European Union Aviation Safety Agency

Notice of Proposed Amendment 2020-03

Amendment of the requirements for flight recorders and underwater locating devices

Certification specifications, acceptable means of compliance, and guidance material for locating an aircraft in distress

RMT.0400 (OPS.090)

EXECUTIVE SUMMARY

The objective of this Notice of Proposed Amendment (NPA) is to facilitate the implementation of CAT.GEN.MPA.210 ‘Location of an aircraft in distress — Aeroplanes’ of Annex IV (Part-CAT) to Regulation (EU) No 965/2012 (the ‘Air OPS Regulation’).

This NPA proposes to amend the certification specifications (CSs), acceptable means of compliance (AMC), and guidance material (GM) to support the implementation of CAT.GEN.MPA.210. The scope of this NPA includes air operations (Air OPS), initial airworthiness, and air traffic management (ATM).

The proposed amendments are expected to increase safety as they will facilitate locating an accident scene, which will increase the chances of rescuing accident survivors and accelerate the collection of evidence, necessary for determining the accident causes. In addition, this rulemaking proposal is expected to ensure consistency with the existing requirements for flight recorders and emergency locator transmitters (ELTs), as well as low-frequency underwater locating devices (ULDs) (8.8 kHz).

Action area: Aircraft tracking, rescue operations, and accident investigation

Affected rules:
- Air OPS: AMC & GM to Annex I (Definitions), Annex IV (Part-CAT), Annex VI (Part-NCC), Annex VII (Part-NCO), and Annex VIII (Part-SPO) to the Air OPS Regulation.
- Initial airworthiness: CS-MMEL
- ATM/ANS: AMC & GM to Annex VIII (Part-CNS) to Regulation (EU) 2017/373 (the ‘ATM-ANS Regulation’), CS-ACNS

Affected stakeholders: Aircraft operators, design organisation approval (DOA) holders, ATM/ANS providers

Driver:	Safety	**Rulemaking group:**	No
Impact assessment:	Light	**Rulemaking Procedure:**	Standard

Table of contents

1. About this NPA

1.1. How this NPA was developed

The European Union Aviation Safety Agency (EASA) developed this NPA in line with Regulation (EU) 2018/1139[1] (the 'Basic Regulation') and the Rulemaking Procedure[2]. This rulemaking activity is included in the European Plan for Aviation Safety (EPAS) 2020-2024 under rulemaking task (RMT).0400 (OPS.090). The text of this NPA has been developed by EASA. It is hereby submitted to all interested parties[3] for consultation.

1.2. How to comment on this NPA

Please submit your comments using the automated **Comment-Response Tool (CRT)** available at **http://hub.easa.europa.eu/crt/**[4].

The deadline for submission of comments is **17 April 2020**.

1.3. The next steps

Following the closing of the public commenting period, EASA will review the comments received.

Based on the comments received, EASA will develop decisions that amend the acceptable means of compliance (AMC) and guidance material (GM) to Regulation (EU) No 965/2012[5] (the 'Air OPS Regulation'), the AMC and GM to Regulation (EU) 2017/373[6] (the 'ATM/ANS Regulation'), the Certification Specifications and Guidance Material for Master Minimum Equipment List (CS-MMEL), and the Certification Specifications and Acceptable Means of Compliance for Airborne Communications, Navigation and Surveillance (CS-ACNS).

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1 Regulation (EU) 2018/1139 of the European Parliament and of the Council of 4 July 2018 on common rules in the field of civil aviation and establishing a European Union Aviation Safety Agency, and amending Regulations (EC) No 2111/2005, (EC) No 1008/2008, (EU) No 996/2010, (EU) No 376/2014 and Directives 2014/30/EU and 2014/53/EU of the European Parliament and of the Council, and repealing Regulations (EC) No 552/2004 and (EC) No 216/2008 of the European Parliament and of the Council and Council Regulation (EEC) No 3922/91 (OJ L 212, 22.8.2018, p. 1) (https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1535612134845&uri=CELEX:32018R1139).

2 EASA is bound to follow a structured rulemaking process as required by Article 115(1) of Regulation (EU) 2018/1139. Such a process has been adopted by the EASA Management Board (MB) and is referred to as the 'Rulemaking Procedure'. See MB Decision No 18-2015 of 15 December 2015 replacing Decision 01/2012 concerning the procedure to be applied by EASA for the issuing of opinions, certification specifications and guidance material (http://www.easa.europa.eu/the-agency/management-board/decisions/easa-mb-decision-18-2015-rulemaking-procedure).

3 In accordance with Article 115 of Regulation (EU) 2018/1139 and Articles 6(3) and 7 of the Rulemaking Procedure.

4 In case of technical problems, please contact the CRT webmaster (crt@easa.europa.eu).

5 Commission Regulation (EU) No 965/2012 of 5 October 2012 laying down technical requirements and administrative procedures related to air operations pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (OJ L 296, 25.10.2012, p. 1) (https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1573482144115&uri=CELEX:32012R0965).

6 Commission Implementing Regulation (EU) 2017/373 of 1 March 2017 laying down common requirements for providers of air traffic management/air navigation services and other air traffic management network functions and their oversight, repealing Regulation (EC) No 482/2008, Implementing Regulations (EU) No 1034/2011, (EU) No 1035/2011 and (EU) 2016/1377 and amending Regulation (EU) No 677/2011 (OJ L 62, 8.3.2017, p. 1) (https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1575031513290&uri=CELEX:32017R0373).

The comments received on this NPA and the EASA responses to them will be reflected in a comment-response document (CRD). The CRD will be published on the EASA website[7] as an appendix to the decisions.

7 https://www.easa.europa.eu/document-library/comment-response-documents

2. In summary — why and what

2.1. Why we need to change the rules — issue/rationale

CAT.GEN.MPA.210 ('Location of an aircraft in distress') was laid down in Regulation (EU) 2015/2338 amending Regulation (EU) No 965/2012; however, the AMC & GM to CAT.GEN.MPA.210 have not yet been issued. In addition, EASA identified that amendments to CS for airborne communication, navigation and surveillance (CS-ACNS) are necessary to facilitate the implementation of CAT.GEN.MPA.210.

Furthermore, EASA identified that the AMC & GM on emergency locator transmitters (ELTs) to the Air OPS Regulation need to be amended so that new types of ELTs may be used.

Safety recommendations within the scope of this RMT are presented in Chapter 4, Section 4.1.3 of this NPA.

There are no exemptions[8] in accordance with Article 70 'Safeguard provisions' or Article 71 'Flexibility provisions' and/or Article 76 'Agency measures' of the Basic Regulation, which are pertinent to the scope of this RMT.

No alternative means of compliance (AltMoC) are pertinent to the scope of this RMT.

For International Civil Aviation Organization (ICAO) and third-country references relevant to the scope of this RMT, see Section 4.4.4 of this NPA.

2.2. What we want to achieve — objectives

The overall objectives of the EASA system are defined in Article 1 of the Basic Regulation. This proposal will contribute to the achievement of the overall objectives by addressing the issues outlined in Section 2.1.

The main specific objective of this proposal is to ensure that industry implements solutions to comply with CAT.GEN.MPA.210 so that:

— any solution is at least as effective as the current system, which is based on ELTs and the international COSPAS-SARSAT programme for providing information to rescue coordination centres (RCCs) and search and rescue points of contact (SPOC), in order not to degrade the survivability of accidents to aeroplanes;

— wherever an accident that requires SAR operations occurs to an aeroplane within the scope of CAT.GEN.MPA.210, these SAR operations are accurately and quickly directed to the accident site;

[8] Exemptions having an impact on the development of this RMT content and referring to:
- — Article 70(1): measures taken as an immediate reaction to a safety problem;
- — Article 71(1): limited in scope and duration exemptions from substantive requirements laid down in the Basic Regulation and its implementing rules in the event of urgent unforeseeable affecting persons or urgent operational needs of those persons;
- — Article 71(3): derogation from the rule(s) implementing the Basic Regulation where an equivalent level of protection to that attained by the application of the said rules can be achieved by other means; and
- — Article 76(7): Individual flight time specifications schemes deviating from the applicable certification specifications which ensure compliance with essential requirements and, as appropriate, the related implementing rules.

— wherever an accident occurs to an aeroplane within the scope of CAT.GEN.MPA.210, the aeroplane or its wreckage is quickly located in order to retrieve evidence and identify accident causes without significant delay;

— EASA Member States save resources and reduce the exposure to risk of their SAR units when those SAR units are searching for the aeroplane and its occupants;

— the introduction of a solution has no adverse impact on the workload of RCCs/SPOC and air traffic service (ATS) units and this solution is compatible with their current legal responsibilities; and

— the introduction of a solution has no adverse impact on other users of the international COSPAS-SARSAT programme (helicopters, ships, individuals carrying portable locator beacons).

Another specific objective of this proposal is to ensure consistency across CSs, AMC and GM applicable to the location of an aircraft in distress, flight recorders, ELTs, and ULDs.

2.3. How we want to achieve it — overview of the proposals

CAT.GEN.MPA.210 is a performance-based rule as it does not prescribe any particular solution or technology.

According to this rule, performance objectives were defined and consolidated through the following three workshops:

— an 'end-users' workshop that gathered 12 representatives of SAR and investigation authorities and took place on 12 (face-to-face meeting) and 23 (follow-up teleconference) July 2018;

— an 'enablers' workshop that gathered 21 representatives of aircraft manufacturers, equipment manufacturers, and communication service providers on 10 September 2018 (face-to-face meeting); and

— an 'OPS' webinar that gathered 14 representatives of aircraft manufacturers and aircraft operators on 14 November 2018 (two teleconferences).

From these performance objectives, technical conditions were derived. There are two types of technical conditions:

technical conditions that are applicable to all types of solutions ('common technical conditions'); and

technical conditions that specifically apply to three types of solutions considered mature at the time of issuance of this NPA ('specific technical conditions').

The common technical conditions and the specific technical conditions were then transposed into AMC to CAT.GEN.MPA.210 and CSs. While being the fundation of the amendments proposed in Chapter 3, the performance objectives do not appear there. The performance objectives are part of Option 2, which is presented in Section 4.3 of this document.

2.4. What are the expected benefits and drawbacks of the proposals

The expected benefits and drawbacks of the proposal are summarised below. For the full impact assessment of alternative options, please refer to Chapter 4.

The proposal provides for technical conditions that address all aspects of the location of an aircraft in distress. Solutions meeting these technical conditions are expected to be robust and allow to locate the point of end of flight with an accuracy that is sufficient for SAR and safety investigation authorities. In addition, the technical conditions do not prescribe a particular technology, while permitting the use of solutions based on ELTs. As the technical conditions are not technology-prescriptive, they will need limited adjustment, should a new technology emerge that meets the intended purpose of CAT.GEN.MPA.210.

By reducing the time to locate an accident site, the proposal also reduces the economic burden on EASA Member States caused by extended SAR operations and/or underwater search operations. In addition, the cost impact on industry is expected to be low as CAT.GEN.MPA.210 is only applicable to aeroplanes first issued with an individual certificate of airworthiness (CofA) on or after 1 January 2023, so that aircraft manufacturers will probable install solutions meeting CAT.GEN.MPA.210 before first delivery of the aeroplanes concerned.

3. Proposed amendments and rationale in detail

The text of the amendment is arranged to show deleted, new or amended and unchanged text as follows:

— deleted text is ~~struck through~~;

— new or amended text is highlighted in blue;

— an ellipsis '[…]' indicates that the rest of the text is unchanged.

3.1. General approach to the definition of CSs, AMC and GM

The proposed CSs, AMC and GM in this Chapter were developed following a top-down approach, from the high-level specific objectives of this RMT, to common performance objectives (CPOs), to common technical conditions and specific technical conditions (see Section 2.2).

There are 23 CPOs, which are presented in Appendix 3 to this NPA.

The common technical conditions are defined in a new section of CS-ACNS (conditions applicable to the airborne system), in AMC to CAT.GEN.MPA.210 (conditions applicable to the operator), and in AMC to CNS.OR.100 of the ATM/ANS Regulation (conditions applicable to the provider of the transmission service).

In addition, specific technical conditions are defined for solutions based on technologies that are considered mature at the time of issuance of this NPA, namely the automatic deployable flight recorder (ADFR), the ELT of a distress tracking type ('distress tracking ELT' or 'ELT(DT)') and high-rate tracking (HRT). These specific technical conditions are expected to provide easier means to comply with CAT.GEN.MPA.210. These specific technical conditions are also included in the new section of CS-ACNS.

This is in detail the top-down approach followed:

(a) Define the high-level specific objectives of this RMT (see Section 2.2).

(b) Define the CPOs necessary to meet the specific objectives of this RMT and to comply with CAT.GEN.MPA.210 (e.g. the means must be 'robust', 'accurately locate the point of end of flight' etc.).

(c) Derive from the CPOs common technical conditions that any solution should fulfill to meet the CPOs.

(d) Derive from the CPOs specific technical conditions for solutions based on an ELT(DT), ADFR or HRT.

(e) If a technical condition addresses an aspect of the airborne system, draft a corresponding certification certification in CS-ACNS. If a technical condition addresses an aspect related to the provider of the service transmitting the data to the ground, draft corresponding AMC & GM to the ATM/ANS Regulation. If a technical condition addresses any other aspect, draft corresponding AMC & GM to CAT.GEN.MPA.210.

(f) Amend the AMC & GM to the Air OPS Regulation that address the carriage of ELTs, where this is necessary to allow the use of new types of ELTs (such as an ELT(DT)).

3.2. Draft acceptable means of compliance and guidance material (Draft EASA decision)

3.2.1. Draft AMC/GM to Definitions

GM1 Annex I Definitions

DEFINITIONS FOR TERMS USED IN ACCEPTABLE MEANS OF COMPLIANCE AND GUIDANCE MATERIAL

[…]

(g) 'Emergency locator transmitter' is a generic term describing equipment that broadcasts distinctive signals on designated frequencies and~~, depending on application, may be activated by impact or may be manually activated~~ may be activated by various conditions (e.g. manual activation, automatic distress detection, impact detection, immersion detection, etc.)

[…]

Rationale

For some types of ELT (automatic deployable ELT, distress tracking ELT), there are other conditions that may activate the ELT than just manual activation or impact detection.

GM2 Annex I Definitions

ABBREVIATIONS AND ACRONYMS

[…]

ELT	emergency locator transmitter
ELT(AD)	emergency locator transmitter (automatically deployable)
ELT(AF)	emergency locator transmitter (automatic fixed)
ELT(AP)	emergency locator transmitter (automatic portable)
ELT(DT)	emergency locator transmitter (distress tracking)
ELT(S)	survival emergency locator transmitter

[…]

Rationale

The ELT(DT) is a new type of ELT designed to be activated prior to a crash upon detection of a distress condition. Requirements applicable to the ELT(DT) are proposed in draft ETSO-C126c (refer to NPA 2019-06).

3.2.2. Draft AMC & GM to Part-CAT

SUBPART A: GENERAL REQUIREMENTS

AMC1 CAT.GEN.MPA.210 Location of an aircraft in distress — Aeroplanes

PERFORMANCE AND PROCEDURES

(a) Performance of the airborne system

The airborne system used to comply with CAT.GEN.MPA.210 (the 'system') should:

(1) be approved in accordance with the applicable airworthiness requirements; and

(2) comply with the Certification Specifications — Airborne Communications, Navigation and Surveillance (CS-ACNS) issued by EASA, or equivalent.

(b) Transmission service

(1) If the system relies on ELTs for transmitting information sufficient to comply with CAT.GEN.MPA.210, the operator should ensure that the international COSPAS-SARSAT programme meets the following:

(i) the data corresponding to ELT signals transmitted by the system is automatically made available to the ATS unit providing the alerting service in the airspace where the aircraft is indicated to be by this data (the 'relevant ATS unit'); and

(ii) the time from receipt of ELT data by a local user terminal (LUT) to making the corresponding data available to the relevant ATS unit does not exceed 15 minutes, with a probability of 95 %.

(2) If the system relies on other equipment than ELTs for transmitting information sufficient to comply with CAT.GEN.MPA.210:

(i) this equipment should use a transmission service provided by a surveillance provider that is certified in accordance with the ATM/ANS Regulation; and

(ii) the communication infrastructure used by the transmission service that is designated in accordance with (i) should satisfy the assumptions about performance of the communication infrastructure (as a minimum the assumptions regarding availability, integrity, and coverage) that were part of the approval of the system installation.

(c) Flight crew procedures

The operator should establish flight crew procedures for using the system, including manual activation and manual deactivation of the system. These procedures should require manual activation only when the flight crew needs to declare a state of emergency to the ATS, and they should highlight the implications of unjustified manual activation for search and rescue authorities.

(d) Handling of a potential distress situation

(1) The operational control over the flights should include procedures for assessing whether an aircraft is likely to be in a distress situation and informing without delay the relevant ATS unit.

(2) If the operator can remotely deactivate the system, it should only use this capability when it has established with certainty that the aircraft is not in a distress situation.

(e) Limiting the effects of undesirable system activation

The operator should establish procedures for informing without delay the relevant ATS unit(s) when an aircraft on which the system is activated is not in a distress situation (e.g. in the case of nuisance activation of the system or successful recovery from a distress situation). In addition, to reduce the frequency and effects of undesirable system activation, the operator should:

(1) establish procedures for disabling the system after completion of the flight;

(2) consider the system inoperative if nuisance activation occurs several times during a flight or if the system is disabled because of nuisance activation; and

(3) analyse undesirable system activation to determine the probable cause, and retain records of such analyses for at least 12 months.

Rationale

Draft AMC1 CAT.GEN.MPA.210 addresses the following aspects:

(a) Performance of the airborne system

AMC1 CAT.GEN.MPA.210 specifies that the system is approved in accordance with the applicable airworthiness requirement (depending on the approval process, this could for instance be CS-ETSO or CS-25). In addition, it specifies that the system should be as defined in CS-ACNS, where a new section on the location of an aircraft in distress and emergency location is proposed (see Section 3.3.2 of this NPA). As CAT.GEN.MPA.210 is only applicable to aeroplanes first issued with an individual CofA on or after 1 January 2023, it is expected that in most cases, such airborne systems will be installed and approved before first delivery of the aircraft concerned.

(b) Transmission service

The transmission service transmits the data related to activation and deactivation from the airborne system to the competent stakeholders and stores that data (a definition of the transmission service is provided in GM2 CAT.GEN.MPA.210), including:

— detection of signals sent by the airborne system;

— processing of those signals into data through a communication infrastructure;

— sending the data to the RCC or SPOC responsible for the area where the aeroplane is indicated to be by the data (the ‘competent SAR centre’) and making this data available to the ATS unit providing the alerting service in the area where the aeroplane is indicated to be by this data (the ‘relevant ATS unit’); and

— recording of the data for later use ('operational record-keeping function', defined in proposed AMC1 CNS.OR.100 — refer to Section 3.2.6 of this NPA).

The transmission service is expected to be compatible with the current legal framework applicable to SAR and ATS and particularly, to the distribution of tasks and responsibilities between SAR centres and ATS units in case of a distress situation. The competent SAR centre directly receives the data for efficiency purposes as it is currently the case when an ELT is activated. However, as ATS units are responsible for coordinating the alerting service, this data is made simultaneously available to the relevant ATS unit. According to the proposed CS-ACNS (see Section 3.3.2 of this NPA), the airborne system is designed to activate only if an accident or distress situation occurs or is likely to occur within minutes. This is a very seldom event for aeroplanes within the scope of CAT.GEN.MPA.210. Therefore, an individual SAR centre or an individual ATS unit will seldom receive data corresponding to activated airborne systems.

When the airborne system relies on an ELT to locate the point of end of flight, the performance of the international COSPAS-SARSAT programme is deemed sufficient with regard to the transmission of the data to the competent SAR centre. The international COSPAS-SARSAT programme sets a standard for this capability of the distribution service. However, in addition to that, the data should be made available to the relevant ATS unit.

— 'Make available' in this context means that the relevant ATS unit either receives the data or has free-of-charge access to a repository where the data is clearly identified and readily available for download. This is defined in GM2 CAT.GEN.MPA.210.

— This could be achieved by sending a copy of the ELT message(s) to a global repository, such as the distress tracking repository that is described in ICAO Global Aeronautical Distress & Safety System (GADSS) Concept of Operations (ConOps)[9].

If the airborne system does not rely on an ELT to transmit information sufficient to comply with CAT.GEN.MPA.210, to ensure that the transmission service is acceptable, point (b)(2) of AMC1 CAT.GEN.MPA.210 specifies that:

— this provider should be a surveillance provider (i.e. a legal or natural person performing the ATC surveillance function) that is certified in accordance with Part-CNS of the ATM/ANS Regulation. AMC1 CNS.OR.100 provides further conditions to be met by the transmission service provider; and

— the communication infrastructure used by the transmission service should meet at least the performance that was submitted for approval of the system installation. If the system was designed and installed on the basis of wrong assumptions about the performance of the communication infrastructure, this is likely to result in the performance infrastructure failing to detect signals when the system is activated.

(c) Flight crew procedures

Flight crew procedures addressing the use of the system, including manual activation and deactivation of the system, are necessary to limit the frequency of inadvertent activation and

[9] Global Aeronautical Distress & Safety System (GADSS) Concept of Operations, Version 6.0, 7 June 2017.

to be able to activate the system manually when needed (e.g. when the flight crew identifies a distress situation but the system does not automatically activate). The flight crew procedures should also include that manual activation is reserved for a genuine emergency situation, i.e. a situation that would justify declaring a state of emergency to an ATS unit.

The proposed CS-ACNS in Section 3.3.2 of this NPA requires to define instructions on the use of the system by the flight crew. These instructions can then be used by the aircraft operator to define flight crew procedures.

(d) Handling of a potential distress situation

The transmission service is not required to transmit signals from the system to the operator. However, the communication and coordination principles established in ICAO Annex 11 (Air Traffic Services), Chapter 5 (Alerting Service), and ICAO Annex 12 (Search and Rescue), Chapter 5 (Operating Procedures) are such that in case an aircraft is in a state of emergency, whoever receives the information first, will share it with the operator concerned.

Upon being informed that one of their flights is potentially in a distress situation, operators should use all means at their disposal to verify whether the distress is genuine and if confirmed, to quickly identify and inform the relevant ATS unit. Operators should also share with the relevant ATS unit any relevant information on the status of the flight and the location of the aeroplane. For operators to be ready in case there is an indication that one of their aeroplanes might be in a distress situation, procedures for the operational control over the flights should cover verification of a possible distress situation and notification to the relevant ATS unit.

If the system used to comply with CAT.GEN.MPA.210 allows the aircraft operator to remotely deactivate it, the operator should use this capability with the greatest caution possible so that it does not miss a genuine distress situation, and useful information remains available to the SAR authorities. Therefore, before using this capability, the operator should have established with certainty that the aeroplane is not in a distress situation.

