude	The last known vehicle Latitude position determined at the latest moment possible before message generation.
Position longitude	The last known vehicle Longitude position determined at the latest moment possible before message generation.
Vehicle direction	The vehicle's last known real direction of travel determined at the latest moment possible before message generation.