(e) Limiting the effects of undesirable system activation

The transmission service is required to automatically transmit the information on activation of an airborne system to the competent SAR centre (see proposed AMC1 CNS.OR.100 in Section 3.2.6 of this NPA), which ensures fast and reliable transmission of information in case of a distress situation. However, SAR centres have limited operational capacity and SAR operations can be risky (for example, when they are conducted in a hostile environment). Therefore, an activation of the system not corresponding to a distress situation (undesirable system activation) or the successful recovery of an aeroplane after a distress situation need to be recognised as early as possible. At aeroplane level, this is addressed by requiring that the system provides timely indication to the flight crew when it is activated (see proposed CS ACNS in Section 3.3.2 of this NPA). However, this requirement needs to be completed by:

— operational procedures to quickly inform the relevant ATS unit that an aeroplane is not in distress or not anymore in distress, and to disable the system after completion of the flight (in case of a 'nuisance activation', i.e. an automatic undesirable system activation);

— taking corrective actions when a system is subject to frequent nuisance activation; it is not acceptable to address repetitive nuisance activation by disabling the system as this does not solve the underlying issue and defeats the purpose of CAT.GEN.MPA.210; and

— monitoring of recurrent undesirable system activation by the operator; at system level, erroneous automatic activation is classified as a 'major' failure condition (see proposed CS-ACNS in Section 3.3.2 of this NPA); at transmission service level, non-genuine activation data are addressed by setting an appropriate minimum integrity level for the communication infrastructure (see proposed CS-ACNS in Section 3.3.2 of this NPA).

However, analyses of undesirable system activation are needed at regular time intervals to maintain the rate of undesirable system activation at an acceptable level. Such analyses should be retained for at least 12 months to monitor trends in the frequency of undesirable system activation.

GM1 CAT.GEN.MPA.210 Location of an aircraft in distress — Aeroplanes
OBJECTIVES

(a) The purpose of CAT.GEN.MPA.210 is to increase the likelihood that an accident site will be accurately and quickly located, anywhere in the world and irrespective of the accident survivability (hence, the terms 'automatic', 'robust', and 'accurately' are used in CAT.GEN.MPA.210). This also implies that the stakeholders concerned are quickly informed that an accident occurred. One of the main objectives of CAT.GEN.MPA.210 is to deliver data to the competent SAR centre, which they can easily use to timely and accurately locate the accident site. Other important objectives of CAT.GEN.MPA.210 are to make this data available to the ATS unit providing the alerting service in the airspace where the aircraft is indicated to be by this data, and to locate the aircraft within a reasonable time frame for the purpose of a safety investigation.

(b) The airborne system used to comply with CAT.GEN.MPA.210 may rely, for example, on an emergency locator transmitter of a distress tracking type (ELT(DT)), an automatic deployable flight recorder (ADFR), or the transmission of position reports at short time intervals ('high-rate tracking (HRT)').

(c) Certification Specifications — Airborne Communications, Navigation and Surveillance (CS-ACNS) contains conditions for the airborne system to be considered suitable for the purpose of CAT.GEN.MPA.210.

(d) If other equipment than an ELT is used for transmitting information sufficient to comply with CAT.GEN.MPA.210, AMC1 CNS.OR.100 to Part-CNS of the ATM/ANS Regulation contains conditions for the provider of the transmission service used by that equipment.

Rationale

GM1 CAT.GEN.MPA.210 clarifies the purpose of CAT.GEN.MPA.210, and who the main 'end-users' of a means to locate the point of end of flight are. It also provides examples of acceptable technologies, and points to CS-ACNS for all aspects related to the airborne system. Finally, GM1 CAT.GEN.MPA.210 indicates in which CSs and AMC the conditions applicable to the airborne system and to the transmission service can be found.

GM2 CAT.GEN.MPA.210 Location of an aircraft in distress — Aeroplanes

EXPLANATION OF TERMS

The terms used in CAT.GEN.MPA.210 and AMC1 CAT.GEN.MPA.210 are explained below for better understanding:

— ‘accident during which the aeroplane is severely damaged’ refers to an accident during which the aeroplane sustains damage or structural failure that adversely affects its structural strength, its performance or its flight characteristics, and would normally require a major repair or replacement of the affected component, except for an engine failure or damage to the engine, when the damage is limited to a single engine (including its cowlings or accessories), to propellers, wing tips, antennas, probes, vanes, tires, brakes, wheels, fairings, panels, landing gear doors, windscreens, the aeroplane skin (such as small dents or puncture holes), or for minor damage to the landing gear, and that resulting from hail or bird strike (including holes in the radome);

— ‘accurately’ refers to the accuracy being sufficient for safety investigation purposes, and, in addition, for SAR purposes when the accident conditions are survivable;

— ‘activation of the system’ refers to transition of the system from another state to the activated state;

— ‘automatic’ refers to not requiring any human action to perform its intended function;

— ‘communication infrastructure’ refers to the network of sensors, repeaters, and stations that are used to detect signals sent by the system, when the latter is activated, to process into data the information contained in these signals, and to transmit this data to the ground; this infrastructure typically includes satellites and ground stations;

— ‘relevant ATS unit’ refers to the air traffic service unit providing the alerting service in the airspace where the aircraft is indicated to be by the data transmitted by an activated system;

— ‘competent SAR centre’ refers to the rescue coordination centre (RCC) or the search and rescue (SAR) point of contact (SPOC) that are responsible for the area where the aircraft is indicated to be by the data transmitted by an activated system;

— ‘deactivation’ refers to the transition from the activated to another state;

— ‘make data available’ refers to the relevant stakeholders receiving the data or having free-of-charge access to a repository where the data is clearly identified and readily available for download;

— ‘nuisance activation’ refers to an automatic activation of the airborne system that is not desirable as it does not correspond to an accident condition within the scope of CAT.GEN.MPA.210;

— ‘point of end of flight’ refers to, depending on the nature of the accident, the point where the aircraft crashed into land or water, or landed on land or water, or was destroyed;

— ‘robust’ refers to being designed to work properly under the possible circumstances of survivable accidents, and under the possible circumstances of most non-survivable accidents;

— ‘system’ refers to the organised set of airborne applications and airborne equipment that meets CAT.GEN.MPA.210;

— ‘the system is activated’ refers to the system transmitting activation signals; and

— ‘transmission service’ refers to the service that relies on the communication infrastructure to make the information sent by the system available to the relevant stakeholders (competent SAR centre and relevant ATS unit).

Rationale

Terms used in CAT.GEN.MPA.210 and AMC1 CAT.GEN.MPA.210 are explained in GM2 CAT.GEN.MPA.210.

GM3 CAT.GEN.MPA.210 Location of an aircraft in distress — Aeroplanes
DISTRIBUTION SERVICE

A distribution service that is capable of making the data available to the operator is advisable.

Rationale

Additional recipients of the distribution service

To facilitate coordination between the ATS unit and the operator in case of a system activation, it is advisable that the operator is also quickly informed. A fast way to achieve this is to include the operator in the recipients of the distribution service.

SUBPART D: INSTRUMENTS, DATA, EQUIPMENT

SECTION 1 — Aeroplanes

AMC2 CAT.IDE.A.280 Emergency locator transmitter (ELT)
TYPES OF ELT AND GENERAL TECHNICAL SPECIFICATIONS

(a) The ELT required by this provision should be one of the following:

(1) Automatic fixed (ELT(AF)). […]

(2) Automatic portable (ELT(AP)). […]

(3) Automatic deployable (ELT(AD))~~a~~. An ELT that is rigidly attached to the aircraft before the crash and that is automatically ejected, deployed and activated by an impact, and, in some cases, also by ~~hydrostatic~~water sensors. ~~Manual deployment is also provided.~~ This type of ELT should float in water and is intended to aid SAR teams in locating the crash site. The ELT(AD) may be either a stand-alone beacon or may be an inseparable part of a deployable recorder.

(4) Distress tracking ELT (ELT(DT)). An ELT that is designed to be activated upon automatic detection of a distress condition. This type of ELT is intended to provide information prior to the crash to aid in locating a crash site and/or any survivor(s).

~~(4)~~(5) Survival ELT (ELT(S)). […].

(b) To minimise the possibility of damage in the event of crash impact, ~~the automatic ELT~~the ELT(AF), ELT(AP), ELT(AD), and ELT(DT) should be rigidly fixed to the aircraft structure, as far aft–as is practicable, with its antenna and connections arranged so as to maximise the probability of the signal being transmitted after a crash.

(c) Unless an automatic ELT is installed, the ELT(DT) should have capability C (crash survivability) and capability H1 (121.5-MHz homing signal) as specified in EUROCAE ED-62B ‘Minimum Operational Performance Standard for Aircraft Emergency Locator Transmitters’, dated December 2018, or any later equivalent standard produced by EUROCAE.

~~(c)~~(d) […]

Rationale

The explanation of the term ‘Automatic deployable (ELT(AD))’ in AMC2 CAT.IDE.A.280 needs to be reconciled with the definition of the ELT(AD) in EUROCAE ED-62B, Section 1.3.1: ‘The ELT(AD) may be either a stand-alone beacon or may be an inseparable part of an Automatic Deployable Flight Recorder (ADFR)’. With regard to the manual deployment of the ELT(AD), EUROCAE ED-62B, Section 2.9.4.1.1 refers to EUROCAE ED-112A or ED-155 when the ELT(AD) is part of a deployable recorder. EUROCAE ED-112A, Section 3.1.7, specifies that ‘There shall be no means for manual deployment.’ Therefore, the manual deployment capability may be required or forbidden, depending on whether the ELT(AD) is integrated or not into a deployable recorder. In regard to the sensors of the ELT(AD), the term ‘hydrostatic sensor’ refers to a particular type of water sensor that uses pressure to detect immersion, while EUROCAE ED-62B allows for the use of other kinds of water sensors to detect immersion. Therefore, the term ‘hydrostatic sensors’ was replaced by ‘water sensors’ in point (a)(3).

As CAT.IDE.A.280 contains the term ‘ELT of any type’, the list of ELT types in AMC2 CAT.IDE.A.280 should be updated. Particularly, the ‘distress tracking ELT (ELT(DT))’ should be introduced into the list of ELT types provided in AMC2 CAT.IDE.A.280. The proposed explanatory text for the ELT(DT) is taken from EUROCAE ED-62B, Section 1.3.1.

Furthermore, only the ELT(AF), ELT(AP) and ELT(AD) may be considered automatic ELTs. According to EUROCAE ED-62B, Section 1.3.1, ‘An Automatic ELT as referenced in the ICAO SARPS is either an ELT(AF), ELT(AP), or ELT(AD). For these ELTs, the term automatic is used to identify ELTs which have the capability to determine that a crash or a ditching has occurred and either activate or deploy as required.’ This means that the ELT(DT) and ELT(S) are not automatic ELTs. This clarification is proposed to be introduced in GM1 CAT.IDE.A.280.

In addition, the aeroplane should carry equipment that has the capabilities of an automatic ELT, i.e. is crash survivable and able to transmit a 121.5-MHz homing signal. Therefore, point (c) was introduced to address this aspect.

Note: EASA was made aware that ongoing research and development projects aim to provide operators with the capability of remotely controlling the activation and/or deactivation of ELTs. Such capability raises several issues. Therefore, stakeholders are requested to provide their feedback on this point (please refer to Section 4.3.3 of this NPA).

GM1 CAT.IDE.A.280 Emergency locator transmitter (ELT)

TERMINOLOGY

~~'ELT' is a generic term describing equipment that broadcasts distinctive signals on designated frequencies and, depending on application, may be activated by impact or may be manually activated~~.

An 'automatic ELT' as required by CAT.IDE.A.280 means an ELT(AF), ELT(AP) or ELT(AD). Other types of ELTs are not considered 'automatic ELTs'.

GM2 CAT.IDE.A.280 Emergency locator transmitter (ELT)

ADDITIONAL GUIDANCE

Guidance material for inspection of the ELT system is found in FAA Advisory Circular 91-44A 'Installation and Inspection Procedures for Emergency Locator Transmitters and Receivers', dated February 2018.

Rationale

A general definition of an ELT is already provided in the GM to Definitions; therefore, it does not need to be repeated in GM1 CAT.IDE.A.280.

Similar to automatic ELTs, the ELT(DT) needs to be 'rigidly fixed to the aircraft structure, as far aft as is practicable, with its antenna and connections arranged so as to maximise the probability of the signal being transmitted after a crash'. All types of ELTs should meet this condition, except for the ELT(S), which should be manually removable from the aircraft and easily accessible by aircraft occupants. AMC2 CAT.IDE.A.280, point (b), was corrected accordingly.

GM2 CAT.IDE.A.280 refers to Federal Aviation Administration (FAA) AC 91-44A for guidance on performing inspections to ensure the continued performance of the ELT system. This aspect is addressed in the US air operation requirements: see Federal Aviation Regulation (FAR) Part 91 (General Operating and Flight Rules), Subpart C, paragraph 91.207(d). It is also addressed in the Canadian Aviation Regulations (CARs), Part V (Airworthiness), Standard 571 (Maintenance), Appendix G (Maintenance of Emergency Locator Transmitters) and Part VI (General Operating and Flight Rules), Standard 625 (Aircraft Equipment and Maintenance Standard), Appendix C (Out of Phase Tasks and Equipment Maintenance Requirements). FAA AC 91-44A contains practical guidance in Section 9.

AMC2 CAT.IDE.A.285(f) Flight over water

ROBUST AND AUTOMATIC MEANS TO LOCATE THE POINT OF END OF FLIGHT AFTER AN ACCIDENT

The 'robust and automatic means to accurately determine, following an accident where the aeroplane is severely damaged, the location of the point of end of flight' should be compliant with CAT.GEN.MPA.210.

Rationale

Point (f)(2) of CAT.IDE.A.285 provides for an alleviation of the requirement to carry a ULD operating at a frequency of 8.8 ± 1 kHz when 'the aeroplane is equipped with robust and automatic means to accurately determine, following an accident where the aeroplane is severely damaged, the location of the point of end of flight', as it refers to CAT.GEN.MPA.210 'Location of an aircraft in distress — aeroplanes', and not just to an ELT.

SECTION 2 — Helicopters

AMC2 CAT.IDE.H.280 Emergency locator transmitter (ELT)

TYPES OF ELT AND GENERAL TECHNICAL SPECIFICATIONS

(a) The ELT required by this provision should be one of the following:

(1) Automatic fixed (ELT(AF)). […]

(2) Automatic portable (ELT(AP)). […]

(3) Automatic ~~D~~deployable (ELT(AD)). An ELT that is rigidly attached to the aircraft before the crash and that is automatically ejected, deployed and activated by an impact, and, in some cases, also by ~~hydrostatic~~ water sensors. ~~Manual deployment is also provided.~~ This type of ELT should float in water and is intended to aid SAR teams in locating the crash site. The ELT(AD) may be either a stand-alone beacon or may be an inseparable part of a deployable recorder.

~~(4) Survival ELT (ELT(S)). An ELT that is removable from an aircraft, stowed so as to facilitate its ready use in an emergency, and manually activated by a survivor. An ELT(S) may be activated manually or automatically (e.g. by water activation). It should be designed either to be tethered to a life-raft or a survivor. A water-activated ELT(S) is not an ELT(AP).)~~

(b) […]

GM1 CAT.IDE.H.280 Emergency locator transmitter (ELT)

TERMINOLOGY

~~'ELT' is a generic term describing equipment that broadcasts distinctive signals on designated frequencies and, depending on application, may be activated by impact or may be manually activated.~~

An 'automatic ELT' as required by CAT.IDE.H.280 means an ELT(AF), ELT(AP) or ELT(AD). Other types of ELTs are not considered 'automatic ELTs'.

AMC1 CAT.IDE.H.300(b)(3) & CAT.IDE.H.305(b) Flight over water & ~~S~~survival equipment

SURVIVAL ELT

(a) The survival ELT (ELT(S)) is an ELT removable from an aircraft, stowed in a way to facilitate its ready use in an emergency, and manually activated by a survivor. An ELT(S) may be activated manually or automatically (e.g. by a water-activated sensor). It should be designed to be tethered either to a life raft or a survivor.

(b) An ELT(AP) may be used to replace one required ELT(S) provided that it meets the ELT(S) requirements. A water-activated ELT(S) is not an ELT(AP).

Rationale

Similar to AMC2 CAT.IDE.A.280, the explanation of the term 'Automatic deployable (ELT(AD))' in AMC2 CAT.IDE.H.280 needs to be reconciled with the definition of the ELT(AD) in EUROCAE ED-62B.

However, unlike AMC2 CAT.IDE.A.280, explanations of the terms 'Distress Tracking (ELT(DT))' and 'Survival (ELT(S))' are not necessary in AMC2 CAT.IDE.H.280 as CAT.IDE.H.280 only requires the carriage of an automatic ELT onboard the aircraft. The definition of ELT(S) was moved to AMC1 CAT.IDE.H.300(b)(3) & CAT.IDE.H.305(b) as an ELT(S) is required in CAT.IDE.H.300 and CAT.IDE.H.305.

Clarification of the types of ELTs which may be considered 'automatic ELTs' is proposed to be introduced in GM1 CAT.IDE.A.280.

A general definition of an ELT is already provided in GM to Annex I (Definitions) of the Air OPS Regulation (see Section 3.2.1 of this NPA), and does not need to be repeated in GM1 CAT.IDE.H.280.

Note: EASA was made aware that ongoing research and development projects aim to provide operators with the capability of remotely controlling the activation and/or deactivation of ELTs. Such capability raises several issues. Therefore, stakeholders are requested to provide their feedback on this point (please refer to Section 4.3.3 of this NPA).

3.2.3. Draft AMC/GM to Part-NCC

SUBPART D — INSTRUMENTS, DATA AND EQUIPMENT

SECTION 1— Aeroplanes

AMC2 NCC.IDE.A.215 Emergency locator transmitter (ELT)

TYPES OF ELT AND GENERAL TECHNICAL SPECIFICATIONS

~~(a)~~ Refer to AMC2 CAT.IDE.A.280, point (a).~~The ELT required by this provision should be one of the following:~~

~~(1) Automatic fixed (ELT(AF)). An automatically activated ELT that is permanently attached to an aircraft and is designed to aid search and rescue (SAR) teams in locating the crash site.~~

~~(2) Automatic portable (ELT(AP)). An automatically activated ELT that is rigidly attached to an aircraft before a crash, but is readily removable from the aircraft after a crash. It functions as an ELT during the crash sequence. If the ELT does not employ an integral antenna, the aircraft-mounted antenna may be disconnected and an auxiliary antenna (stored on the ELT case) attached to the ELT. The ELT can be tethered to a survivor or a life-raft. This type of ELT is intended to aid SAR teams in locating the crash site or survivor(s).~~

~~(3) Automatic deployable (ELT(AD)). An ELT that is rigidly attached to the aircraft before the crash and that is automatically ejected, deployed and activated by an impact, and, in some cases, also by hydrostatic sensors. Manual deployment is also provided. This type of ELT should float in water and is intended to aid SAR teams in locating the crash site. Survival ELT (ELT(S)). An ELT that is removable from an aircraft, stowed so as to facilitate its ready use in an emergency and manually activated by a survivor. An ELT(S) may be activated manually or automatically (e.g. by water activation). It should be designed~~

~~either to be tethered to a life-raft or a survivor. A water-activated ELT(S) is not an ELT(AP).~~

(b) To minimise the possibility of damage in the event of crash impact, ~~the automatic ELT~~the ELT(AF), ELT(AP), ELT(AD), and ELT(DT) should be rigidly fixed to the aircraft structure, as far aft as is practicable, with its antenna and connections arranged so as to maximise the probability of the signal being transmitted after a crash.

(c) Refer to AMC2 CAT.IDE.A.280, point (c).

(d)~~(c)~~ […]

GM1 NCC.IDE.A.215 Emergency locator transmitter (ELT)

TERMINOLOGY

Refer to GM1 CAT.IDE.A.280.

Rationale

The same corrections as in AMC2 CAT.IDE.A.280 need to be made to AMC2 NCC.IDE.A.215 (refer to Section 3.2.3 of this NPA). In addition, as in Part-CAT, the types of ELTs need to be explained. Therefore, to ensure harmonisation of terms between Part-CAT and Part-NCC, AMC2 NCC.IDE.A.215, point (a) refers to AMC2 CAT.IDE.A.280, point (a) (AMC2 CAT.IDE.A.280, point (a) only covers explanations of the different types of ELTs) and GM1 NCC.IDE.A.215 is created, with a reference to GM1 CAT.IDE.A.280.

SECTION 2 — Helicopters

AMC2 NCC.IDE.H.215 Emergency locator transmitter (ELT)

TYPES OF ELT AND GENERAL TECHNICAL SPECIFICATIONS

(a) Refer to AMC2 CAT.IDE.H.280, point (a).~~The ELT required by this provision should be one of the following:~~

~~(1) Automatic fixed (ELT(AF)). An automatically activated ELT that is permanently attached to an aircraft and is designed to aid SAR teams in locating the crash site.~~

~~(2) Automatic portable (ELT(AP)). An automatically activated ELT that is rigidly attached to an aircraft before a crash, but is readily removable from the aircraft after a crash. It functions as an ELT during the crash sequence. If the ELT does not employ an integral antenna, the aircraft-mounted antenna may be disconnected and an auxiliary antenna (stored on the ELT case) attached to the ELT. The ELT can be tethered to a survivor or a life-raft. This type of ELT is intended to aid SAR teams in locating the crash site or survivor(s).~~

~~(3) Automatic deployable (ELT(AD)). An ELT that is rigidly attached to the aircraft before the crash and that is automatically ejected, deployed and activated by an impact, and, in some cases, also by hydrostatic sensors. Manual deployment is also provided. This type of ELT should float in water and is intended to aid SAR teams in locating the crash site.~~

~~(4) Survival ELT (ELT(S)). An ELT that is removable from an aircraft, stowed so as to facilitate its ready use in an emergency, and manually activated by a survivor. An ELT(S) may be activated manually or automatically (e.g. by water activation). It should be designed either to be tethered to a life-raft or a survivor. A water-activated ELT(S) is not an ELT(AP).~~

(b) […]

GM1 NCC.IDE.H.215 Emergency locator transmitter (ELT)
TERMINOLOGY

Refer to GM1 CAT.IDE.H.280.

Rationale

The same corrections as in AMC2 CAT.IDE.H.280 need to be made in AMC2 NCC.IDE.H.215 (refer to Section 3.2.3 of this NPA). In addition, like in Part-CAT, types of ELTs needs to be explained. Therefore, to ensure harmonisation of terms between Part-CAT and Part-NCC, AMC2 NCC.IDE.H.215, point (a) refers to AMC2 CAT.IDE.H.280, point (a) (AMC2 CAT.IDE.H.280, point (a) only covers explanations of different types of ELTs) and GM1 NCC.IDE.H.215 is created, with reference to GM1 CAT.IDE.H.280.

AMC2 NCC.IDE.H.227 Life-rafts, survival ELTs, and survival equipment on extended overwater flights
SURVIVAL ELT

Refer to AMC1 CAT.IDE.H.300(b)(3) & CAT.IDE.H.305(b).

Rationale

The definition of ELT(S) was introduced in the proposed new AMC2 NCC.IDE.H.227, as an ELT(S) is required by NCC.IDE.H.227, and the proposed AMC2 NCC.IDE.H.215 refers to the proposed AMC2 CAT.IDE.H.280 that does not contain a definition of ELT(S).

3.2.4. Draft AMC/GM to Part-NCO

SUBPART D — INSTRUMENTS, DATA AND EQUIPMENT

SECTION 1 — Aeroplanes

GM1 NCO.IDE.A.170 Emergency locator transmitter (ELT)
TERMINOLOGY

~~(a) An ELT is a generic term describing equipment that broadcasts distinctive signals on designated frequencies and, depending on application, may be activated by impact or may be manually activated.~~

~~(b) A PLB is an emergency beacon other than an ELT that broadcasts distinctive signals on designated frequencies, is standalone, portable and is manually activated by the survivors.~~

Refer to GM1 CAT.IDE.A.280.

Rationale

AMC2 NCO.IDE.A.170 was not amended as the proposed specifications addressing the ELT(DT) were defined assuming a large aeroplane.

GM1 NCO.IDE.A.170: general definitions of an ELT and a personal locator beacon (PLB) are provided in GM1 Annex I Definitions and they do not need to be repeated in GM1 NCO.IDE.A.170.

However, the meaning of an 'automatic ELT' needs to be defined; therefore, a reference to GM1 CAT.IDE.A.280 is made, where the term is explained. In addition, as AMC2 NCO.IDE.A.170, point (b) is also applicable to the ELT(DT), even if it is not an automatic ELT, this AMC was amended accordingly.

SECTION 2 — Helicopters

AMC2 NCO.IDE.H.170 Emergency locator transmitter (ELT)

TYPES OF ELT AND GENERAL TECHNICAL SPECIFICATIONS

(a) The ELT required by this provision should be one of the following:

(1) Automatic fixed (ELT(AF)). […]

(2) Automatic portable (ELT(AP)). […]

(3) Automatic deployable (ELT(AD)). An ELT that is rigidly attached to the aircraft before the crash and that is automatically ejected, deployed and activated by an impact, and, in some cases, also by water~~hydrostatic~~ sensors. ~~Manual deployment is also provided.~~ This type of ELT should float in water and is intended to aid SAR teams in locating the crash site. The ELT(AD) may be either a stand-alone beacon or may be an inseparable part of a deployable recorder.

(4) Survival ELT (ELT(S)). […]

(b) […]

GM1 NCO.IDE.H.170 Emergency locator transmitter (ELT)

TERMINOLOGY

~~(a) An ELT is a generic term describing equipment that broadcasts distinctive signals on designated frequencies and, depending on application, may be activated by impact or may be manually activated.~~

~~(b) A PLB is an emergency beacon other than an ELT that broadcasts distinctive signals on designated frequencies, is standalone, portable and is manually activated by the survivors.~~

Refer to GM1 CAT.IDE.H.280.

Rationale

AMC2 NCO.IDE.H.170 is amended in the same way as AMC2 CAT.IDE.H.280, point (a), except that in AMC2 NCO.IDE.H.170, the ELT(S) type needs to be also explained. Depending on the helicopter maximum passenger seating configuration, an ELT(S) may be required by NCO.IDE.H.170.

GM1 NCO.IDE.H.170: general definitions of an ELT and a PLB are provided in GM1 Annex I and they do not need to be repeated in GM1 NCO.IDE.H.170.

However, the meaning of an ‘automatic ELT’ needs to be defined, therefore, a reference to GM1 CAT.IDE.H.280 is made, where the term is explained.

3.2.5. Draft AMC/GM to Part-SPO

SUBPART D — INSTRUMENTS, DATA AND EQUIPMENT

SECTION 1 — Aeroplanes

AMC2 SPO.IDE.A.190 Emergency locator transmitter (ELT)

TYPES OF ELT AND GENERAL TECHNICAL SPECIFICATIONS

(a) Refer to AMC2 CAT.IDE.A.280, point (a).~~The ELT required by this provision should be one of the following:~~

~~(1) Automatic fixed (ELT(AF)). An automatically activated ELT that is permanently attached to an aircraft and is designed to aid search and rescue (SAR) teams in locating the crash site.~~

~~(2) Automatic portable (ELT(AP)). An automatically activated ELT that is rigidly attached to an aircraft before a crash, but is readily removable from the aircraft after a crash. It functions as an ELT during the crash sequence. If the ELT does not employ an integral antenna, the aircraft-mounted antenna may be disconnected and an auxiliary antenna (stored on the ELT case) attached to the ELT. The ELT can be tethered to a survivor or a life-raft. This type of ELT is intended to aid SAR teams in locating the crash site or survivor(s).~~

~~(3) Automatic deployable (ELT(AD)). An ELT that is rigidly attached to the aircraft before the crash and that is automatically ejected, deployed and activated by an impact, and, in some cases, also by hydrostatic sensors. Manual deployment is also provided. This type of ELT should float in water and is intended to aid SAR teams in locating the crash site.~~

~~(4) Survival ELT (ELT(S)). An ELT that is removable from an aircraft, stowed so as to facilitate its ready use in an emergency and manually activated by a survivor. An ELT(S) may be activated manually or automatically (e.g. by water activation). It should be designed either to be tethered to a life-raft or a survivor. A water-activated ELT(S) is not an ELT(AP).~~

(b) To minimise the possibility of damage in the event of crash impact, ~~the automatic ELT~~the ELT(AF), ELT(AP), ELT(AD), and ELT(DT) should be rigidly fixed to the aircraft structure, as far aft as is practicable, with its antenna and connections arranged so as to maximise the probability of the signal being transmitted after a crash.

(c) Refer to AMC2 CAT.IDE.A.280, point (c).

(d)~~(c)~~ […]

GM1 SPO.IDE.A.190 Emergency locator transmitter (ELT)

TERMINOLOGY

~~(a) An ELT is a generic term describing equipment that broadcasts distinctive signals on designated frequencies and, depending on application, may be activated by impact or may be manually activated.~~

~~(b) A PLB is an emergency beacon other than an ELT that broadcasts distinctive signals on designated frequencies, is standalone, portable and is manually activated by the survivors.~~

Refer to GM1 CAT.IDE.A.280.

Rationale

To ensure harmonisation of terms, reference to AMC2 CAT.IDE.A.280, point (a) is made in AMC2 SPO.IDE.A.190. See also the rationale for AMC2 CAT.IDE.A.280 and GM1 CAT.IDE.A.280.

GM1 SPO.IDE.A.190: general definitions of an ELT and a PLB are provided in the GM1 Annex I Definitions and they do not need to be repeated in GM1 NCO.IDE.A.170.

However, there is a need to explain what 'automatic ELT' means: reference to GM1 CAT.IDE.A.280 is made, where this term is explained. In addition, as AMC2 SPO.IDE.A.190, point (b) is also applicable to the ELT(DT), even if an ELT(DT) is not an automatic ELT, that point was amended accordingly.

SECTION 2 — Helicopters

AMC2 SPO.IDE.H.190 Emergency locator transmitter (ELT)

TYPES OF ELT AND GENERAL TECHNICAL SPECIFICATIONS

(a) The ELT required by this provision should be one of the following:

(1) Automatic fixed (ELT(AF)). […]

(2) Automatic portable (ELT(AP)). […]

(3) Automatic deployable (ELT(AD)). an ELT that is rigidly attached to the aircraft before the crash and that is automatically ejected, deployed and activated by an impact, and, in some cases, also by water ~~hydrostatic~~ sensors. ~~Manual deployment is also provided.~~ This type of ELT should float in water and is intended to aid SAR teams in locating the crash site. The ELT(AD) may be either a stand-alone beacon or may be an inseparable part of a deployable recorder.

(4) Survival ELT (ELT(S)). […].

(b) […]

GM1 SPO.IDE.H.190 Emergency locator transmitter (ELT)

TERMINOLOGY

~~(a) An ELT is a generic term describing equipment that broadcasts distinctive signals on designated frequencies and, depending on application, may be activated by impact or may be manually activated.~~

~~(b) A PLB is an emergency beacon other than an ELT that broadcasts distinctive signals on designated frequencies, is standalone, portable and is manually activated by the survivors.~~

Refer to GM1 CAT.IDE.H.280.

Rationale

AMC2 SPO.IDE.H.190 is amended in the same way as AMC2 CAT.IDE.H.280, point (a), except that in AMC2 SPO.IDE.H.190, the ELT(S) type needs to be explained. Depending on the helicopter maximum passenger seating configuration, an ELT(S) may be required by SPO.IDE.H.190.

GM1 SPO.IDE.H.190: general definitions of an ELT and a PLB are provided in the GM1 Annex I Definitions and they do not need to be repeated in GM1 SPO.IDE.H.190.

However, the meaning of an 'automatic ELT' needs to be defined, therefore, a reference to GM1 CAT.IDE.H.280 is made, where the term is explained.

3.2.6. Draft AMC & GM to Part-CNS

AMC1 CNS.OR.100 Technical and operational competence and capability

COMPETENCE OF THE SURVEILLANCE PROVIDER (TRANSMISSION SERVICE FOR THE LOCATION OF AN AIRCRAFT IN DISTRESS)

(a) The transmission service means a distribution service that automatically delivers data corresponding to signals transmitted by an airborne system to the competent SAR centre and that automatically makes this data available to the relevant ATS unit, for the purpose of CAT.GEN.MPA.210 'Location of an aircraft in distress' (refer to Annex IV (Part-CAT) to Regulation (EU) No 965/2012). The transmission service has priority over the other services that are provided by the surveillance provider.

(b) A surveillance provider for which EASA is the competent authority pursuant to Article 80 of the Basic Regulation may provide the transmission service defined in (a). In that case, the surveillance provider should:

(1) establish the performance of the communication infrastructure used by the transmission service, particularly assumptions about the availability, integrity, and coverage of the communication infrastructure;

(2) demonstrate that the transmission service is capable of processing signals that are simultaneously received by up to 15 airborne systems that are installed to comply with CAT.GEN.MPA.210 and are activated;

(3) demonstrate that the total time from receipt of data on the ground to delivering corresponding data to the competent SAR centre does not exceed 15 minutes, with a probability of 95 %;

(4) demonstrate that the total time from receipt of data on the ground to making the corresponding data available to the ATS unit that provides the alerting service in the area where the aircraft is indicated to be by the data, does not exceed 15 minutes, with a probability of 95 %;

(5) demonstrate that the SAR centres' contact information of that is used by the transmission service to meet point (b)(3) is global and maintained up to date;

(6) deliver the data to the competent SAR centre in plain text and in a format recognised by the International Aeronautical and Maritime Search and Rescue Manual (IAMSAR Manual); and

(7) perform an operational record-keeping function that:

(i) integrally records data corresponding to signals transmitted by the system;

(ii) retains this data for at least 30 days; and

(iii) is capable of retrieving data recorded in the preceding 48 hours within 30 minutes of receiving an appropriate request.

Rationale

(a) When the international COSPAS/SARSAT programme is not the transmission service, the proposed AMC1 CNS.OR.100 defines the conditions for that service. The transmission service transmits the activation and deactivation data from the airborne system to the relevant stakeholders, including:

(1) detection of signals sent by the airborne system and processing of those signals into data by a communication infrastructure;

(2) distribution of the data to the competent SAR centre and making this data available to the relevant ATS unit ('distribution service'); and

(3) recording of the data for later use ('operational record-keeping function').

Important aspects of the transmission service are the following:

(1) The data should be automatically transmitted to the competent SAR centre and automatically made available to the relevant ATS unit. This is the function of the distribution service. In accordance with the international COSPAS-SARSAT programme, the 406-MHz signals from an ELT are transmitted via the COSPAS-SARSAT satellites (LEOSAR, GEOSAR or MEOSAR) to a local user terminal (LUT), then to a mission control centre (MCC), and finally, delivered to the competent SAR centre without any human intervention. In addition, SAR centres and ATS units already have established procedures to assess whether an aircraft is in a distress situation.

(2) The transmission service should be compatible with the current legal framework applicable to SAR and ATS and particularly, to the distribution of tasks and responsibilities between SAR centres and ATS units in case of a distress situation. The competent SAR centre directly receives the data for efficiency purposes as it is currently the case when an ELT is activated. However, as ATS unit are responsible for coordinating the alerting service, this data is made simultaneously available to the relevant ATS unit. According to the proposed CS-ACNS (see Section 3.3.2 of this NPA), the airborne system is designed to activate only if an accident or distress situation occurs or is likely to occur within minutes. This is a very seldom event for aeroplanes within the scope of CAT.GEN.MPA.210. Therefore, an individual SAR centre or an individual ATS unit will seldom receive data corresponding to activated airborne systems.

(3) The transmission service should have priority over services that are not required for safe flight and landing, as there may only elapse a few tens of seconds to a few minutes from activation of the system to its destruction in the accident.

(b) The following conditions for the transmission service are defined:

(1) The performance of the communication infrastructure used by the transmission service (particularly, its availability, integrity, and coverage) should be established. This is

necessary to compare that performance with the performance assumptions based on which the system installation was approved (see proposed AMC1 CAT.GEN.MPA.210, point (b)(2)(ii) in Section 3.2.2 of this NPA).

(2) The capacity of the transmission service should be sufficient to transmit all signals from nuisance and genuine activation. Therefore, the probability that at any given point in time the number of activated systems exceeds the capacity of the transmission service should be very small. In this context, the following should be considered:

(i) Nuisance activation of the system (undesirable automatic system activation) might be much more frequent than genuine activation. The proposed CS ACNS.E.LAD.620 (see Section 3.3.2 of this NPA) permits that nuisance activation occurs twice every 100 000 flight hours (FH), while the average rate of accidents for large CAT aeroplanes is of the order of 1 per 1 000 000 FH: therefore, the frequency of nuisance activation may be 10 times the frequency of genuine activation. However, it is not expected that the transmission service distinguishes between nuisance and genuine activation as priority is given to fast and reliable data transmission to the relevant stakeholders.

(ii) The probability that the number of simultaneously activated systems exceeds the capacity of the communication infrastructure in any given day should be less than 0.001 % (1 out of 100 000) as this is considered sufficiently remote: 100 000 days correspond to approximately 273 years.

(iii) The average number of systems simultaneously activated should be computed taking into account that those systems might keep transmitting for longer periods. For example, if the system transmits nuisance activation signals, the flight will probably be continued, and based on the proposed CS ACNS.E.LAD.270 and CS ACNS.E.LAD.350 in Section 3.3.2 of this NPA (no means for flight crew to stop the automatic transmission of activation signals apart from using circuit protective devices), the system may well keep transmitting until the aircraft reaches its destination. To simplify, it is assumed that when the system is activated, it remains activated for the duration of a day (24 hours).

(iv) Assuming that the target fleet accumulates around 50 000 000 FH per year and an activation rate of 2 per 100 000 FH, i.e 1 per 50 000 FH, then the transmission service would have to transmit in average activation signals from 1 000 aeroplanes per year or from 3 aeroplanes per day. According to *Poisson's* equation, if there is 3 cases of activation per day in average, the likelihood that there is more than x cases of activation in a given day is less than 0.001 % (1 out of 100 000) if x is greater than or equal to 13. Therefore, if the system has sufficient capacity to process signals from 13 simultaneously activated systems, then the probability that the number of simultaneously activated systems exceeds the capacity of the communication infrastructure in any given day is less than 0.001 %. However, the minimum capacity of the transmission service is set to 15 to provide for an additional safety margin.

(3) The total time from receipt of data by the communication infrastructure to delivering corresponding data to the competent SAR centre should not exceed 15 minutes. The current technical specifications of the international COSPAS-SARSAT programme for MEOSAR, MEOLUT, and MCC are such that there is a high probability that information reaches the competent RCC within 15 minutes of being received by a MEOLUT. Therefore, this time value serves as a baseline for delivering data to the competent SAR centre.

(4) The total time from receipt of data by the communication infrastructure to making the corresponding data available to the relevant ATS unit should not exceed 15 minutes. This time is consistent with the time frame of emergency phases, as specified in ICAO Annex 11, Chapter 5.

(5) The SAR centres' contact information of that is used by the surveillance provider for delivering the data to the competent SAR centre should be global and maintained up to date. To perform as required, the distribution service has to rely on a system that maintains the contact information and the area of competence of the SAR centres up to date. Given the typical range of aeroplane models within the scope of CAT.GEN.MPA.210, the distress may occur everywhere on the globe; therefore, it is essential that this system is global.

(6) The data should be delivered to the competent SAR centre in plain text and in a format recognised by the IAMSAR Manual. It is essential for effective SAR coordination that the data format is internationally recognised by SAR authotities. The IAMSAR Manual is published jointly by ICAO and the International Maritime Organisation (IMO). The purpose of this Manual is according to its foreword, 'to assist States in meeting their own search and rescue (SAR) needs, and the obligations they accepted under the Convention on International Civil Aviation, the International Convention on Maritime Search and Rescue and the International Convention for the Safety of Life at Sea (SOLAS).' The recommendations of the IAMSAR Manual are internationally recognised by SAR authorities.

(7) The transmission service should include an operational record-keeping function that retains the data for a duration that is sufficient for SAR and safety investigation purposes. Following an accident, it might take several days before a safety investigation authority requests a copy of the data transmitted by the transmission service. For example, CAT.GEN.MPA.195 requires that following an accident, operators preserve the original recorded data of the flight recorders for a period of 60 days or until otherwise directed by the investigation authority. The current technical specifications of the international COSPAS-SARSAT programme prescribe that data received by an MCC must be retained for at least 30 days[10]. Therefore, this latter value serves as a baseline for all transmission services.

[10] C/S A.005, Section 5.8 specifies: 'MCCs shall archive alert data and messages for at least 30 days'.

3.3. Draft certification specifications (Draft EASA Decision)

3.3.1. Draft CS-MMEL

Book 2 — Guidance Material

APPENDIX

APPENDIX 1 to GM1 MMEL.145: MMEL ITEMS GUIDANCE BOOK

ATA 25 EQUIPMENT/FURNISHINGS

Summary of the guidance items:

ITEM	ATA
Flight Crew Seats	25-11-1
Observer Seats	25-11-2
Passenger Seats	25-21-1
Cabin Crew Seat Assembly (single or dual position)	25-21-2
Exterior Lavatory Door Ashtrays (MC)	25-40-1
Interior Lavatory Ashtrays (MC)	25-40-2
Escape Slides	25-60-1
Independent portable lights (MC)	25-60-2
Protective Breathing Equipment (PBE) (MC)	25-60-3
Megaphones (MC)	25-60-4
Life rafts (MC)	25-60-5
Survival Equipment (MC)	25-60-6
Emergency Flotation Equipment	25-60-7
Crash Axes and Crowbars (MC)	25-61-1
First-Aid Kits (MC)	25-62-1
Emergency Medical Kits (MC)	25-62-2
Emergency Locator Transmitter (MC)	25-63
Life jackets (MC)	25-64-1
Equipment for the location of an aircraft in distress	25-65-1

[…]

Aircraft applicability: Aeroplanes & Helicopters

ATA Chapter: 25 Equipment/Furnishing					
(1) System & Sequence Numbers ITEM		(2) Rectification interval	(3) Number installed	(4) Number required for dispatch	(5) Remarks or Exceptions
25-63	**Emergency Locator Transmitter (ELT)**				
25-63-1	Automatic Emergency Locator Transmitter ELT(AF) ELT(AP)				
25-63-1A		D	-	-	Any in excess of those required may be inoperative.
25-63-1B	(Aeroplanes)	A	1	0	May be inoperative for a maximum of 6 flights or 25 flight hours, whichever occurs first.
25-63-1C	(Aeroplanes)	C	-	0	May be inoperative provided that the equipment for the location of an aircraft in distress is operative.
25-63-1~~C~~D	(Aeroplanes)	C	-	1	Any in excess of one may be inoperative.
25-63-1~~D~~E	(Helicopters)	A	-	0	May be inoperative provided: (a) The helicopter shall not fly for more than 6 hours after the ELT was found to be inoperative, and (b) A maximum of 24 hours have elapsed since the ELT was found to be inoperative.

Aircraft applicability: Aeroplanes

ATA Chapter: 25 Equipment/Furnishings					
(1) System & Sequence Numbers ITEM		(2) Rectification interval	(3) Number installed	(4) Number required for dispatch	(5) Remarks or Exceptions
25-65-1	**Equipment for the location of an aircraft in distress**				
25-65-1A		D	-	-	Any in excess of those required by regulations may be inoperative.
25-65-1B	(Aeroplanes)	A	-	0	May be inoperative for a maximum of 6 flights or 25 flight hours, whichever occurs first.
25-65-1C	(Aeroplanes)	C	-	0	May be inoperative provided that at least one automatic emergency locator transmitter (ELT) is operative.

Additional considerations:

A means for the location of an aircraft in distress is required for aeroplanes, as applicable, in accordance with CAT.GEN.MPA.210.

[…]

Rationale

A means compliant with CAT.GEN.MPA.210 can also replace an automatic ELT in accordance with the Air OPS Regulation (refer to CAT.IDE.A.280 ‘Emergency locator transmitter’). Therefore, the dispatch conditions of such means should be consistent with those applicable to automatic ELTs.

3.3.2. Draft CS-ACNS

Book 1 — Certification Specifications
&
Book 2 — Guidance Material

Subpart E — Others

SECTION 1 — TERRAIN AWARENESS AND WARNING SYSTEM (TAWS)

[…]

SECTION 3 — LOCATION OF AN AIRCRAFT IN DISTRESS AND EMERGENCY LOCATION

General

CS ACNS.E.LAD.001 Applicability and scope

This Section provides standards for the location of an aircraft in distress, in accordance with the Regulation (EU) 965/2012 (refer to CAT.GEN.MPA.210), including when an emergency locator transmitter (ELT) (refer to CAT.IDE.A.280) or a low-frequency underwater locating device (ULD) (refer to CAT.IDE.A.285) is replaced by means compliant with CAT.GEN.MPA.210. The intent of CAT.GEN.MPA.210 is to provide for robust and automatic means to accurately determine, following an accident during which the aircraft is severely damaged, the location of the point of end of flight. Aircraft within the scope of this Section are large aeroplanes with a maximum certified take-off mass (MCTOM) of more than 27 000 kg and a maximum passenger seating configuration of more than 19. Accidents and distress situations within the scope of this Section are those that take place between take-off and landing, or at an airfield, and severely damage the aircraft, irrespective of the number of fatalities and injuries.

Rationale

One of the objectives of this NPA is to establish a simplified process for showing compliance of aircraft types (or changes to aircraft types) with CAT.GEN.MPA.210. To meet this objective, information needed by aircraft and equipment manufacturers was gathered to introduce a new section in CS-ACNS.

CS-ACNS, Subpart E 'Others' was considered the most appropriate part to introduce the new section, for the following reasons:

— According to CS ACNS.A.GEN.001 'Applicability', CS-ACNS is applicable to equipment at installation level, which is, among others, required by the Air OPS Regulation.

— ICAO Annex 10 (Aeronautical Telecommunications), Vol III (Communication Systems) includes specifications on an 406-MHz signal of and ELT and on ELT message coding. Therefore, ICAO Annex 10 classifies the transmission of information from an ELT to the responsible RCC or SPOC as part of communication, navigation, and surveillance (CNS). As the means to comply with CAT.GEN.MPA.210 should take into account the needs of SAR authorities (and investigation authorities), and such means may include an ELT, CS-ACNS is the appropriate document to include certification specifications addressing these means.

— However, the transmission of emergency signals is a particular case of communication and therefore, it should not be addressed in CS-ACNS, Subpart B 'Communications'. Subpart E 'Others' contains CSs not directly related to communication, navigation, and surveillance, such as CSs for terrain avoidance warning systems or reduced vertical separation minima. Therefore, Subpart E is a more appropriate location.

— According to the proposed CS ACNS.E.LAD.001, accidents and distress situations within its scope are those that take place 'between take-off and landing', including accidents occurring during initial climb or final approach. According to CAT.IDE.A.280, means compliant with CAT.GEN.MPA.210 may replace an automatic ELT. Therefore, similar to an automatic ELT, those means should provide the accurate location of the point of end of flight after an accident occurring during the above-mentioned flight phases. Most accidents occur during take-off, climb, approach or landing (see also the proposed CS ACNS.E.LAD.210 below).

GM1 ACNS.E.LAD.001 Applicability and scope

COMMON GUIDANCE FOR ALL SOLUTIONS

The objective of CAT.GEN.MPA.210 is to increase the likelihood that an accident site is quickly and accurately located, wherever the accident occurs and irrespective of the accident survivability. The scope of CAT.GEN.MPA.210 includes only accidents and distress situations, therefore unlawful interference is not addressed in this Section.

Means compliant with CAT.GEN.MPA.210 are expected to provide better and faster location information to authorities in charge of search and rescue (SAR) and to authorities conducting investigations of aviation accidents. Therefore, if a means compliant with CAT.GEN.MPA.210 is installed onboard the aircraft, CAT.IDE.A.280 does not require the carriage of an automatic ELT and CAT.IDE.A.285 does not require the carriage of a low-frequency ULD.

As a result, the following considerations are addressed in this Section:

— SAR authorities must timely locate and rescue the survivors of an accident; and

— safety investigation authorities (SIAs) must locate the accident site and collect evidence in a reasonable time frame, particularly the content of the flight recorders.

The scope of this Section is accidents and distress situations, as a means compliant with CAT.GEN.MPA.210 may replace an automatic ELT. In CS ACNS.E.LAD.001, 'accident that severely damages the aircraft' means an accident during which the aircraft sustains damage or structural failure that:

— adversely affects the structural strength, performance or flight characteristics of the aircraft; and

— would normally require a major repair or replacement of the affected component, except for an engine failure or damage to the engine, when the damage is limited to a single engine (including its cowlings or accessories), to propellers, wing tips, antennas, probes, vanes, tires, brakes, wheels, fairings, panels, landing gear doors, windscreens, the aircraft skin (such as small dents or puncture holes), or for minor damage to main rotor blades, tail rotor blades, the landing gear, and those resulting from hail or bird strike (including holes in the radome);

This Section includes 'common' acceptable means of compliance (AMC) and guidance material (GM) (applicable to any solution), as well as 'specific' AMC and GM (applicable only to a particular type of solution). For each CS, there may be one or several common AMC & GM and one or several specific AMC & GM. When considering a certain type of solution, both common and specific AMC & GM of this Section need to be taken into account for demonstrating compliance with the related CS.

This Section includes three types of solutions:

— Automatic deployable flight recorder (ADFR)

An AFDR is composed of a recorder in a deployable package, a deployment system, and sensors in the aircraft. The deployable package contains an ELT that facilitates locating it, and a structure having both an aerofoil function and a float function. The sensors detect the deformation of the aircraft structure subsequent to the accident and the water pressure due to immersion. These detections result in the automatic deployment of the deployable package as well as in the activation of the ELT. Thanks to the deployment characteristics, the deployable package lands clear of the main impact point. It floats on water if the accident site is in water. The ELT transmits 406-MHz signals that are detected by a satellite of the international COSPAS-SARSAT programme, further transmitted to the ground, and then processed into ELT messages that are delivered to the competent SAR centre. This permits to locate the point of end of flight within a few minutes. The ELT also transmits a 121.5-MHz homing signal to support the on-site search and rescue of potential survivors.

— Distress tracking ELT (ELT(DT))

An ELT(DT) is a specific type of ELT that relies on an 'automatic triggering function' that monitors aircraft parameters and automatically triggers the ELT when it detects conditions that are very likely to result in an accident or a distress situation. Once the ELT is activated, it transmits the 406-MHz signals. When detected by a satellite of the international COSPAS-SARSAT programme, the 406-MHz signals are transmitted to the ground, and then processed into ELT messages that are delivered to the competent SAR centre. This permits to locate the point of end of flight within a few minutes. If the accident is survivable, a crash-survivable ELT (an ELT(DT) or an automatic ELT) transmits the 406-MHz signals and a 121.5-MHz homing signal after the impact to provide accurate location of the point of end of flight and to support the on-site location and rescue of potential survivors.

— High-rate tracking (HRT)

HRT is an on-board system transmitting signals that permit to locate the aircraft, in most cases through a space-based infrastructure. In case of an accident, the information content of these signals is transmitted to the competent SAR centre and made available to the relevant ATS unit. The frequency of the transmission and the accuracy of transmitted position data are such that the point of end of flight can be located within a few minutes. Adequate location accuracy of the point of end of flight after a survivable accident is achieved either through high frequency of transmission or post-crash transmission or both. A 121.5-MHz homing signal is also transmitted after a survivable accident to support the on-site location and rescue of potential survivors.

While not required, the installation of an ELT(AF), ELT(AD) or ELT(AP) is a means to meet several requirements of this Section: transmission of a homing signal, manual activation, operation without propulsive power, and location accuracy in case of a survivable accident.

This Section’s requirements do not address remote activation or remote deactivation of airborne systems.

Rationale

The objective of this GM is to clarify the purpose and scope of the new Section 3 of Subpart E, the structure of the proposed AMC and GM, as well as the main solutions described.

While the common AMC & GM are applicable to any type of solution, the specific AMC & GM are only offered for solutions based on an ADFR, ELT(DT), or HRT. These three solutions capture the most mature technologies developed so far to comply with CAT.GEN.MPA.210. However, other types of solutions may be acceptable if they meet the related CSs and the commonly applicable AMC & GM of this new Section 3.

Section 3 does not address remote activation and remote deactivation of the means that are compliant with CAT.GEN.MPA.210 as these capabilities are not considered necessary to meet the objective of that requirement. CAT.GEN.MPA.210 does not require to track the aeroplane; it only requires to locate the point of end of flight when the aeroplane is severely damaged by an accident.

In addition, EASA is not aware of a concept of operation for remote activation and remote deactivation that is accepted by the aviation and SAR communities and would bring clear safety or survivability benefits. EUROCAE Working Group 98 (WG-98) is working on the definition of minimum performance specifications on the remote control of solutions based on an ELT(DT).

CS ACNS.E.LAD.010 Definitions

This CS contains definitions of terms that are only applicable in this Section and may differ from definitions of terms in CS ACNS.A.GEN.005 ‘Definitions’:

— ‘activation of the system’ means transition from another state to the activated state;

— ‘activation signals’ are signals transmitted by the system to accurately determine the location of the point of end of flight;

— ‘automatic triggering function’ means a function that is performed by airborne equipment and that automatically activates the system when it detects conditions that are very likely to result in an accident or a distress situation;

— ‘communication infrastructure’ means the network of sensors, repeaters, and stations used to detect activation and deactivation signals sent by the system to process into data the information contained in these signals and transmit this data to the ground. This infrastructure typically includes satellites and ground stations;

— ‘competent SAR centre’ means the rescue coordination centre (RCC) or the search and rescue (SAR) point of contact (SPOC) responsible for the area where the aircraft is indicated to be by the activated system;

— ‘deactivation’ means the transition from the activated state to another state;

— ‘functions of the system’ means the minimum set of functions performed by the system to meet CAT.GEN.MPA.210; they include: normal operation, detection of activation conditions, automatic activation and automatic deactivation, manual activation and manual deactivation, collection of the information to be transmitted, transmission of activation signals and of deactivation signals, indication of activation to the flight crew, transmission of a homing signal, and means to determine the causes of undesirable automatic activation;

— ‘homing signal’ means a signal that allows mobile SAR facilities in the vicinity of the transmitter to continuously proceed towards the transmitter;

— ‘point of end of flight’ means, depending on the nature of the accident, the point where the aircraft crashed into land or water, or landed on land or water, or was destroyed;

— ‘relevant ATS unit’ means the air traffic service unit competent to provide the alerting service in the airspace where the aircraft is indicated to be by the activated system;

— ‘solution based on an ADFR’ means a solution using equipment that meets all requirements applicable to an automatic deployable flight recorder (ADFR), except those related to the recording and retrieval of data for accident investigation purposes.

— ‘solution based on an ELT(DT)’ means a solution that is based on an automatic triggering function coupled with an emergency locator transmitter of a distress tracking type (ELT(DT)).

— ‘solution based on HRT’ means a solution that is based on an automatic triggering function coupled with airborne equipment that transmits the aircraft position and information that an accident or a distress situation is very likely to occur.

— ‘signals’ means the information transmitted by the system; a signal may contain some of the data required to meet CAT.GEN.MPA.210, or it may not (e.g. post-processing of the signal may be needed to compute that data);

— ‘standby’ means that the system cannot be automatically activated but may still be manually activated;

— ‘survivable accident’ is an accident where some crew members or passengers may survive;

— ‘system’ means the organised set of airborne applications and airborne equipment to meet CAT.GEN.MPA.210;

— ‘the system is activated’ means that the system is transmitting activation signals; and

— the system is armed’ means that all the functions of the system are operating or ready to operate immediately (in particular, the detection of an accident condition and the signal transmission).

Rationale

These terms are used throughout Subpart E, Section 3. Accurate definitions permit more concise requirements. The definition of an ‘accident where the aircraft is severely damaged’ stems from ICAO Annex 13, point (b) ‘Definition of an accident’.

GM1 ACNS.E.LAD.010 Definitions

COMMON GUIDANCE FOR ALL SOLUTIONS

(a) A survivable accident can be understood as an accident during which a properly installed automatic ELT is not exposed to conditions exceeding the environmental test conditions of an ELT(AF), as specified in EUROCAE ED-62B, Chapter 4.

(b) The following terms, as defined in EUROCAE ED-62B, are used throughout this Section:

(1) 'class' determines a range of operating temperatures;

(2) 'capability C (crash survivability)' means meeting minimum crash-resistance specifications;

(3) 'capability H1 (121.5-MHz homing signal)' means transmitting a homing signal at a frequency of 121.5 MHz;

(4) 'capability G (internal/integral GNSS receiver)' means containing a GNSS receiver and transmitting GNSS coordinates through the 406-MHz signal;

(5) 'capability T.001 (first generation)' means meeting the requirements of C/S T.001 'Specification for Cospas-Sarsat 406MHz Distress Beacons'; and

(6) 'capability T.018 (second generation)' means meeting the requirements of C/S T.018 'Specification for Second Generation Cospas-Sarsat 406MHz Distress Beacons'.

(c) Non-dedicated airborne data sources that are used for the detection of activation conditions are usually not considered part of the system, except for the source of position information that is transmitted through the activation signals.

Rationale

(a) EUROCAE ED-62B 'Minimum operational performance standard for aircraft emergency locator transmitters 406 MHz' is generally considered an acceptable standard for ELTs. FAA TSO-C126c, Section 3 states: 'New models of 406 MHz ELTs identified and manufactured on or after the effective date of this TSO must meet the requirements in Sections 2, 3, and 4 of RTCA/DO-204B, Minimum Operational Performance Standard for Aircraft Emergency Locator Transmitters 406 MHz, dated 12/13/2018'. The content of RTCA DO-204B is identical to that of ED-62B. In addition, the proposed ETSO-C126c in NPA 2019-06 refers to ED-62B. In the absence of other widely accepted criteria, the environmental test conditions of ED-62B are used to define when an accident is survivable.

(b) Definitions of terms that are used throughout this new Section 3 stem from EUROCAE ED-62B.

(c) This point provides more accurate guidance on what belongs to the system. Non-dedicated airborne data sources do not need to be considered part of the system. However, position information in activation signals is essential to accurately locate the point of end of flight, therefore, the source of such data is considered part of the system.

GM2 ACNS.E.LAD.010 Definitions
GUIDANCE FOR SOLUTIONS BASED ON AN ADFR

The solution based on an ADFR could be an ADFR, or an ADFR combined with a stand-alone non-deployable automatic ELT (ELT(AF) or ELT(AP)), depending on the ADFR capabilities. The recording function of the ADFR is not necessary to comply with CAT.GEN.MPA.210.

Rationale

EUROCAE ED-62B, Section 1.3.1 indicates in its description of the ELT(AD) type: 'The ELT(AD) may be either a stand-alone beacon or may be an inseparable part of an Automatic Deployable Flight Recorder (ADFR)'. However, the specifications applicable to an ELT that is in the deployable package of an ADFR are different from those applicable to a stand-alone ELT(AD). For instance, ED-62B refers to minimum operational performance specifications applicable to an ADFR (ED-112A or ED-155) regarding the deployment performance of the ELT in the deployable package of an ADFR, its buoyancy, endurance, environmental test conditions, etc.

GM3 ACNS.E.LAD.010 Definitions
GUIDANCE FOR SOLUTIONS BASED ON AN ELT(DT)

(a) In the solution based on an ELT(DT), the ELT could be:

— a crash-survivable ELT(DT); or

— an ELT(DT) and an ELT(AF), ELT(AD) or ELT(AP).

(b) It is expected that the flight crew can manually activate one of the ELTs of this solution (refer to CS ACNS.E.LAD.250).

(c) EUROCAE ED-62B 'Minimum operational performance standard for aircraft emergency locator transmitters 406 MHz' and COSPAS-SARSAT specifications prescribe that the ELT(DT) sends an encoded position signal.

GM4 ACNS.E.LAD.010 Definitions
GUIDANCE FOR SOLUTIONS BASED ON HRT

(a) In the solution based on HRT, an airborne system transmits frequent signals that contain the aircraft position. It is expected that a solution based on HRT provides location accuracy of the point of end of flight close to that provided by a solution based on an ADFR or on an ELT(DT), and that the robustness of a solution based on HRT is comparable to that of a solution based on an ADFR or on an ELT(DT).

(b) It is expected that a solution based on HRT transmits a homing signal after a survivable accident (refer to CS ACNS.E.LAD.170).

(c) The source of the aircraft position used by the solution based on HRT needs to be robust so that accurate position determination remains possible in conditions representative of an accident flight (refer to CS ACNS.E.LAD.310 and CS ACNS.E.LAD.320).

(d) In the solution based on HRT, an airborne system could continuously transmit the aircraft position throughout the flight. However, only information contained in activation and deactivation signals is expected to be received by the competent SAR centre (refer to CS ACNS.E.LAD.240).

Rationale

The position reports sent by the aircraft should not be integrally transmitted to the competent SAR centre. Only the activation and deactivation signals are relevant for the purpose of CAT.GEN.MPA.210, and therefore sent to the SAR centre. Refer also to AMC1 CAT.GEN.MPA.210.

Transmission

CS ACNS.E.LAD.110 Transmission of the activation signals

The system transmits the activation signals to the communication infrastructure within a time frame that maximises the likelihood that at least a set of data containing the information required for activation signals is received following activation.

Rationale

This requirement focuses on the transmission of the activation signals to locate the point of end of flight. 'Activation signals' is defined in the proposed CS ACNS.E.LAD.010. Those signals correspond to 406-MHz signals when the transmitter is an ELT. The content of the activation signals is defined in the proposed CS ACNS.E.LAD.140. The signals should be transmitted upon activation, which is addressed in the proposed CS ACNS.E.LAD.240 and CS ACNS.E.LAD.250. The activation signals must be transmitted before the transmitter is destroyed through the crash, and this may require several transmissions depending on the system performance.

AMC1 ACNS.E.LAD.110 Transmission of the activation signals

ACCEPTABLE MEANS OF COMPLIANCE SPECIFIC TO SOLUTIONS BASED ON AN ADFR

(a) The ADFR should meet the specifications defined in ETSO-2C517, except that the recording of data for the purpose of facilitating accident investigations is not necessary for compliance with CAT.GEN.MPA.210.

(b) The ADFR should be installed as specified in the appropriate certification specification for the aircraft type, except that the recording of data for the purpose of facilitating accident investigations is not necessary for compliance with CAT.GEN.MPA.210.

(c) The ELT that is integrated into the deployable package of the ADFR should be of class 0 unless it is shown that during aircraft operation, the ELT is exposed to temperature cycles for which class 1 is acceptable as well.

(d) The following ELT configurations can meet CS ACNS.E.LAD.110 and CS ACNS.E.LAD.170:

(1) an ELT that is integrated into the deployable package of the ADFR, approved and compliant with ETSO-C126c, of type ELT(AD), class 0, capabilities C (crash survivability), G (internal/integral GNSS receiver), and H1 (121.5-MHz homing signal), and any generation (capability T.001 or T.018); or

(2) an ELT that is integrated into the deployable package of the ADFR, approved and compliant with ETSO-C126c, of type ELT(AD), class 0, capability C (crash survivability),

and H1 (121.5-MHz homing signal), and any generation (capability T.001 or T.018), and an ELT that is approved and compliant with ETSO-C126c, of type (AF) or (AP), a class appropriate for the installation, capabilities C (crash survivability), and G (internal/integral GNSS receiver), and any generation (capability T.001 or T.018).

(e) Refer to AMC2 ACNS.E.LAD.320 for showing the successful transmission of activation signals in case of a non-survivable accident.

Rationale

(a) The proposed ETSO-2C517 in NPA 2019-06 provides for the minimum performance of the ADFR system at equipment level.

(b) CS 25.1457 addresses the installation aspects of the ADFR.

(c) The ELT that is integrated into the deployable package of the ADFR should be of class 0 as the deployable package containing the ELT will most probably be located close to the external surface of the aircraft and therefore exposed to severe temperature cycles during aircraft operation. At 36 000-ft altitude in international standard atmosphere (ISA) conditions, the temperature is –56.5°C. However, if the aircraft stands at the gate in a hot location and directly in the sun, the temperature at the surface of the aircraft may well locally exceed +55°C. In addition, the ELT that is integrated into the deployable package of the ADFR is expected to start transmitting upon deployment of the ADFR and to transmit a homing signal for at least 48 hours. However, if it is shown that the ELT is exposed to less severe temperature cycles, the ELT may be of class 1.

(d) An encoded position needs to be transmitted to achieve 200-meter accuracy after a survivable accident (refer to the proposed CS ACNS.E.LAD.420). To achieve this accuracy, the ELT that is integrated into the deployable package of the ADFR can be of capability G. Alternatively, a stand-alone ELT(AF) or (AP) of capability G can be installed in addition to the ADFR. This additional ELT(AF) or (AP) does not need to transmit a homing signal and it can be of another class than class 0 as the transmission of the 406-MHz signal is required for only a short period of time and the ELT that is integrated into the deployable package of the ADFR transmits the homing signal for at least 48 hours.

(e) Refer to the rationale of CS ACNS.E.LAD.320 and of AMC2 ACNS.E.LAD.320.

AMC2 ACNS.E.LAD.110 Transmission of the activation signals
ACCEPTABLE MEANS OF COMPLIANCE SPECIFIC TO SOLUTIONS BASED ON AN ELT(DT)

(a) The following ELT configurations can meet CS ACNS.E.LAD.110 and CS ACNS.E.LAD.170:

(1) an ELT(DT) that is approved and compliant with ETSO-C126c, of class 0 or 1, capabilities G (internal/integral GNSS), C (crash survivability), and H1 (121.5-MHz homing signal), and any generation (capability T.001 or T.018); or

(2) an ELT(DT) that is approved and compliant with ETSO-C126c, of a class appropriate to the installation, capability G, and any generation (capability T.001 or T.018), and an ELT(AF), (AD) or (AP) that is approved and compliant with ETSO-C126c, class 0 or 1, capabilities G, C, and H1, and any generation.

(b) Installation of the ELT(DT) should result in the ELT(DT) transmitting the activation signals and deactivation signals, either through the automatic triggering function or manual activation by the flight crew.

(c) The transmission of the activation signals should start no later than 5 s after detection of an activation condition through the automatic triggering function or manual activation by the flight crew.

Rationale

(a) Two solutions based on an ELT(DT) could meet both proposed CS ACNS.E.LAD.110 and CS ACNS.E.LAD.170: either the ELT(DT) is crash survivable and able to transmit the homing signal during 48 hours irrespective of the local climatic conditions (class 0 or 1), or the ELT(DT) does not meet all the specifications and needs to be complemented by an ELT(AF), an ELT(AD) or an ELT(AP) of class 0 or 1. However, as CAT.GEN.MPA.210 is applicable to aeroplanes that perform long-haul flights, and the accident might take place in a very cold and remote location, even if the aircraft is not usually operated over cold areas, the SAR team may need more time to reach the accident site. In any case, an internal GNSS receiver should be integrated into the crash survivable ELT to meet the 200-m accuracy specification (refer to the proposed CS ACNS.E.LAD.420).

(b) The ELT(DT) should be automatically activated through an automatic triggering function (refer also to the proposed CS ACNS.E.LAD.240 and its AMC), and the installation should ensure that the system performs its intended function.

(c) The transmission should start without delay (in accordance with the COSPAS-SARSAT standard, i.e. within 5 sec) due to the risk of destruction of the ELT through the crash (non-survivable crash) or subsequent fire (survivable crash).

AMC3 ACNS.E.LAD.110 Transmission of the activation signals

ACCEPTABLE MEANS OF COMPLIANCE SPECIFIC TO SOLUTIONS BASED ON HIGH-RATE TRACKING

The transmission of the activation signals should start no later than 5 s after detection of an activation condition through the automatic triggering function or manual activation by the flight crew.

Rationale

Refer to the rationale of the proposed AMC2 ACNS.E.LAD.110, point (c).

GM1 ACNS.E.LAD.110 Transmission of the activation signals

COMMON GUIDANCE FOR ALL SOLUTIONS

It is recommended that activation signals are also transmitted when some of the information required by CS ACNS.E.LAD.140 is not available to the system (e.g. due to the failure of some data sources).

CS ACNS.E.LAD.120 Repeated transmission of the activation signals

Once activated, the system repeatedly transmits activation signals at such a frequency that they can be detected by the communication infrastructure at time intervals that do not exceed 1 minute. The system continues to transmit those signals at least until it reaches the point of end of flight or until it is deactivated.

Rationale

If a system activates before it reaches the point of end of flight (e.g. based on an ELT(DT) or HRT), regular transmission of its position facilitates the follow-up to a distress situation. The characteristics of the signal (power, frequency, pointing, etc) should be sufficient to ensure detection by the communication infrastructure that is assumed in the proposed CS ACNS.E.LAD.320 at time intervals that do not exceed 1 minute.

The transmission service will automatically provide the data corresponding to the activation signals to the competent SAR centre, and simultaneously make this data available to the ATS units that are competent for the area where the activation signals are coming from. This information distribution scheme is not intended to change the respective responsibilities of the ATS unit(s) (alerting service) and SAR centres. In addition, to limit the impact on SAR centres, the system should only be activated when an accident where the aircraft is severely damaged or a distress situation occur or are likely to occur within minutes (refer to the proposed CS ACNS.E.LAD.240).

The transmission must be discontinued if normal flight conditions are recovered (deactivation is addressed in the proposed CS ACNS.E.LAD.260).

GM1 ACNS.E.LAD.120 Repeated transmission of the activation signals

COMMON GUIDANCE FOR ALL SOLUTIONS

The conditions of CS ACNS.E.LAD.240 'Automatic activation' and CS ACNS.E.LAD.620 'Erroneous automatic activation' restrict automatic activation to genuine accidents and distress situations. Therefore, the period of time from automatic activation of the system to reaching the point of end of flight or the end of the distress situation is not expected to exceed a few minutes, in most cases.

The transmission service is also expected to make this data available to the ATS units that are competent for the area where the activation signals are coming from to support them in providing the alerting service.

CS ACNS.E.LAD.130 Transmission of the deactivation signals

(a) Upon deactivation, the system automatically transmits deactivation signals so that at least a set of data containing the information required for deactivation signals is transmitted within 1 minute of the deactivation time.

(b) Transmission of deactivation signals is repeated to achieve reception by the communication infrastructure of the information required for deactivation signals, with a 99.9-% probability.

Rationale

(a) Specific signals must be sent to indicate deactivation of the system as authorities should be able to distinguish between interruptions of the transmission of activation signals possibly caused by the accident and those due to a recovery to normal conditions (see the proposed CS ACNS.E.LAD.260 on deactivation conditions). The transmission of deactivation signals should not be delayed to reduce the impact on the competent SAR centre.

It is recognised that the competent authorities may not rely only on deactivation signals to determine the end of a distress situation. However, deactivation signals are an important input for them to assess the situation. Furthermore, they may use deactivation signals as a primary source of information after gaining confidence in those signals.

(b) A single transmission may not ensure a high probability that the deactivation signal is received by the communication infrastructure in all situations. Therefore, the transmission may have to be repeated.

CS ACNS.E.LAD.140 Activation signals — mandatory information

The activation signals contain sufficient information to determine:

— that the system is activated;

— the latitude and longitude of the transmitter;

— the times at which the latitude and longitude were valid;

— the individual aircraft from which the activation signals are sent; and

— the type of airborne equipment that transmitted the signals.

Rationale

The activation signals must contain sufficient information to determine that the aircraft is likely to be in a distress situation, as well as to locate and identify the affected aircraft. The information on the type of airborne equipment that transmitted the signals can be used to contact the provider of the transmission service and/or the manufacturer of that airborne equipment if the other information required by CS ACNS.E.LAD.140 (status of the system, latitude and longitude values and their age, identification of the individual aircraft) is incomplete or erroneous.

Determining the times at which the latitude and longitude were valid allows to establish how fresh the information that stems from the position source of the system is.

AMC1 ACNS.E.LAD.140 Activation signals — mandatory information

ACCEPTABLE MEANS OF COMPLIANCE APPLICABLE TO ANY SOLUTION

(a) If the activation signals are transmitted in flight, they should be sent no later than 2 seconds after the time at which the position data is valid.

(b) The activation signals should contain the latitude and longitude of the transmitter even if their accuracy is such that they are considered erroneous (refer to AMC1 ACNS.E.LAD.630 and GM1 ACNS.E.LAD.630).

(c) The latitude and longitude information should be provided in the World Geodetic System 84 (WGS84) (G1150 or later) or in another realisation of the International Terrestrial Reference Frame (2000 or later).

(d) The information contained in the activation signals or their characteristics should be sufficient to determine with certainty whether those signals were transmitted by an ELT.

Rationale

(a) Examples of survivable accidents with large turbojet aeroplanes seem to indicate that in most cases, the aeroplane speed at the time of collision with terrain is not greater than 180 kt or approximately 90 m/s. A 2-s delay would then induce a 180-m error, which is similar to the value required by the proposed CS ACNS.E.LAD.420.

(b) The risk of destruction of the transmitter at the crash gives priority to transmitting.

(c) WGS-84 is defined in ICAO Doc 9674 World Geodetic System — 1984 (WGS-84) Manual. The International Earth Rotation and Reference Systems Service provides for and maintains the international terrestrial reference frame (ITRF). Note: COSPAS-SARSAT technical documents (refer to C/S T.001.) recognise WGS-84 and the Galileo terrestrial reference frame (GTRF) as geodetic systems; they both agree with the ITRF 2000 at centimetre level.

(d) See the rationale of CS ACNS.E.LAD.140.

GM1 ACNS.E.LAD.140 Activation signals — mandatory information

COMMON GUIDANCE FOR ALL SOLUTIONS

The type of airborne equipment that transmitted the signals should allow the identification of the type of transmitter and service, e.g. ELT(DT), ELT(AD), aeronautical mobile satellite services, etc. The objective is to allow the retrieval of further data that could assist in refining the location of the accident site and obtaining other information useful for SAR and investigation purposes.

GM2 ACNS.E.LAD.140 Activation signals — mandatory information

GUIDANCE FOR SOLUTIONS BASED ON AN ELT(DT)

It is advisable that the ELT(DT) encodes the latitude and longitude based on an approved aircraft position source (when available), rather than on the internal GNSS receiver as the latter is often less reliable and less accurate.

CS ACNS.E.LAD.150 Activation signals — supplementary information

If any of the following data is readily available to the system and supported by the transmission service, the activation signals contain this data:

— whether latitude and longitude were stamped as invalid data;

— the estimated accuracy of latitude and longitude;

— whether activation was automatically or manually triggered;

— the altitude;

— the ground speed;

— the ground track; or

— the vertical speed.

Rationale

Additional data may allow to locate the point of end of flight with greater accuracy. However, this data may not be included in communication protocols that are provided by the transmission service or may not be readily available to the system (e.g. to obtain this data a change to equipment that is not part of the system may be required). It could particularly affect older aircraft designs for which it could be challenging to collect this information. Therefore, this information is only required if practicable.

CS ACNS.E.LAD.160 Deactivation signals — mandatory information

The deactivation signals are sufficient to determine:

— that the system was deactivated;

— the individual aircraft from which the deactivation signals are sent; and

— the type of airborne equipment that transmitted the signals.

Rationale

The deactivation signals must allow to determine that the distress situation is over and to identify the affected aircraft. The type of airborne equipment that transmitted the signals can be used to contact the provider of the transmission service and/or the manufacturer of that airborne equipment if the other information required by CS ACNS.E.LAD.160 (status of the system, identification of the individual aircraft) is incomplete or erroneous.

CS ACNS.E.LAD.170 Transmission of a homing signal

(a) In case of a survivable accident that falls within the scope of this Section, a 121.5-MHz homing signal is automatically transmitted after reaching the point of end of flight. The 121.5-MHz homing signal is compatible with standard homing direction finders.

(b) The flight crew can manually initiate the transmission of a 121.5-MHz homing signal, at least when the aircraft is not airborne.

(c) The flight crew can manually stop the transmission of the 121.5-MHz homing signal whether this transmission was automatically or manually initiated unless the homing transmitter is detached from the aircraft.

(d) The homing signal is transmitted for at least 48 hours or until the aircraft is submersed.

Rationale

(a) As CAT.IDE.A.280 allows for the removal of the automatic ELT, the system must transmit a homing signal equivalent to the one provided by such an ELT after a survivable accident within the scope of Section 3 (survivable accident is defined in the proposed CS ACNS.E.LAD.001). CS ACNS.E.LAD.420 requires that the point of end of flight is located with a two-dimensional location accuracy greater than or equal to 200 meters (95 % probability) within 20 minutes of the time of reaching the point of end of flight when the accident is survivable. This may be insufficient to rescue survivors under certain circumstances (risk of drowning if the accident occurs over water, adverse weather conditions making SAR operations more difficult and/or reducing visibility, etc.). SAR units report operations in poor visibility conditions, e.g. fog patches close to the ground that conceal the wreckage of the aircraft or aircraft hidden by jungle vegetation. In addition, all mobile SAR facilities worldwide are equipped with a standard homing direction finder, which is an easy-to-use tool in SAR operations. The SAR authorities consider that the 121.5-MHz homing signal is essential for searching the wreckage in reduced visibility conditions. Transmission of the 121.5-MHz homing signal before reaching the point of end flight is not desirable as it could hinder emergency communications on that frequency.

(b) The flight crew should be able to manually trigger the transmission of a homing signal, similar to the manual activation of the system. However, the transmission of a homing signal might be inhibited when the aircraft is airborne as this could hinder emergency communications on that frequency.

(c) The flight crew should be able to interrupt the homing signal transmission as that transmission could hinder emergency communications on that frequency. Only if the transmitter is detached from the aircraft (for instance, in case of a deployed ADFR), it is not expected that the flight crew has means to stop the transmission of the homing signal.

(d) EUROCAE ED-62B, Section 3.8.6 specifies that the minimum duration of the homing signal transmission of an ELT should be 48 hours.

AMC1 ACNS.E.LAD.170 Transmission of a homing signal
ACCEPTABLE MEANS OF COMPLIANCE APPLICABLE TO ANY SOLUTION

(a) When the same battery powers both the transmission of the activation signal and of the homing signal, the battery capacity should be sufficient to cover both transmissions.

(b) The installation of the homing transmitter and of its antenna should be such that after a successful ditching or landing, the transmission is possible despite damage to, or immersion of, the lower part of the fuselage and/or the wings.

Rationale

(a) The battery capacity should be sufficient to ensure that the activation signals that are required to meet the accuracies for non-survivable and survivable accidents as well as the homing signal are transmitted. It should be noted that ELTs are required to transmit for 24 hours on 406 MHz and for 48 hours on 121.5 MHz (as specified in EUROCAE ED-62B).

(b) A successful ditching or an emergency landing in marshy areas will most probably result in submersion of the lower part of the fuselage. The installation should be robust to withstand these conditions so that the transmission of activation signals and homing signals is not affected. When the fuselage becomes immersed to such a point that no survivor should remain in the hull, it is assumed that activation signals were transmitted and survivors found shelter in life rafts that are fitted with portable beacons.

AMC2 ACNS.E.LAD.170 Transmission of a homing signal
ACCEPTABLE MEANS OF COMPLIANCE SPECIFIC TO SOLUTIONS BASED ON AN ADFR

(a) The system should meet the conditions of AMC1 ACNS.E.LAD.170.

(b) Refer to AMC1 ACNS.E.LAD.110 for possible ELT configurations.

Rationale

(a) Any solution should meet the common AMC.

(b) The ELT configurations specified in AMC1 ACNS.E.LAD.110 take into account severe temperature cycles encountered during the operation of the aircraft, which result in failed transmission of the homing signal if an appropriate class is not selected for the ELT.

AMC3 ACNS.E.LAD.170 Transmission of a homing signal

ACCEPTABLE MEANS OF COMPLIANCE SPECIFIC TO SOLUTIONS BASED ON AN ELT(DT)

(a) The system should meet the conditions of AMC1 ACNS.E.LAD.170.

(b) The ELT used to meet CS ACNS.E.LAD.170 should detect that the aircraft collided with terrain or water to initiate the transmission of a 121.5-MHz homing signal. The detection may be made by means of an acceleration sensor ('g-switch') or through other methods (see EUROCAE ED-62B, Section 2.9.5.1)

(c) Refer to AMC2 ACNS.E.LAD.110 for possible ELT configurations.

Rationale

(a) Any solution should meet the common AMC.

(b) The 121.5-MHz homing signal should be transmitted automatically upon impact as the flight crew may not be able to manually trigger the transmission. There could be other means than a g-switch to detect a condition that triggers a transmission. EUROCAE ED-62B, Section 2.9.5.1 allows the detection of a constant and valid position to initiate the 121.5-MHz homing signal transmission.

AMC4 ACNS.E.LAD.170 Transmission of a homing signal

ACCEPTABLE MEANS OF COMPLIANCE SPECIFIC TO SOLUTIONS BASED ON HRT

(a) The system should meet the conditions of AMC1 ACNS.E.LAD.170.

(b) The following may be installed to meet CS ACNS.E.LAD.170 and CS ACNS.E.LAD.420: an ELT(AF), (AD) or (AP) that is approved and compliant with ETSO-C126c, of class 0 or 1, capabilities H1 (121.5-MHz homing signal), and G (internal/integral GNSS receiver), and of any generation (capability T.001 or T.018).

Rationale

(a) Any solution should meet the common AMC.

(b) To ensure that a homing signal is successfully transmitted after a survivable accident, an automatic ELT of capability C is advisable. If the point of end of flight is in a very cold area, class 0 or 1 is needed: CAT.GEN.MPA.210 is applicable to aeroplanes that perform long-haul flights and the accident might take place in a very cold and remote area, even if the aircraft is not usually operated over cold areas. In that case, SAR teams may need more time to reach the accident site. If, in addition, the automatic ELT has capability G, it can be used to meet the accuracy requirement of the proposed CS ACNS.E.LAD.420 (see also the proposed AMC3 ACNS.E.LAD.420).

GM1 ACNS.E.LAD.170 Transmission of a homing signal
COMMON GUIDANCE FOR ALL SOLUTIONS

(a) CS ACNS.E.LAD.170 might be met by installing an ELT(AF), (AD) or (AP).

(b) It is recommended that the manual activation of the system also initiates the transmission of the 121.5-MHz homing signal as soon as, but not before, the aircraft reaches the point of end of flight (see CS ACNS.E.LAD.250).

Rationale

(a) The proposed CS ACNS.E.LAD.170 was introduced to maintain the capability to locate survivors on an accident scene, which otherwise could be lost if an automatic ELT is replaced by other means that are compliant with CAT.GEN.MPA.210. Carrying an ELT(AF) or (AD) or (AP) is a simple means to maintain this capability.

(b) The proposed CS ACNS.E.LAD.250 requires a manual means to initiate the transmission of the activation signals. Therefore, it is recommended that no further crew action is taken, and that the same means initiates the 121.5-MHz homing signal as soon as the manual activation is triggered on the ground, or at the point of the impact if the manual activation occurs in flight. Transmission of the 121.5-MHz homing signal in flight is discouraged as it could prevent crew communication on that emergency frequency. However, this is not forbidden as the crew can manually interrupt the transmission of the homing signal.

GM2 ACNS.E.LAD.170 Transmission of a homing signal
GUIDANCE FOR SOLUTIONS BASED ON AN ELT(DT)

(a) The 121.5-MHz homing signal should be transmitted for at least 48 hours and at any location on the ground, including very cold areas. As the point of end of flight is required to be determined within 20 minutes of the time of end of flight in case the accident is survivable (refer to CS ACNS.E.LAD.420), the 406-MHz signal does not need to be transmitted for several hours after that time.

(b) AMC2 ACNS.E.LAD.110 provides ELT configurations that are considered compliant with the requirements of this Section.

GM3 ACNS.E.LAD.170 Transmission of a homing signal
GUIDANCE FOR SOLUTIONS BASED ON AN ADFR

If an ELT that is integrated into the deployable package of the ADFR is used to meet CS ACNS.E.LAD.170, it is acceptable that the crew cannot stop the transmission of the 121.5-MHz homing signal by this ELT after that package is deployed.

Rationale

Remote deactivation of an ELT is not required in this Section.

Operation, activation and deactivation

CS ACNS.E.LAD.210 Normal operation

(a) The system is automatically armed at the beginning of the flight and no later than when the aircraft becomes airborne.

(b) The system remains armed at least as long as the aircraft is airborne.

Rationale

(a) Most accidents occur during take-off, climb, approach or landing. A working paper that was presented at the *ICAO Thirteenth Air Navigation Conference*[11] showed that in several historical accidents of large aeroplanes, the absence of accurate location information had caused significant delays, which in turn, resulted in more deaths caused by the accident. Therefore, the system must be armed at the time of lift-off. 'Armed', as defined in the proposed CS ACNS.E.LAD.010, does not mean that the system transmits activation signals, but that it is ready to activate.

(b) All the functions of the system should be operating or ready to operate until the aircraft is on the ground. The definition of 'functions of the system' is provided in the proposed CS ACNS.E.LAD.010.

AMC1 ACNS.E.LAD.210 Normal operation

ACCEPTABLE MEANS OF COMPLIANCE APPLICABLE TO ANY SOLUTION

(a) All the airborne equipment that is needed for the functions of the system to operate should be considered.

(b) The airborne status may be acquired either through sensors that detect weight on the wheels, or by detecting that the airspeed and/or height above ground exceed a certain threshold. In the latter case, the thresholds should be set to values that trigger the detection of the airborne status while the aircraft is still above the airfield.

(c) The correct arming of the system should be demonstrated by dedicated testing during certification, and, if necessary, by providing system status monitoring.

Rationale

(a) The performance of the system relies not only on the transmitter and the detection of the incoming accident, but also on other equipment, such as a position source. All the equipment needed to make the accident detection, the position reporting, and the transmission should be powered to meet the proposed CS ACNS.E.LAD.210. The definition of 'functions of the system' is provided in the proposed CS ACNS.E.LAD.010.

(b) The arming of the system may be delayed for a few seconds after lift-off as in the case of an accident right after lift-off, the point of end of flight will be on the airfield.

11 Working paper AN-Conf/13-WP/212 was presented by Austria on behalf of the European Union, its Member States, the other Member States of the European Civil Aviation Conference (ECAC), and EUROCONTROL.

(c) The system will never activate if the transition to the airborne status is not correctly detected.

AMC2 ACNS.E.LAD.210 Normal operation

ACCEPTABLE MEANS OF COMPLIANCE SPECIFIC TO SOLUTIONS BASED ON AN ELT(DT)

(a) The system should meet the conditions of AMC1 ACNS.E.LAD.210.

(b) Except for specific operations, such as maintenance, an arming and a disarming signal should be automatically sent to the ELT(DT). The arming of the ELT(DT) should occur no later than when the aircraft becomes airborne.

Rationale

(a) Any solution should meet the common AMC.

(b) EUROCAE ED-62B, Section 2.9.5.1 specifies the ELT(DT) behaviour, assuming that a system of the aircraft gives an arming/disarming command. If the ELT(DT) is not armed, it cannot be activated through the automatic triggering function. Therefore, the installation of the ELT(DT) should be designed to prevent the ELT(DT) from not being armed, e.g. as a result of an inadvertent action of the flight crew or maintenance staff.

GM1 ACNS.E.LAD.210 Normal operation

COMMON GUIDANCE FOR ALL SOLUTIONS

The system is intended to support three states:

— a standby state, where automatic activation (as defined in CS ACNS.E.LAD.240) is disabled, for instance when the aircraft is at a parking position or in maintenance;

— an armed state, where the system continuously monitors the aircraft state to detect conditions for activation; and

— an activated state, where the system actively transmits the signals that are needed to locate the point of end of flight and other essential data for SAR purposes.

GM2 ACNS.E.LAD.210 Normal operation

GUIDANCE FOR SOLUTIONS BASED ON AN ADFR

For the ADFR, 'armed' means that the ADFR is ready to be deployed as soon as its sensors detect an accident.

GM3 ACNS.E.LAD.210 Normal operation

GUIDANCE FOR SOLUTIONS BASED ON AN ELT(DT)

(a) Arming and disarming of an ELT(DT) is defined in EUROCAE ED-62B, Section 2.9.5.1. Arming results in the transition to the armed state. Disarming results in the transition to the standby state.

(b) Reception of an activation command will result in the activation of the ELT(DT) that was previously armed.

CS ACNS.E.LAD.230 Continued operation after losing normal electrical power

(a) If the system does not deploy equipment, it remains armed or activated throughout thefollowing:

(1) flight with normal electrical power, for the maximum possible duration of flight in that condition, followed by;

(2) flight without normal electrical power, for the maximum possible duration of flight in that condition.

(b) If the system does deploy equipment, it remains armed or activated throughout the following:

(1) flight with normal electrical power, for the maximum possible duration of flight in that condition, followed by;

(2) flight without normal electrical power, for the maximum possible duration of flight in that condition, followed by;

(3) 15 minutes on the ground without normal electrical power.

Rationale

The activation must remain possible during the complete flight, including when normal electrical power is discontinued following the loss of propulsive power or auxiliary powere unit (APU), for instance due to fuel exhaustion. When the system is activated, it is acceptable that some of the functions of the system do not operate anymore: for example, an ELT(DT) can be activated because the power supply to its automatic triggering function was lost. Once the deployable package of the ADFR is deployed (which activates its integrated ELT), it is not expected that crash detection still operates.

In case of a successful emergency landing outside an airfield or a successful ditching, if life rafts can be deployed, it is expected that the survival ELT (ELT(S)) will provide means to locate drifting survivors (AMC2 CAT.IDE.A.280 specifies that an ELT(S) 'should be designed either to be tethered to a life-raft or a survivor'). If the accident is survivable but the integrity of the airframe is not preserved, activation should still be possible to allow for locating survivors.

When automatic activation depends on the deployment of a part (as with an ADFR), deployment must remain possible until the aircraft has sunk and the deployment sensors have been immersed. In addition, manual activation without deployment must be possible for a few minutes after landing or ditching.

AMC1 ACNS.E.LAD.230 Continued operation after losing normal electrical power

ACCEPTABLE MEANS OF COMPLIANCE APPLICABLE TO ANY SOLUTION

CS ACNS.E.LAD.230, point (c) may be met by installing an ELT(AF) or (AP).

Rationale

The proposed CS ACNS.E.LAD.230, point (c) was introduced to maintain the capability to locate survivors on an accident scene, which could be lost if an automatic ELT is replaced with other means compliant with CAT.GEN.MPA.210. Carrying an ELT(AF) or (AP) is a simple means to maintain this capability.

AMC2 ACNS.E.LAD.230 Continued operation after losing normal electrical power

ACCEPTABLE MEANS OF COMPLIANCE APPLICABLE TO SOLUTIONS BASED ON AN ELT(DT) AND TO SOLUTIONS BASED ON HRT

(a) The system should meet the conditions of AMC1 ACNS.E.LAD.230.

(b) If the system relies on an automatic triggering function, it should be designed to allow maintenance crew to disable transmission during maintenance activities or specific design or production flights.

(c) Care should be taken to minimise the probability of inadvertent transmission of a disarming signal during a crash.

Rationale

Maintenance procedures on the ground may require stimulating aircraft sensors to simulate an in-flight status. Such conditions may result in the automatic triggering function sending an activation order to the system. Easy means should be provided to disable the transmission in such cases. Similarly, some specific design or production flights may result in unusual flight parameters, which could lead to undesirable system activation. Means to disable the transmission would be useful in this case too.

GM1 ACNS.E.LAD.230 Continued operation after losing normal electrical power

GUIDANCE FOR SOLUTIONS BASED ON AN ADFR

The 15-minute period on ground without any propulsive power on any engine is intended to cover for the case of a ditching if the sensors of the ADFR do not detect an accident condition (no severe damage to the airframe). Depending on the ditching condition, the aircraft may stay afloat for a certain time, resulting in a delay before a water immersion sensor triggers the deployment. If the aircraft stays afloat for more than 15 minutes, it is assumed that the ditching conditions allow some flight or cabin crew members to activate the ELT that is integrated into the deployable package of the ADFR or attached to the aircraft and that ELT(S)s, when present, are also activated.

CS ACNS.E.LAD.240 Automatic activation

Automatic activation occurs only when the aircraft detects that an accident or a distress situation just occurred, is occurring, or is likely to occur within minutes.

Rationale

The system must be capable of automatically activating (‘activation’ is defined in the proposed CS ACNS.E.LAD.010), which includes automatic detection of activation conditions. The detection of accident conditions and transmission of signals may happen before, during, or after the accident, depending on the retained solution. The aircraft must make the detection (a robust solution does not make timely activation dependent on successful transmission from and/or to the aircraft). The functions of the system as defined in the proposed CS ACNS.E.LAD.010 include detection of activation conditions.

There may be distress situations that do not immediately result in an accident (e.g. a complete engine flameout away from any airfield, which corresponds to scenario 4 of EUROCAE ED-237), but are still worth transmitting activation signals.

Automatic activation is only allowed when an accident where the aircraft is severely damaged or a distress situation is likely to occur within the next minutes. This is to restrict activation conditions to cases that really require an SAR centre to be notified.

AMC1 ACNS.E.LAD.240 Automatic activation

ACCEPTABLE MEANS OF COMPLIANCE APPLICABLE TO SOLUTIONS BASED ON AN ELT(DT) AND TO SOLUTIONS BASED ON HRT

The criteria used by the automatic triggering function should comply with EUROCAE ED-237, except that this function should not be inhibited when the aircraft is airborne unless the aircraft is equipped with an ELT(AF), (AD) or (AP). When the accident database of EUROCAE ED-237 does not cover all possible scenarios, additional accidents should be included to verify the event detection rate.

Rationale

EUROCAE ED-237 contains performance specifications for criteria that allow the detection of an incoming accident. EUROCAE ED-237 may be used, except that the inhibition of the automatic triggering function in some flight phases, as provided for in Section 3.1 of that document, is not allowed. That inhibition is not consistent with the system's specification to be capable of automatically activating whenever the aircraft is airborne (refer to CS ACNS.E.LAD.210).

The EUROCAE ED-237 criteria may not be sufficient to test all possible scenarios of the automatic triggering function. Particularly, the accident database of EUROCAE ED-237, Section 4.2.1 may not be sufficient.

GM1 ACNS.E.LAD.240 Automatic activation

COMMON GUIDANCE FOR ALL SOLUTIONS

(a) The accident scenarios to be considered include survivable accidents and non-survivable accidents (refer to CS ACNS.E.LAD.010 and GM1 ACNS.E.LAD.010).

(b) As specified in EUROCAE ED-237: 'A minimum occurrence duration of a particular condition of a scenario (the persistence time) should also be considered as part of the triggering criteria logic'. For each of the criteria, a trade-off needs to be found between reliable detection of accidents and distress situations and limiting the frequency of nuisance activation.

CS ACNS.E.LAD.250 Manual activation

(a) Whether the system is armed or not, the system can be manually activated by the flight crew.

(b) Manual deployment of any part of the system is prevented during flight.

Rationale

(a) The crew must be able to manually activate the system as the system may fail to change to the armed state or detect the crash condition, e.g. in case of a successful emergency landing outside of an airfield. This also replicates the capability of the automatic ELT that the system may replace. This capability must be maintained to comply with CAT.GEN.MPA.210, whatever the system installed.

(b) Manual deployment of the system transmitter during flight defeats the purpose of CAT.GEN.MPA.210, which is to accurately locate the point of end of flight. In addition, any deployment of a part during flight could cause serious or fatal injuries to people on the ground.

AMC1 ACNS.E.LAD.250 Manual activation
ACCEPTABLE MEANS OF COMPLIANCE APPLICABLE TO ANY SOLUTION

(a) CS ACNS.E.LAD.250 may be met by installing an ELT(AF) or (AP).

(b) The controls to manually activate and deactivate the system should be designed and installed to reduce the risk of inadvertent activation/deactivation (e.g. using guarded switches).

Rationale

(a) The proposed CS ACNS.E.LAD.250 is introduced to maintain the capability to locate survivors on an accident scene. That capability could be lost if another means that complies with CAT.GEN.MPA.210 replaces an automatic ELT. Carrying an ELT(AF) or (AP) is a simple means to maintain this capability.

(b) As any activation of the system may trigger unnecessary response from SAR centres and ATS units, the controls for manual activation should be designed and installed to keep the risk of inadvertent activation limited.

AMC2 ACNS.E.LAD.250 Manual activation
ACCEPTABLE MEANS OF COMPLIANCE APPLICABLE TO SOLUTIONS BASED ON HRT

(a) The system should meet the conditions of AMC1 ACNS.E.LAD.250.

(b) Unless an automatic ELT is installed, it should be possible for the flight crew to manually and simultaneously activate the position reporting function (when not continuous) and the transmission of the activation signals. Compliance with CS ACNS.E.LAD.250 is also possible by using an automatic ELT.

Rationale

(a) Any solution should meet the common AMC.

(b) The flight crew should be able to manually activate with one action both the transmission of position and transmission of activation signals to indicate to the competent SAR centre that there is a distress condition. An automatic ELT is also a means to indicate a distress condition to the competent SAR centre as the automatic ELT can be activated it from the cockpit (this does not apply to a survival ELT, which may not be accessible to the flight crew in case of emergency). The aircraft flight manuals (AFMs) of most large aircraft types require the flight crew to activate the automatic ELT under the abnormal procedures for emergency landing or ditching.

GM1 ACNS.E.LAD.250 Manual activation
COMMON GUIDANCE FOR ALL SOLUTIONS

Similar to an ELT(AF), the crew should be able to manually activate the system even if the system is not armed (e.g. in case of an emergency landing or ditching that does not result in an automatic activation).

CS ACNS.E.LAD.260 Automatic deactivation

(a) The system is only automatically deactivated if the aircraft detects a confirmed return to a safe flight condition.

(b) When the system is manually activated, it cannot be automatically deactivated.

Rationale

(a) Automatic deactivation is important to not unduly use SAR services by keeping the system activated long after the aircraft returns to a safe flight condition. In addition, it should be ensured that SAR centres can trust that the aircraft is safe when deactivation messages are received.

(b) The flight crew might need to manually activate the system when the system fails to automatically activate or when the flight crew intends to trigger an alert before the conditions for automatic activation are met (e.g. in case of emergency landing). Manual activation of the system should remain responsibility of the commander, in accordance with CAT.GEN.MPA.105, point (b), which states that 'The commander […] shall, in an emergency situation that requires immediate decision and action, take any action he/she considers necessary […]. In such cases he/she may deviate from rules, operational procedures and methods in the interest of safety.' Therefore, manual activation is not allowed to be automatically deactivated.

GM1 ACNS.E.LAD.260 Automatic deactivation

GUIDANCE FOR ALL SOLUTIONS

No automatic deactivation capability is expected after the transmitter of activation signals is deployed.

The criteria for a 'return to safe flight' are usually more stringent than those for triggering the system activation. Otherwise, if the criteria for a 'return to safe flight' are the same as those for triggering the system activation, a confirmation time may be needed that is long enough (normally several minutes) to prevent undesirable deactivation.

In any case, the confirmation time is a trade-off between preventing undesirable deactivation during transient return to a safe flight condition and limiting the duration of transmission after recovery from a distress situation.

GM2 ACNS.E.LAD.260 Automatic deactivation

GUIDANCE FOR SOLUTIONS BASED ON AN ADFR

If the system relies on the ELT integrated into the deployable package of the ADFR to comply with CS ACNS.E.LAD.260, it is acceptable that the system cannot stop the transmission of the activation signals after deployment of the deployable package.

CS ACNS.E.LAD.270 Manual deactivation

(a) When the system is manually activated, it can be manually deactivated if the transmitter is attached to the aircraft.

(b) When the system is automatically activated, it cannot be manually deactivated.

Rationale

(a) The flight crew must be able to deactivate the system when they activated it. Only if the transmitter is detached from the aircraft (for instance, in case of a deployed ADFR), it is not expected that the flight crew have means to stop the transmission of activation signals.

(b) However, manual deactivation of an automatically activated system is forbidden during flight, not only because it is unacceptable to address unreliable design through operational procedures, but also to avoid inadvertent deactivation by the flight crew.

CS ACNS.E.LAD.280 Indications to the flight crew

(a) The system provides timely indication to the flight crew that it is activated or transmitting the homing signal.

(b) The system provides indication to the flight crew in case of failure that affects its performance.

Rationale

(a) The flight crew must be made aware of automatic activation as they may want to manually activate the system if automatic activation failed, or, in case of nuisance activation, to be able to timely inform the relevant ATS unit that this is nuisance activation (refer to the proposed AMC1 CAT.GEN.MPA.210). This also applies to automatic activation that results in the deployment of a part that may cause danger to third parties (refer to the proposed CS ACNS.E.LAD.650). For the same reasons, the flight crew must also be made aware that the system transmitts a 121.5-MHz homing signal.

(b) If the flight crew is made aware that the performance of the system is degraded, they will be better prepared to use alternative means to alert the authorities in case of a distress situation (e.g. use the aeronautical emergency frequency).

AMC1 ACNS.E.LAD.280 Indications to the flight crew

ACCEPTABLE MEANS OF COMPLIANCE APPLICABLE TO ANY SOLUTION

The indication to the flight crew that the system is activated should be a caution, in accordance with CS 25.1322.

Rationale

The flight crew should be immediately made aware of a nuisance activation to inform the relevant ATS unit without delay.

AMC2 ACNS.E.LAD.280 Indications to the flight crew

ACCEPTABLE MEANS OF COMPLIANCE SPECIFIC TO SOLUTIONS BASED ON AN ADFR

The system should provide distinct indications when the ELT integrated into the deployable package of the ADFR is activated without deployment and when this package is deployed.

Rationale

The deployed part could cause damage to other aircraft, an aerodrome approach aid, or aerodrome lights, when deployed on or above a runway or taxiways. If the flight crew is made aware of this situation, they can inform the ground to prevent any hazard resulting from such damage.

CS ACNS.E.LAD.290 Means to analyse undesirable automatic activation

The system provides means to determine the causes of undesirable automatic activation.

Rationale

According to the proposed AMC1 CAT.GEN.MPA.210, the operator should perform an analysis of the undesirable automatic activation if the frequency of such activation in its fleet is abnormally high. Any activation signal is automatically transmitted to the competent SAR centre and made available to the relevant ATS unit and therefore, it has an impact on their resources. Therefore, the system design should support quick and effective analysis by the operator of undesirable automatic activation, and ultimately quick corrective actions.

AMC1 ACNS.E.LAD.290 Means to analyse undesirable automatic activation
ACCEPTABLE MEANS OF COMPLIANCE APPLICABLE TO ANY SOLUTION

The information that is necessary to determine the cause of undesirable automatic activation may be transmitted during flight or stored on board the aircraft. This information should be sufficient to identify the individual aircraft and determine the time and source of each case of activation.

Rationale

This information is the minimum that is needed for postflight analysis of an undesirable automatic activation. The time information is useful for synchronising with other airborne recordings (flight data recorder or quick-access recorder) and operational data.

AMC2 ACNS.E.LAD.290 Means to analyse undesirable automatic activation
ACCEPTABLE MEANS OF COMPLIANCE SPECIFIC TO SOLUTIONS BASED ON AN ADFR

(a) The system should meet the conditions of AMC1 ACNS.E.LAD.290.

(b) If airborne equipment retains data that is sufficient to identify which conditions triggered the deployment of the deployable package of the ADFR or the activation of its integrated ELT, this equipment should be affixed to the aircraft.

Rationale

In case of unintended deployment of the deployable package of the ADFR or undesirable activation of its integrated ELT, there may be no action taken to retrieve the deployable package as this may require a disproportionate effort without any safety benefit. Therefore, the data that is sufficient to identify which conditions triggered unintended deployment or activation needs to be accessible without retrieving the deployable package.

AMC3 ACNS.E.LAD.290 Means to analyse undesirable automatic activation

ACCEPTABLE MEANS OF COMPLIANCE APPLICABLE TO SOLUTIONS BASED ON AN ELT(DT) AND TO SOLUTIONS BASED ON HRT

(a) The system should meet the conditions of AMC1 ACNS.E.LAD.290.

(b) Data on automatic activation resulting from loss of power supply to the automatic triggering function (refer to AMC2 ACNS.E.LAD.310, point (b) or AMC3 ACNS.E.LAD.310, point (b), as applicable) should also be stored or transmitted.

Rationale

According to the proposed AMC2 ACNS.E.LAD.310, point (b), and the proposed AMC3 ACNS.E.LAD.310, point (b), the transmitter (ELT(DT) or other transmission means depending on technology) should transmit the activation signals if the automatic triggering function powers down abnormaly or is affected by a loss of multiple data sources. This AMC provides for including such triggers of undesirable automatic activation in the information to be stored or transmitted.

Robustness

CS ACNS.E.LAD.310 Environmental conditions encountered during accidents

(a) No environmental condition that may be encountered during the accident flight or that may result from the aircraft colliding with terrain or water adversely affects the location accuracy specified for non-survivable accidents, or the performance of the following functions of the system: automatic activation and transmission of the activation signals.

(b) The location accuracy specified for survivable accidents is achieved under environmental conditions that are encountered during most survivable accidents where the aircraft is severely damaged.

(c) Requirements applicable to transmission of a homing signal are met under environmental conditions that are encountered during most survivable accidents where the aircraft is severely damaged.

Rationale

The accident conditions must not impede the detection and transmission of the activation signals, and the location accuracy requirements must be met under such conditions. This may include the specific environmental conditions before, during and after the crash, as applicable, depending on the type of solution: if the solution is designed to transmit activation signals before the crash, only conditions affecting the aircraft before the crash may need to be considered. If the solution is designed to start transmitting after the crash or keep transmitting after the crash, conditions affecting the aircraft before the crash as well as conditions during and after the crash need to be considered. In addition, the location accuracy objective is different depending on whether the accident is survivable (refer to CS ACNS.E.LAD.420) or not (refer to CS ACNS.E.LAD.410).

AMC1 ACNS.E.LAD.310 Environmental conditions encountered during accidents
ACCEPTABLE MEANS OF COMPLIANCE APPLICABLE TO ANY SOLUTION

(a) The system should meet the specifications for automatic activation and transmission of the activation signals while all the equipment that the system is composed of is subject to the environmental test conditions of Table 1 and Table 2 below.

(b) If activation signals need to be transmitted by equipment affixed to the aircraft, after reaching the point of end of flight, to meet CS ACNS.E.LAD.410, that equipment should be shown to pass the following tests:

(1) the impact test of EUROCAE ED-112A, Section 2.4.2.1;

(2) the penetration test of EUROCAE ED-112A, Section 2.4.2.3;

(3) the static crush test of EUROCAE ED-112A, Section 2.4.2.4; and

(4) the fire test of Section EUROCAE ED-112A, 3.3.2.4, except that the duration of the fire test may be less than specified in Section 3.3.2.4 if that duration is sufficient to ensure the transmission of the activation signals as well as compliance with CS ACNS.E.LAD.410.

Successful transmission of activation signals should be shown at the end of this sequence of tests.

(c) If activation signals need to be transmitted by equipment affixed to the aircraft after reaching the point of end of flight to meet CS ACNS.E.LAD.420, that equipment should successfully transmit the activation signals after being subjected to the environmental tests applicable to an ELT(AF) in Table 4-1 and Table 4-2 of EUROCAE ED-62B. However, if the duration of the flame test of EUROCAE ED-62B, Section 4.5.13 is not sufficient to ensure that at least a complete set of data, such as those specified in CS ACNS.E.LAD.140, is received and that CS ACNS.E.LAD.420 is met, an appropriate duration should be determined and used for the flame test.

(d) The homing signal transmitter should successfully transmit the 121.5-MHz homing signal when subjected to the environmental tests applicable to an ELT(AF) in Table 4-1 and Table 4-2 of EUROCAE ED-62B.

(e) If ELTs are used to meet CS ACNS.E.LAD.310, they should be installed in accordance with the guidelines of EUROCAE ED-62B, Chapter 6.

Table 1 — Minimum environmental qualification level test conditions applicable to the system

The following tests may be performed in any order or combination that is convenient to the manufacturer. Unless otherwise specified, compliance with requirements on automatic activation (CS ACNS.E.LAD.240 and CS ACNS.E.LAD.110) and compliance with requirements on transmission of activation signals (CS ACNS.E.LAD.120 and CS ACNS.E.LAD.140) should be ensured for each test. In addition, the test should be considered failed if undesirable activation occurs during the test. Equipment dedicated to the system may be replaced between tests. Unless otherwise specified, dedicated power sources may be replaced if the duration of the test is greater than the duration of the battery capacity.

The test categories indicated in this table are those defined in EUROCAE ED-14G. When no test category is indicated in this table, select an appropriate test category for the system. Note: the environmental conditions and test procedures described in EUROCAE ED-14G and in RTCA DO-160G are identical so that RTCA DO-160G may be used instead of ED-14G.			
TESTS ACCORDING TO EUROCAE ED-14G			**ADDITIONAL TEST CONDITIONS**
CONDITIONS	**SECTION IN ED-14G**	**TEST CATEGORIES (MINIMUM)**	
Temperature and altitude Low temperature High temperature Altitude	4.0 4.5.1 4.5.2 & 4.5.3 4.6.1	A1	The system should be activated without deployment before the test; compliance with CS ACNS.E.LAD.120 and CS CNS.E.LAD.140 should be ensured during the test. In addition, CS ACNS.E.LAD.240 should be met for each operating temperature, at the end of each test period. CS ACNS.E.LAD.240 should be met for the tested altitude, at the end of each test period. If the projected duration of the test is greater than the duration of the dedicated power source, the system activation can be delayed until the temperature is stabilised at the operating temperature.
Decompression Overpressure	4.6.2 4.6.3	A1	The decompression test should be performed at a pressure altitude of 50 000 ft. The system performance should be checked after the test.
Temperature variation	5.0	B	The system should be activated before the test; CS ACNS.E.LAD.120 and CS ACNS.E.LAD.140 should be met during the test. In addition, compliance with CS ACNS.E.LAD.240 should be ensured at the end of the test or after the test.
Humidity	6.0	B	The system performance should be checked after the test.
Operational shock & crash safety	7.0		The system performance should be checked after the test.

Vibration	8.0	R and H	The system should be activated without deployment before the test; compliance with CS ACNS.E.LAD.120 and CS ACNS.E.LAD.140 should be ensured during the test, and compliance with CS ACNS.E.LAD.240 should be ensured after the test.
Waterproofness	10.0	W	The system performance should be checked after the test.
Magnetic effect	15.0	B	The system should be activated before the test.
Power input	16.0		The system should be activated without deployment before the test; compliance with CS ACNS.E.LAD.120 and CS ACNS.E.LAD.140 should be ensured during the test in both normal and abnormal operating conditions. In addition, compliance with CS ACNS.E.LAD.240 should be ensured.
Voltage spike	17.0		The system should be activated without deployment before the test; compliance with CS ACNS.E.LAD.120 and CS ACNS.E.LAD.140 should not be affected by the test conditions. In addition, compliance with CS ACNS.E.LAD.240 should be ensured.
Audio frequency susceptibility	18.0		The system performance should be checked during the test.
Induced signal susceptibility	19.0		The system performance should be checked during the test.
Radio frequency susceptibility	20.0	T and R	The system performance should be checked during the test.
Radio frequency transmission	21.0	H	
Lightning-induced transient susceptibility	22.0		The system performance should be checked after the test.
Lightning direct effects	23.0		The test is applicable to external antennas only. The antenna should still be operative

			after the test.
Icing	24.0		The test is applicable to external antennas only. Compliance with CS ACNS.E.LAD.120 and CS ACNS.E.LAD.140 should be ensured during the test.
Electrostatic discharge	25.0	A	The system performance should be checked after the test.
Flammability	26.0	C	

Table 2 — Flame test

CONDITIONS	TEST CONDITIONS
Flame	The flame test should be performed for the following components: transmitter of activation signals, antennas used by the system, and antenna cabling. At the start of the flame test, the temperature of these components should be stabilised at an ambient room temperature. The fire source should be in a tray of 1 m^2 and 100 mm deep, containing water to a depth of 5 cm, in which 10 l of Avgas 100 LL is floating. The Avgas should be ignited and allowed to burn for 15(±2) s, before carrying out the following flame test: (a) place the components in a position directly over the centre of the fire tray at a height of 1 m(±25 mm) above the tray; and (b) let the components remain in the flame for a duration corresponding to the time frame defined in CS ACNS.E.LAD.110. The flame test should be conducted in conditions as near as practicable to still air conditions. After removal from the flame, the components of the test should be allowed to cool naturally to ambient temperature before being tested. Compliance with CS ACNS.E.LAD.120 and CS ACNS.E.LAD.140 should be ensured after the test.

Rationale

(a) A system compliant with CAT.GEN.MPA.210 should not only successfully transmit activation signals when the aircraft on which it is installed is operated in normal environmental conditions, but also in conditions that may occur between the detection of the distress condition and the end of flight. Table 1 contains a set of environmental conditions that are considered representative of this specific environment.

(b) Depending on the technology used, the system may have to transmit activation signals after the crash to meet the location accuracy requirements of the proposed CS ACNS.E.LAD.410 (for all accidents). For equipment that remains attached to the aircraft and transmits activation signals after the crash to meet the 6-NM accuracy objective, the equipment should be robust to withstand the crash test conditions that are applicable to fixed (non-deployable) recorders, except that the exposure to fire can be reduced to the time that is needed to transmit sufficient information to meet the proposed CS ACNS.E.LAD.410.

(c) The same considerations as under (b) above apply to systems that need to transmit the activation signals after the crash to meet the location accuracy specified for survivable accidents (refer to the proposed CS ACNS.E.LAD.420). The main difference with point (b) is that the crash conditions are less stringent if the accident is survivable. According to the proposed GM1 ACNS.E.LAD.010, a survivable accident can be defined using EUROCAE ED-62B test conditions. In addition, a complete set of data, such as those specified in the proposed CS ACNS.E.LAD.140, should be received even if the system is destroyed by post-crash fire. Therefore, the duration of the flame test may need to be longer than the duration specified in ED-62B, Section 4.5.13 ('The ELT system components under test shall remain in the flame for a minimum period of 15 seconds.').

(d) The transmission of a homing signal is required if the accident is survivable (refer to the proposed CS ACNS.E.LAD.170); therefore its transmission should be possible after the environmental test applicable to an ELT(AF) in Table 4-1 and Table 4-2 of EUROCAE ED-62B has been applied to the homing signal transmitter.

(e) Poor installation practice is a known and recurrent issue that prevents efficient ELT operation. EUROCAE ED-62B, Chapter 6 includes guidelines that aim at resolving this issue.

AMC2 ACNS.E.LAD.310 Environmental conditions encountered during accidents

ACCEPTABLE MEANS OF COMPLIANCE SPECIFIC TO SOLUTIONS BASED ON AN ELT(DT)

(a) The system should meet the conditions of AMC1 ACNS.E.LAD.310.

(b) When the ELT(DT) is armed, loss of power supply to the automatic triggering function or loss of multiple data sources that are used by the automatic triggering function should result in the activation of the ELT(DT).

(c) Installation of the ELT(DT) should be in accordance with the guidelines of EUROCAE ED-62B, Chapter 6.

(d) The ELT(DT) unit, its antennas, and other components that are required for the transmission of the activation signals should be installed to minimise the risk of disconnection during an accident.

(e) When installing an ELT(DT) that uses an integral battery instead of an internal battery, mitigation measures should be provided to ensure that the ELT(DT) remains powered after a survivable accident.

Rationale

(a) The proposed AMC1 ACNS.E.LAD.310 is applicable to any solution.

(b) The cause of an accident may disable the automatic triggering function or some of the data sources (sensors or aircraft systems) that are used to detect the conditions for automatic activation (e.g. due to a fire in the avionics bay). However, the failure rate of the automatic triggering function or of an individual data source could be higher than the target rate of erroneous automatic activation (see the proposed CS ACNS.E.LAD.620). Therefore, the conditions need to be based on more reliable information, e.g. the power bus status or loss of multiple data sources.

(c) EUROCAE ED-62B, Chapter 6 contains specific considerations for the installation of an ELT(DT).

(d) The accident may affect the structural integrity of the fuselage, which may result in disconnection between components of the system, if the installation does not address such considerations.

(e) EUROCAE ED-62B allows to develop an ELT(DT) with an integral battery (i.e. the battery is not located inside the beacon). In that case, specific installation considerations should be taken into account. It is usually considered that an internal battery makes the ELT(DT) more robust in case of an accident, than an integral battery. By design, an internal battery will not be separated from the rest of the ELT(DT) when the ELT(DT) is submitted to the conditions of a survivable accident (refer to the proposed AMC1 ACNS.E.LAD.310).

AMC3 ACNS.E.LAD.310 Environmental conditions encountered during accidents

ACCEPTABLE MEANS OF COMPLIANCE SPECIFIC TO SOLUTIONS BASED ON HRT

(a) The system should meet the conditions of AMC1 ACNS.E.LAD.310.

(b) When the system is armed, loss of power supply to the automatic triggering function or loss of multiple data sources that are used by the automatic triggering function should result in the transmission of the activation signals, except when those losses result from the normal shutdown of the aircraft.

(c) The installation of the various components that are necessary to transmit the activation signals should minimise the probability that failures resulting from accident conditions that precede the crash impede the performance of the system.

Rationale

Refer to the rationale of the proposed AMC2 ACNS.E.LAD.310.

GM1 ACNS.E.LAD.310 Environmental conditions encountered during accidents

COMMON GUIDANCE FOR ALL SOLUTIONS

The accident conditions to be considered for compliance with CS ACNS.E.LAD.310 do not include the case of an in-flight destruction of the aircraft.

GM2 ACNS.E.LAD.310 Environmental conditions encountered during accidents

GUIDANCE FOR SOLUTIONS BASED ON AN ADFR

An ADFR that meets the conditions of AMC1 ACNS.E.LAD.110 can be used to meet CS ACNS.E.LAD.310.

GM3 ACNS.E.LAD.310 Environmental conditions encountered during accidents

GUIDANCE FOR SOLUTIONS BASED ON AN ELT(DT) AND FOR SOLUTIONS BASED ON HRT

The automatic triggering function is within the scope of AMC1 ACNS.E.LAD.310, point (a).

CS ACNS.E.LAD.320 Flight dynamics and locating the aircraft

(a) The following detailed assumptions about the minimum performance of the communication infrastructure are provided:

(1) the distribution of sensors, repeaters, and stations over time and in space, and the resulting coverage of the communication infrastructure; and

(2) the minimum availability and integrity of the communication infrastructure that is needed to ensure that the communication infrastructure is very likely to detect and transmit without errors activation signals from an aircraft.

(b) Based on the assumptions of point (a), it is shown that:

(1) if the system transmits activation signals before or without deploying any equipment:

(i) the system is automatically activated, the activation signals are transmitted, and the communication infrastructure detects the activation signals for all values of aircraft pitch attitude, aircraft roll attitude, aircraft altitude, and aircraft speed, as well as for all possible values of the derivatives of these parameters within the flight envelope;

(ii) the communication infrastructure detects the deactivation signals for all values of aircraft pitch attitude, aircraft roll attitude, aircraft altitude, and aircraft speed that correspond to normal operation of the aircraft;

(iii) the performance of the following functions is not adversely affected on accident trajectories with parameter values that vary between the ranges of Table 3:

(A) automatic activation; and

(B) transmission of the activation signals; and

(iv) the following is not adversely affected on accident trajectories with parameter values that vary between the ranges of Table 3:

(A) detection of the activation signals by the communication infrastructure; and

(B) location accuracy of the point of end of flight.

(2) if the system transmits activation signals from deployable equipment:

(i) the deployable equipment has at least the same performance as an automatic deployable flight recorder with regard to deployment, activation, and crashworthiness of the transmitter;

(ii) unless the system transmits before deployment activation signals that are sufficient to meet the location accuracy requirements applicable to a non-survivable accident, the crash testing specifications of the transmitter in the deployable equipment and the deceleration properties of the deployable equipment are such that the transmission of activation signals is not adversely affected by impact shock forces representative of deployment during a non-survivable aircraft collision with terrain.

(iii) the communication infrastructure detects the activation signals of the deployed equipment when this equipment is not moving;

(iv) the installation allows the flight crew to manually transmit activation signals and deactivation signals without deployment; and

(v) the communication infrastructure detects the activation signals and deactivation signals when the aircraft stands on its landing gears and the equipment is not deployed; and

(3) the performance specified in points (1) or (2), as applicable, is met at any location.

Table 3 — Parameter ranges for typical accident trajectories

Parameter	Range	Unit
Pitch attitude	+/–60	°
Roll attitude	+/–60	°
Pitch rate	+/–20	°/s
Roll rate	+/–30	°/s
Yaw rate	+/–20	°/s
Altitude	From 0 to the absolute ceiling of the aircraft	ft
Longitude	+/–180	°
Latitude	+/–90	°
Speed	From 0 to Vd/Md (design diving speed)	kt
Vertical speed	From maximum negative vertical speed at Vd to maximum positive vertical speed	ft/min

Rationale

(a) The performance of the communication infrastructure is essential for the successful transmission of activation signals. Therefore, the applicant must provide detailed assumptions about the minimum performance of the communication infrastructure and use these assumptions to show that with these assumptions, the communication infrastructure is capable of successfully receiving the activation signals.

(b) The system must be able to detect and transmit the activation signals not only in normal flight conditions, but also at aircraft attitudes and speeds that are encountered during loss of control in flight. This may alter particularly the capability of the system to determine the aircraft position, transmit the activation signals, and when applicable, deploy a part. This may also alter the capability of the communication infrastructure to receive the activation signals.

(1) Similar to an ELT(AF) or (AP), the system needs to be manually activated to cover distress scenarios where the aircraft is not immediately severely damaged by the accident (e.g. smooth forced landing or ditching). In such scenarios, the system is not

expected to automatically activate, but the flight crew must be able to manually activate the system.

(2) Past accidents show that a large turbojet aeroplane can fly for hours before the crash (e.g. Malaysia Airlines Boeing B777-200ER (9M-MRO), 8 March 2014, or Helios Airways HCY522 Boeing 737-31S, Grammatiko, Greece, 14 August 2005), which means that the crash may occur at any location (latitude, longitude, altitude, on sea or on ground).

(3) The values of Table 3 were determined based on an analysis of a database of accident trajectories. Some extreme values were discarded as the location accuracy of the point of end of flight is only marginally affected.

(4) If the system transmits activation signals from deployable equipment, the performance of the system with regard to deployment and automatic activation of the transmitter should be not lower than the performance required from an ADFR and its integrated ELT. In addition, to meet CS ACNS.E.LAD.410 ('Location accuracy for non-survivable accidents'), either activation signals are transmitted before deployment, or the deployable equipment should be capable of transmitting activation signals after an aircraft collision with terrain at a speed representative of most non-survivable accidents. This may be achieved by selecting an appropriate impact speed for the deployable equipment and by shaping the deployable equipment so that once released, it strongly decelerates.

AMC1 ACNS.E.LAD.320 Flight dynamics and locating the aircraft
ACCEPTABLE MEANS OF COMPLIANCE APPLICABLE TO ANY SOLUTION

When making assumptions about the performance of the communication infrastructure, the following definitions should be used:

(a) availability: probability that the communication infrastructure can process the information that is contained in activation signals into data and transmit this data to the ground; and

(b) integrity: probability that the information that is required to be contained in activation signals is processed and transmitted, with no undetected error generated by the communication infrastructure.

Rationale

The proposed AMC1 ACNS.E.LAD.320 includes definitions for the terms 'availability' and 'integrity' to ensure a harmonised interpretation of the proposed CS ACNS.E.LAD.320, point (a).

AMC2 ACNS.E.LAD.320 Flight dynamics and locating the aircraft
ACCEPTABLE MEANS OF COMPLIANCE SPECIFIC TO SOLUTIONS BASED ON AN ADFR

(a) The system should meet the conditions of AMC1 ACNS.E.LAD.320.

(b) Assuming that the deployable package of the ADFR has an initial ground speed of 300 kt in the local horizontal plane and that there is no wind, the horizontal distance needed for this package to decelerate to a ground speed at which its integrated ELT is shown to successfully transmit 406-MHz signals after the impact shock test specified in ETSO-2C517 should not exceed the length of the aircraft fuselage.

(c) The ADFR should be installed to achieve 95 % probability that at least one satellite of the international COSPAS-SARSAT programme receives the 406-MHz signal that is transmitted by the ELT that is integrated into the deployable package of the ADFR when the aircraft stands on its landing gears and the equipment is not deployed.

Rationale

(a) The proposed AMC1 ACNS.E.LAD.320 is applicable to any solution.

(b) Examples of non-survivable accidents with large turbojet aeroplanes indicate that in the majority of cases, the speed at collision with terrain is less than 300 kt or approximately 150 m/s. In addition, it is assumed that the deployable package of the ADFR is installed at the rear of the aeroplane. In case of a frontal collision into steep terrain, the distance left for the deployable package to decelerate to a speed corresponding to the speed selected for the impact shock test of the ADFR (refer to draft ETSO-2C517) does not significantly exceed the length of the aeroplane fuselage. Meeting the condition of AMC2 ACNS.E.LAD.320, point (b) is sufficient to be deemed compliant with CS ACNS.E.LAD.320, point (b)(2)(ii). Only the successful transmission of 406-MHz signals must be shown as a 300-kt speed is considered to exceed the maximum possible impact speed of a survivable accident so that the post-crash transmission of a homing signal is not expected.

(c) Point (c) covers the proposed CS ACNS.E.LAD.320, point (b)(2)(v).

AMC3 ACNS.E.LAD.320 Flight dynamics and locating the aircraft

ACCEPTABLE MEANS OF COMPLIANCE APPLICABLE TO SOLUTIONS BASED ON AN ELT(DT) AND TO SOLUTIONS BASED ON HRT

(a) The system should meet the conditions of AMC1 ACNS.E.LAD.320.

(b) If the position source of the system is not a GNSS receiver, the infrastructure used for determining the position should be documented.

(c) If the system transmits activation signals before or without deploying equipment, the performance that is defined as successful automatic activation (refer to CS ACNS.E.LAD.240), transmission of the activation signals (refer to CS ACNS.E.LAD.110), detection of the activation signals by the communication infrastructure, and location accuracy of the point of end of flight (refer to CS ACNS.E.LAD.410) should be shown on typical accident trajectories with parameter values that vary between the ranges of CS ACNS.E.LAD.320, Table 3. In addition, location accuracy for survivable accidents (refer to CS ACNS.E.LAD.420) should be shown on typical trajectories of survivable accidents. Compliance with those requirements should be shown in the most unfavourable conditions of time and location, or a sensitivity analysis should be conducted to show that the variation in time or location does not significantly affect the result. The threshold values for automatic activation should be contained within a range where successful transmission is shown.

A verification method may be to:

(1) show that the system was successfully automatically activated and transmitted the activation signals and that the communication infrastructure detected the activation

signals on the typical accident trajectories of EUROCAE ED-237, Appendix 1, and on the test trajectory of Subpart 3, Section E, Appendix A; and then

(2) show compliance with CS ACNS.E.LAD.410 ('Location accuracy for non-survivable accidents'), using the test trajectory of Subpart 3, Section E, Appendix A; and then

(3) show compliance with CS ACNS.E.LAD.420 ('Location accuracy for survivable accidents'), assuming that:

(i) valid position data is available from the position source of the system 20 s before reaching the point of end of flight; and

(ii) during the last 20 s before reaching the point of end of flight, the aircraft performs a stabilised turn at a ground speed of 180 kt and a bank angle of 45 °.

(d) The antennas that are used by the system, including position source antennas, should be installed so that position determination and transmission of the activation signals are likely to be successful when the aircraft is in flight.

(e) The antennas that are used by the system, including position source antennas, should be installed so that position determination and transmission of the activation signals are likely to be successful at values of aircraft pitch attitude, aircraft roll attitude, aircraft speed, and derivatives of these parameters that are likely to be experienced between the initiation of the distress condition and reaching the point of end of flight.

Rationale

(a) The proposed AMC1 ACNS.E.LAD.320 is applicable to any solution.

(b) For some communication infrastructures or locating systems (e.g. satellite-based augmentation system (SBAS)), coverage may vary with time or aircraft location as new systems are added or old systems are decommissioned and systems may be moving (satellite constellations). Those coverage variations should not significantly affect the performance of the system as an accident may occur to a large aeroplane at any location and time.

(c) Antennas may be used to compute the aircraft position and transmit the activation signals. Unappropriate installation of the antenna could result in satellites being masked by the airframe, especially during the last phase of the flight before the crash.

AMC4 ACNS.E.LAD.320 Flight dynamics and locating the aircraft
ACCEPTABLE MEANS OF COMPLIANCE SPECIFIC TO SOLUTIONS BASED ON AN ELT(DT)

(a) The system should meet the conditions of AMC1 ACNS.E.LAD.320.

(b) The antenna of the internal GNSS receiver should be installed to receive the signals that are sufficient for the computation of a position in the conditions of CS ACNS.E.LAD.320, point (b) (see AMC3 ACNS.E.LAD.320).

Rationale

(a) The proposed AMC1 ACNS.E.LAD.320 is applicable to any solution.

(b) An ELT(DT) may receive a position signal from both the aircraft receiver and the internal receiver. COSPAS-SARSAT C/S T.001, Issue 4, Rev. 3, Section 4.5.5.6 and C/S T.018, Issue 1, Rev. 3, Section 4.5.5.1 specify that the internal GNSS receiver should have priority over the external source. Therefore, the antenna of this internal GNSS receiver should be carefully located on the fuselage to ensure best possible reception of GNSS satellite signals during the last stages before an accident.

GM1 ACNS.E.LAD.320 Flight dynamics and locating the aircraft
COMMON GUIDANCE FOR ALL SOLUTIONS

(a) Documentation that shows the detailed assumptions about the performance of the communication infrastructure needs to be prepared for the aircraft operator.

(b) With regard to assumptions about the coverage of the communication infrastructure, it is advised to consider the coverage that is provided for at least 95 % of the time to assess compliance with CS ACNS.E.LAD.320, point (b).

(c) With regard to the availability and integrity of the communication infrastructure, the COSPAS-SARSAT 406-MHz MEOSAR implementation plan (C/S R.012) of February 2018 specifies 'Minimum MEOSAR system performance requirements for compatibility with the Cospas-Sarsat System'. Those include the following definitions:

(1) availability: 'The system should be available 99.5 % of the time over a period of one year.'

(2) processing anomalies: 'The system should not produce more than one processing anomaly for every 10,000 alert messages. A processing anomaly is an alert message produced by the system, which should not have been generated, or which provided incorrect information.' Alternatively, it could be assumed that the communication infrastructure processes without undetected errors at least 9 999 out of 10 000 signal transmissions from an activated system.

Rationale

(a) Assumptions about the performance of the communication infrastructure will be needed by the operator to show that the system that is installed on their aircraft relies on a communication infrastructure that delivers an adequate performance in transmitting signals. This cannot constitute a requirement of the CS-ACNS as the transmission of such assumptions to the operator is out of the scope of certification; therefore, GM1 ACNS.E.LAD.320, point (a) is introduced to clarify this aspect.

(b) The coverage that is provided by the communication infrastructure varies over time. Therefore, the coverage assumption should correspond to the coverage that is provided most of the time by the communication infrastructure to credibly show the performance of the system, and not to the best possible coverage.

(c) The minimum MEOSAR system performance requirements of C/S R.012 provide example values for availability and integrity. An alternative is also proposed when those example values are not practicable.

CS ACNS.E.LAD.340 Activation and transmission over water and over land

Automatic activation and transmission of the activation signals are successful whether the point of end of flight is located over water or over land.

Rationale

The point of end of flight might be located over water (in case of an accident over water). Given the range of aeroplanes that fall within the scope of CAT.GEN.MPA.210, the circumstances of an accident over water need to be addressed.

AMC1 ACNS.E.LAD.340 Activation and transmission over water and over land

ACCEPTABLE MEANS OF COMPLIANCE APPLICABLE TO ANY SOLUTION

(a) If the system relies on non-deployable equipment that transmits activation signals after reaching the point of end of flight to comply with CS ACNS.E.LAD.410 or CS ACNS.E.LAD.420, those activation signals should be transmitted within 15 seconds after reaching that point.

(b) If the system relies on activation signals that are transmitted by deployed equipment to locate the point of end of flight, that equipment should be floatable and capable of transmitting after being deployed over or in water.

Rationale

(a) It should not be assumed that the aircraft performed a successful ditching and remains afloat for the time required to 'allow the occupants to leave the aeroplane and enter the life rafts' (refer to CS 25.801, point (d)). If the ditching affects the aircraft integrity, the transmission should occur before the aircraft sinks. The 15-sec time condition meets this goal. ELTs are also required to withstand for the same amount of time during the flame test, which defines the limit of the 'survivable accident' (refer to the proposed GM1 ACNS.E.LAD.010). The same amount of time is required for the system installed to comply with CAT.GEN.MPA.210.

(b) The proposed ETSO-2C517 (ADFR) in NPA 2019-06 defines conditions for the transmission of activation signals after the equipment is deployed over or in water.

CS ACNS.E.LAD.350 Means and procedures to prevent undesirable activation

(a) No means, except for circuit protective devices specified by applicable requirements, are provided in the cockpit or cabin to disable the system during flight.

(b) Instructions are provided to the flight crew to address manual activation of the system and handling of undesirable activation.

(c) Maintenance instructions are provided, including procedures to avoid that activation signals are inadvertently transmitted during maintenance of the system.

Rationale

(a) The objective of this CS is not to make the system resistant to tampering, but to ensure that the system is operative when needed. Therefore, the crew should not be able to disable the system in flight, e.g. by mistake or for convenience. However, a failure mode of the system might have a negative safety effect and therefore require the operation of circuit protective devices (e.g. after the presence of smoke or fire has been detected).

(b) SAR centres have limited operational capacity and SAR operations can be risky (e.g. when conducted in hostile environment). Therefore, manual activation of the system that does not correspond to a distress situation should be avoided, and the successful recovery of the aircraft after a distress situation needs to be recognised as early as possible. This is addressed at system level by requiring that the system provides timely indication to the flight crew of when it it is activated (refer to draft CS ACNS.E.LAD.280). However, this specification needs to be complemented by procedures for proper use of the system by the flight crew.

(c) Inadvertent activation of the system that does not correspond to a distress situation should also be prevented during maintenance or ground handling activities.

AMC1 ACNS.E.LAD.350 Means and procedures to prevent undesirable activation

ACCEPTABLE MEANS OF COMPLIANCE APPLICABLE TO ANY SOLUTION

The instructions for the flight crew should be included in the aircraft flight manual (AFM). Those instructions should address as a minimum all of the following:

(a) conditions that justify manual activation of the system and conditions that do not justify manual activation;

(b) recommended flight crew actions after manual activation or manual deactivation of the system; and

(c) recommended flight crew actions in case of undesirable activation.

Rationale

To limit the frequency of undesirable activation, instructions should indicate when manual activation of the system is justified. For example, if an accident or a distress situation is not likely to occur within minutes, manual activation of the ELT should be avoided. Including those instructions in the AFM facilitates the consistent implementation of these procedures.

CS ACNS.E.LAD.360 Priority of activation over concurrent applications

The use of shared airborne resources does not adversely affect the performance of the system.

Rationale

The system may share a common airborne resource and this must not alter its performance. As the system contributes to increasing the chance of survival after an accident and, depending on the solution, there may elapse only a few tens of seconds to a few minutes from activation of the system to its destruction in the accident, the system operation should have high priority.

GM1 ACNS.E.LAD.360 Priority of activation over concurrent applications

COMMON GUIDANCE FOR ALL SOLUTIONS

'Airborne resources' include processing resources, transmitters and antennas. This also implies that sufficient bandwidth is allocated to the system when the system uses a shared communication channel.

Accuracy

CS ACNS.E.LAD.410 Location accuracy for non-survivable accidents

The performance of the system ensures that based on the data that is received on the ground, the point of end of flight is located with a two-dimensional location accuracy greater than or equal to 6 nautical miles (95 % probability), within 20 minutes of the time of reaching the point of end of flight when the accident is not survivable.

Rationale

This requirement addresses the need to locate the point of end of flight for investigation purposes. A 6-NM location accuracy translates into an area of 400 km^2. This area, even in the case of an accident over an ocean, can be covered before the ULD fitted into a non-deployable flight recorder stops transmitting, taking into account the following parameters:

— the time to bring the appropriate locating and recovery means on site;

— the time to scan the area; and

— the potential adverse weather and sea surface conditions.

Both ICAO Annex 6, Part I and the Air OPS Regulation require that the ULD fitted into a non-deployable flight recorder (flight data recorder or cockpit voice recorder) has a minimum underwater transmission time of 90 days. In case of an accident over land, the same surface can be searched using satellite pictures and/or aerial means in less than 90 days in most cases. This value is also consistent with ICAO Annex 6, Part I, Appendix 9. The 20 minutes are chosen for consistency with the proposed CS ACNS.E.LAD.420 (see the related rationale).

AMC1 ACNS.E.LAD.410 Location accuracy for non-survivable accidents
ACCEPTABLE MEANS OF COMPLIANCE APPLICABLE TO ANY SOLUTION

Compliance with CS ACNS.E.LAD.410 should be shown:

(a) through the assumptions about the communication infrastructure that must be provided in accordance with CS ACNS.E.LAD.320; and

(b) in applicable environmental conditions (refer to CS ACNS.E.LAD.310).

Rationale

Refer to the rationale for CS ACNS.E.LAD.320.

AMC2 ACNS.E.LAD.410 Location accuracy for non-survivable accidents
ACCEPTABLE MEANS OF COMPLIANCE SPECIFIC TO SOLUTIONS BASED ON HRT

(a) The system should meet the conditions of AMC1 ACNS.E.LAD.410.

(b) To show compliance with CS ACNS.E.LAD.410, the following should be considered:

(1) the maximum time interval between two successive transmissions of activation signals; and

(2) the accuracy of the transmitted position.

Rationale

(a) The proposed AMC1 ACNS.E.LAD.410 is applicable to any solution.

(b) The location accuracy of the point of end of flight that is provided by a system based on HRT is a function of:

(1) the position-reporting period (e.g. a position-reporting period of 1 min would result in a 6-NM location accuracy when flying in straight line at a speed of 360 kt); and

(2) the accuracy of each transmitted position; the accuracy of a transmitted position depends on the position accuracy that is provided by the position source as well as on the age of the position data when the position was transmitted (e.g. a 5-s old position with a 0.2-NM accuracy of the position source for an aircraft flying at a speed of 360 kt would result in a 0.7-NM accuracy of the transmitted position).

CS ACNS.E.LAD.420 Location accuracy for survivable accidents

The performance of the system ensures that based on the data that is received on the ground, under nominal GNSS constellation geometry, the point of end of flight is located with a two-dimensional location accuracy greater than or equal to 200 meters (95 % probability) within 20 minutes of the time of reaching the point of end of flight, when the accident is survivable.

Rationale

If the accident is survivable, a much better than 6-NM location accuracy is required to allow SAR teams to timely locate and rescue survivors. This is mainly achieved through the transmission of the homing signal that is specified in the proposed CS ACNS.E.LAD.170. However, the homing signal transmitter may be disabled due to submersion (as in the accident of Yemenia Airways Airbus A310-324 in Moroni, Comoros, 29 June 2009) or fire (ELTs are only required to survive for 15 sec in the flame test of EUROCAE ED-62B). Therefore, an additional specification to the proposed CS ACNS.E.LAD.410 is provided for when the accident is survivable.

200-m location accuracy is the proposed objective for a survivable accident. It is a compromise between the capabilities of current technologies and the needs of SAR teams, as specified in the IAMSAR Manual, Vol III, regarding visibility and sweep width by aerial means. An ELT of capability G can be located with an accuracy greater than or equal to 200 m when it is not moving.

AMC1 ACNS.E.LAD.420 Location accuracy for survivable accidents

ACCEPTABLE MEANS OF COMPLIANCE APPLICABLE TO ANY SOLUTION

Compliance with CS ACNS.E.LAD.420 should be shown through the assumptions about the communication infrastructure that are provided in accordance with CS ACNS.E.LAD.320.

AMC2 ACNS.E.LAD.420 Location accuracy for survivable accidents

ACCEPTABLE MEANS OF COMPLIANCE APPLICABLE TO SOLUTIONS BASED ON AN ADFR AND TO SOLUTIONS BASED ON AN ELT(DT)

(a) The system should meet the conditions of AMC1 ACNS.E.LAD.420.

(b) The encoded position resolution of the protocol that is used in the message coding of the ELT should be included in the assessment of the location accuracy.

Rationale

(a) The proposed AMC1 ACNS.E.LAD.420 is applicable to any solution.

(b) Some protocols, e.g. the user protocol, are not adequate for providing an encoded position with a location accuracy of 200 m.

AMC3 ACNS.E.LAD.420 Location accuracy for survivable accidents

ACCEPTABLE MEANS OF COMPLIANCE SPECIFIC TO SOLUTIONS BASED ON HRT

(a) The system should meet the conditions of AMC1 ACNS.E.LAD.420.

(b) If the rate of transmission of the activation signals before reaching the point of end of flight is not sufficient to meet CS ACNS.E.LAD.420, the system should include equipment that is capable of transmitting activation signals after a survivable accident. Refer also to AMC1 ACNS.E.LAD.310, point (c).

Rationale

(a) The proposed AMC1 ACNS.E.LAD.420 is applicable to any solution.

(b) If the rate of transmission of position reports is not sufficient to meet the accuracy specification of the proposed CS ACNS.E.LAD.420 due to the aircraft speed at the time of the crash, continuing transmission after reaching the point of end of flight is needed. This requires that the transmitting equipment survives the conditions of a survivable accident, as defined in the proposed AMC1 ACNS.E.LAD.310: e.g. crash-survivable HRT equipment or an ELT(AF) or (AP) of capability G.

As explained in the rationale for the proposed AMC1 ACNS.E.LAD.140, data from historical accidents shows that in most cases of survivable accidents, the aeroplane speed at the time of collision with terrain is less than 180 kt or approximately 90 m/s. This means that in any case, a position-reporting period of less than 2 s is required to match the 200-m accuracy. Taking also into account the accuracy provided by the position data source and the age of position data at the time of transmission, a position-reporting period of 1 s or less is advisable. When transmission is also required after the crash, the equipment required to compute the position and transmit the activation signals should be designed and installed to withstand the conditions of a survivable crash. That equipment could be either a crash-survivable HRT system or an ELT(AF) or an ELT(AP).

GM1 ACNS.E.LAD.420 Location accuracy for survivable accidents

GUIDANCE FOR SOLUTIONS BASED ON AN ADFR

A solution based on an ADFR can meet CS ACNS.E.LAD.420 if this solution includes an ELT that:

(a) transmits an encoded position;

(b) uses a protocol compatible with the 200-m location accuracy objective; and

(c) is of capabilities G (internal/integral GNSS receiver), and C (crash survivability).

The ELT configurations that are described in AMC1 ACNS.E.LAD.110 support compliance with CS ACNS.E.LAD.420.

GM2 ACNS.E.LAD.420 Location accuracy for survivable accidents

GUIDANCE FOR SOLUTIONS BASED ON AN ELT(DT)

(a) An ELT can meet CS ACNS.E.LAD.420 by transmitting an encoded position after a survivable accident, with a protocol compatible with the 200-m location accuracy objective. An example of solution is a first-generation (capability T.001) ELT(DT) of capabilities C (crash survivability) and G (internal/integral GNSS receiver). Another example is a second-generation (capability T.018), ELT(AF), (AP), (AD), or (DT) of capabilities C (crash survivability) and G (internal/integral GNSS receiver).

(b) To meet CS ACNS.E.LAD.420, the ELT should also detect the occurrence of the crash on ground or water, and transmit an updated GNSS position through the 406-MHz signal. The occurrence of the crash may be detected using an acceleration sensor ('g-switch') or in case of an ELT(DT), other methods (refer to EUROCAE ED-62B, Section 2.9.5.1). The computation of the position does not need to be refreshed once a first reliable fix is computed after reaching the point of end of flight.

GM3 ACNS.E.LAD.420 Location accuracy for survivable accidents

GUIDANCE FOR SOLUTIONS BASED ON HRT

An example of solution to meet CS ACNS.E.LAD.420 is to install an ELT that uses a protocol compatible with the 200-m location accuracy objective and that is of capabilities C (crash survivability) and G (internal/integral GNSS receiver). Refer to GM2 ACNS.E.LAD.420.

Interoperability

CS ACNS.E.LAD.520 Frequency spectrum

The system transmits activation and deactivation signals on frequencies that are protected by the International Telecommunication Union (ITU) Radio Regulations, and belong to the protected aeronautical safety spectrum or to the protected distress spectrum.

Rationale

The transmission of signals should be protected from interferences to provide for sufficient availability. According to ICAO GADSS ConOps, it is recommended that for locating an aeroplane in a distress situation or an accident, only frequencies of the protected aeronautical safety spectrum or of the protected distress spectrum are used.

GM1 ACNS.E.LAD.520 Frequency spectrum

COMMON GUIDANCE FOR ALL SOLUTIONS

ELTs are required to transmit signals on a 406-MHz frequency, which is a frequency of the protected distress spectrum.

System performance

CS ACNS.E.LAD.610 Availability of the system

The system is designed commensurate with at least a minor failure condition for the loss of any function.

Rationale

The 'minor' failure condition is defined in AMC 25.1309 (according to CS ACNS.A.GEN.005, 'Failure condition terms are defined in AMC 25.1309, FAA AC 23.1309-1( ), AC 27-1B or AC 29-2C.'; for large aeroplanes, refer to AMC 25.1309). The 'minor' failure condition is required to verify that the performance of each function of the system (as defined in draft CS ACNS.E.LAD.010) is specified and tested to ensure its adequacy. The loss of any function of the system may result in the absence or delay of an SAR response.

The 'minor' classification is also consistent with current classifications for the loss of the ELT function, which are defined in ETSO/TSO-C126c.

GM1 ACNS.E.LAD.610 Availability of the system

COMMON GUIDANCE FOR ALL SOLUTIONS

(a) Contributors to the failure condition that is described in CS ACNS.E.LAD.610 include:

  (1) failure of the arming of the system;

  (2) an incomplete activation message;

  (3) loss of capability to transmit either the activation signals or the 121.5-MHz homing signal; and

  (4) loss of capability to detect an accident condition.

(b) The functions of the system are defined in CS ACNS.E.LAD.010.

CS ACNS.E.LAD.620 Erroneous automatic activation

The system is designed commensurate with at least a major failure condition for erroneous automatic activation.

Rationale

CS-ACNS provides failure condition classifications (e.g. ADS B-Out) that take into consideration the effects on the other stakeholders. In case of conventional aeronautical communication means, the other stakeholders are the other aircraft. In case of a system that complies with CAT.GEN.MPA.210, the other stakeholders are the SAR authorities.

Excessive quantity of non-genuine activation data would reduce the SAR resources that are available for genuine distress situations, and indirectly increase the number of deaths due to delayed arrival of SAR teams. In this regard, the SAR response to all vehicles and persons carrying an ELT, a personal locator beacon (PLB) or an emergency position-indicating radio beacon (EPIRB), and not only to large aircraft, would be degraded if SAR centres were overwhelmed by non-genuine activation data.

Furthermore, undesirable activation can result in unnecessarily exposing SAR personnel to hazards, such as operating aircraft in marginal weather conditions.

The classification of the failure condition as 'major' is based on the possible effects on the SAR centres.

COSPAS-SARSAT R.007 'Report on System Status and Operations, No 34, January-December 2017' indicates that in 2017, SAR centres received around 17 000 ELT alerts on a global scale. EUROCAE WG-98 (who drafted EUROCAE ED-237) concluded that the possible increase of ELT alerts due to the implementation of CAT.GEN.MPA.210 by the European Union, as well as of standards addressing 'location of an aeroplane in distress' in ICAO Annex 6, Part I, Section 6.18, should not exceed 1 000 alerts per year. The target fleet was evaluated to accumulate around 50 000 000 FH per year. The objective regarding the rate of undesirable activation due to the implementation of national rules that transpose ICAO Annex 6 Part I, Section 6.18 was therefore computed to be around 2E-5/FH, as specified in EUROCAE ED-237, Section 3.2.4 and ICAO Document 10054, Section 2.3.2.8.

Several items could contribute to that rate:

— non-genuine activation data generated by the communication infrastructure;

— inaccurate criteria used for detecting the accident conditions (resulting in undesirable automatic activation);

— development errors and equipment failures (resulting in a particular type of undesirable automatic activation, designated as 'erroneous automatic activation'); and

— undesirable manual activation.

The contribution of the communication infrastructure to the rate of undesirable activation is expected to be negligible, assuming that the communication infrastructure meets the performance proposed in GM1 ACNS.E.LAD.320.

With regard to manual activation, the system replaces an automatic ELT that can be manually activated. Therefore, the frequency of undesirable manual activation is not expected to increase. In addition, the proposed AMC1 ACNS.E.LAD.250 provides for additional precautions regarding design and installation of controls.

The remaining contributors to undesirable activation are:

— inaccurate criteria used for detecting the accident conditions, to which a 1E-5/FH objective is allocated (consistent with EUROCAE ED-237 for the automatic triggering function); and

— development errors and equipment failures resulting in erroneous automatic activation, which are allocated a 1E-5/FH objective.

The failure condition classification addresses the latter contributor and is therefore set to 'major'. The occurrence probability of the major failure condition should be remote. For development errors, as per AMC 25.1309, point 9.b.(4): 'The level of Development Assurance (function development assurance level (FDAL)/item development assurance level (IDAL)) should be commensurate with the severity of the Failure Conditions the system is contributing to.' The FDAL can be determined using EUROCAE ED-79A. In that case, the function will have to be developed based on FDAL C.

GM1 ACNS.E.LAD.620 Erroneous automatic activation
GUIDANCE FOR SOLUTIONS BASED ON AN ELT(DT) AND FOR SOLUTIONS BASED ON HRT

It is not advisable that the automatic triggering function activates the system when input data from a single source is lost or erroneous, except when this indicates that an accident or a distress situation is likely to occur within minutes. On the contrary, the automatic triggering function is expected to activate the system when multiple data sources fail as a result of accident conditions (e.g. on-board fire or in-flight collision). Similarly, loss of the automatic triggering function may be too frequent a condition to be used to activate the system while meeting CS ACNS.E.LAD.620. Loss of power supply to the automatic triggering function is considered a more robust condition to activate the system. Refer to AMC3 ACNS.E.LAD.310.

Rationale

Individual failures of sensors or computers, such as the TAWS computer, should not activate the system as the probability of such individual failures is greater than the maximum probability permitted by CS ACNS.E.LAD.620. However, multiple failures of data sources or failure of their power supplies (whose availability is greater than, and compatible with, the integrity objective) should be addressed. See also the proposed AMC2 ACNS.E.LAD.310, point (b).

GM2 ACNS.E.LAD.620 Erroneous automatic activation
COMMON GUIDANCE APPLICABLE TO ALL SOLUTIONS

(a) 'erroneous automatic activation' in CS ACNS.E.LAD.620 means a type of undesirable automatic activation that results from an equipment failure or from an error during the development of the equipment.

(b) If an ELT that is used for compliance with CAT.GEN.MPA.210 is such that when it is in a standby state, errors in the design of the ELT software or electronic hardware cannot result in undesirable automatic activation, the software and electronic hardware of that ELT can be developed in accordance with a design assurance level (DAL) D.

Rationale

(a) Refer to the rationale of CS ACNS.E.LAD.620.

(b) The purpose of a DAL is to limit the risk that design errors that could result in missed activation and erroneous automatic activation occur during the development of the software or electronic hardware of the equipment.

Most existing ELT designs meet DAL D as in those designs the software and the programmable electronic hardware operate only when the ELT is activated. Therefore, those software or hardware components have no means to generate an erroneous automatic activation. This is not applicable to the component of a system that is in 'running' mode from take-off to landing and that is necessary for the transmission of activation signals.

CS ACNS.E.LAD.630 Integrity of information of the activation signals

The system is designed commensurate with at least a minor failure condition for transmission of activation or deactivation signals that contain an erroneous aircraft position or erroneous aircraft identification.

Rationale

If activation or deactivation signals that contain erroneous information are transmitted, they might lead the competent SAR centre to wrong assumptions about the aircraft concerned, its location, and the status of the flight. This in turn may trigger an inadequate SAR response. More precisely:

— Position data is required to locate the point of end of flight. Erroneous position data could result in delaying or making impossible rescue operations.

— Aircraft identification data is required to allow the relevant ATS unit or the competent SAR centre to contact the aircraft that is potentially in distress or the operator of that aircraft. Erroneous identification data could result in these stakeholders not identifying the aircraft that is potentially in a distress situation.

The worst possible outcome of transmitting activation signals with erroneous information would be that no survivor is rescued. This produces the same outcome as the loss of a function of the system, which is defined as a 'minor' failure condition in the proposed CS ACNS.E.LAD.610.

AMC1 ACNS.E.LAD.630 Integrity of information of the activation signals

ACCEPTABLE MEANS OF COMPLIANCE APPLICABLE TO ANY SOLUTION

The source of the latitude and longitude data should be developed in accordance with a functional DAL D, as specified in EUROCAE ED-79A.

Rationale

Erroneous latitude and/or longitude data produces the same outcome as the loss of the transmitter (delay in locating the aircraft with potentially fatal consequences for accident survivors). Therefore, the source of latitude and longitude data should be developed in accordance with a functional DAL D.

GM1 ACNS.E.LAD.630 Integrity of information of the activation signals

COMMON GUIDANCE FOR ALL SOLUTIONS

An erroneous position of the point of end of flight is any position from which the horizontal distance to the actual position of the point of end of flight is greater than:

(a) 660 m, for a survivable accident; and

(b) 20 NM, for an non-survivable accident.

Rationale

A threshold beyond which the position difference is defined as erroneous must be set. GM1 ACNS.E.LAD.630 recommends to determine a threshold that is consistent with the accuracy objectives of the proposed CS ACNS.E.LAD.420 (200 m with 95 % probability for survivable accidents) and the proposed CS ACNS.E.LAD.410 (6 NM with 95 % probability for non-survivable accidents).

Those objectives are defined with a 95 % probability. This means that various factors could result in the location error exceeding 200 m for 5 % of the survivable accidents where the system is activated and in the location error exceeding 6 NM for 5 % of the non-survivable accidents where the system is activated. Assuming a normal distribution of the location errors, the location error exceeds 660 m for 0.1 % of the survivable accidents where the system is activated, and the location error exceeds 20 NM for 0.1 % of the non-survivable accidents where the system is activated.

The proposed CS ACNS.E.LAD.630 addresses another potential source of errors affecting the position data, which is not addressed in the proposed CS ACNS.E.LAD.420 and the proposed CS ACNS.E.LAD.410, namely random component failures. The 'minor' failure condition classification in the proposed CS ACNS.E.LAD.630 means that the probability of a component failure resulting in an erroneous position is less than 0.1 % per FH.

CS ACNS.E.LAD.650 Risk for third parties

If the system uses deployable equipment, the effects on persons other than aircraft occupants are taken into account when assessing the failure condition corresponding to unintended deployment.

Rationale

Any part that is deployed from an aircraft can cause serious or fatal injuries to people on the ground. Serious or fatal injuries to a person or a small number of people on the ground are considered to have hazardous consequences to people that were not on board the aircraft, when extrapolating the severity definitions from AMC 25.1309. CS 25.1457 'Cockpit voice recorders', point (d)(7) addresses the installation of an ADFR, and particularly, the effects of unintended deployment on persons other than aircraft occupants and on first responders.

AMC1 ACNS.E.LAD.650 Risk for third parties

ACCEPTABLE MEANS OF COMPLIANCE SPECIFIC TO SOLUTIONS BASED ON AN ADFR

The effects of an unintended ADFR deployment on persons other than aircraft occupants should be assessed and addressed in accordance with the AMC to the CSs applicable to the aircraft type, which are related to ADFR installation.

GM1 ACNS.E.LAD.650 Risk for third parties

COMMON GUIDANCE FOR ALL SOLUTIONS

When assessing the effects of unintended deployment of equipment for a solution other than based on an ADFR, it is advised to follow the AMC to the CSs applicable to the aircraft type, which are related to ADFR installation.

Rationale

Deployment of equipment during aircraft operation could result in a foreign object lying on the runway or damage navigation aids.

Depending on the energy released through the deployment and the mass of the deployed equipment, deployment can be a hazard for maintenance staff, ground staff working around the aircraft, or first responders following an accident. Instructions, procedures and/or a placard that indicates the position of the deployable equipment should be in place to avoid unnecessary exposure.

AMC 25.1457, point (d)(7) includes detailed recommendations to address this issue.

Appendix A — Test trajectory

This Appendix defines a test trajectory to verify that the system that is installed to comply with CAT.GEN.MPA.210 meets the location accuracy objectives of CS ACNS.E.LAD.410.

(a) Verification condition

(1) The system is in the least favourable configuration (e.g. if a power supply transition may reset the system, the system is reset; or if a GNSS receiver can be in a cold or warm start-up condition, the cold start-up condition is used).

(2) If a satellite constellation is used, verification should be based on the number and distribution of satellites that are available for 95 % of the time (e.g. no use of spare satellites).

(3) Location and time of the test or simulation are the least favourable ones. This could be shown by performing a location and time sensitivity analysis.

(4) The verification should include tests that allow to confirm the RF link performance.

(5) The applicant should document the verification results, including:

(i) assumptions about the system or the communication infrastructure;

(ii) substantiated deviations from the trajectory and sequence that are defined in (b) of this Appendix;

(ii) the trajectories;

(iii) for each point of the trajectory:

(A) position, attitude, speed, and acceleration;

(B) the number of communication infrastructure sensors that are actively used;

(C) the communication link performance (link budget); and

(D) the exchanged data; and

(iv) the location of the point of end of flight that is determined based on the activation signals transmitted before the time of impact with the ground.

(b) Trajectory

The trajectory and the status of the system should be as described below:

(1) change the system to the armed state, and maintain a static position for 15 s, at an altitude between 0 and 500 m; the attitude angles are:

(i) pitch attitude angle: 0°,

(ii) bank angle: 0°, and

(iii) heading: north;

(2) accelerate in north direction at a rate of 5.55 m/s^2 for 60 s in a straight line, while climbing to 5 000 m;

(3) maintain a horizontal speed of 333 m/s for 60 s, while climbing to 10 000 m;

(4) level out, and set pitch attitude angle, roll attitude angle and heading to 0, then activate the system, and while maintaining a constant horizontal speed of 333 m/s, apply the following during 30 s:

(i) roll:

(A) bank right with a constant roll rate of +30°/s until reaching +30°, then bank left with a constant roll rate of –30°/s until reaching –30°; and

(B) continue this sequence until the end of the 30-s sequence; and

(ii) keep heading, pitch attitude angle, and altitude unchanged;

(5) while maintaining the same altitude, and at a constant horizontal speed of 333 m/s, apply the following during 2 s:

(i) pitch attitude: pitch down at a constant pitch rate of –10°/s until reaching –20°;

(ii) roll attitude: bank left at a constant roll rate of –30°/s until reaching –60°; and

(iii) keep heading and altitude unchanged;

(6) from this point and until altitude is 0 m (corresponding to the time of impact with the ground), maintain a constant speed of 333 m/s, while setting a trajectory with the following characteristics:

(i) maintain pitch attitude angle at –20°;

(ii) maintain a vertical speed of –80 m/s; and

(iii) simultaneously repeat the following sequence:

(A) during 17.5 s:

(a) maintain roll attitude angle at –60°; and

(b) decrease the heading at a constant yaw rate of –10°/s;

(B) during 4 s:

(a) increase the roll attitude angle at a roll rate of 30°/s to reach +60°; and

(b) decrease the yaw rate at a yaw acceleration of 5°/s² to reach +10°/s;

(C) during 17.5 s:

(a) maintain roll attitude angle at +60°; and

(b) increase the heading at a constant yaw rate of +10°/s; and

(D) during 4 s:

(a) decrease roll attitude at a constant roll rate of –30°/s to reach -60°; and

(b) decrease yaw rate at a yaw acceleration of -5°/s² to reach –10°/s; and

(7) after impact with the ground (altitude is 0 m), maintain stationary position for 60 s.

(c) Pass criteria

The last 2D position that is determined through the activation signals that were transmitted before the time of impact with the ground is within 6 NM of the point of impact with the ground.

4. Impact assessment (IA)

4.1. What is the issue

Please refer to Chapter 2.

There are no exemptions or AltMoC pertinent to the scope of this RMT.

4.1.1. Explanations about CAT.GEN.MPA.210

When reviewing EASA Opinion No 01/2014, the Committee established by Art 127 of the Basic Regulation (the 'EASA Committee'[12]) included draft implementing rules (IRs) to address certain issues that had not been not covered by any EASA Opinion that far, among which CAT.GEN.MPA.210 'Location of an aircraft in distress — Aeroplanes'. This was triggerred by the accident of the Malaysia Airlines Boeing B777-200ER (9M-MRO) (8 March 2014, flight MH370) that had happened shortly before EASA Opinion No 01/2014 was published. For the same reason, this NPA is the first EASA document that addresses the topic of location of an aircraft in distress.

Regulation (EU) 2015/2338 adopting CAT.GEN.MPA.210 was published in December 2015. CAT.GEN.MPA.210 is applicable to some categories of large aeroplanes[13] if the aeroplane is first issued with an individual CofA on or after 1 January 2023.

The objective of CAT.GEN.MPA.210 is to facilitate locating large aeroplanes in distress and accidents to large aeroplanes, including in an area with no sufficient coverage by air traffic control (ATC) surveillance systems (e.g. in oceanic and some remote continental areas). CAT.GEN.MPA.210 and CAT.GEN.MPA.205 'Aircraft tracking system — Aeroplanes' were adopted to a large extent due to the disappearance of the Malaysia Airlines flight MH370, where all communications with the aeroplane and its track were abruptly lost by the ATC. For two weeks, SAR efforts were focused on an area around the last detection of the aeroplane by ATC surveillance systems, while the aeroplane most probably kept flying for about another six hours after being lost. The analysis of logon messages that were automatically exchanged once per hour between the aeroplane and the satellites of the telecommunications service provider allowed to determine a search area of several tens of thousands of square kilometres[14]. The only physical evidence of the aeroplane was floating debris, which was found more than a year after the accident. After having explored 120 000 square kilometres of the sea floor, the Australian and Chinese authorities decided to stop the underwater search operations. The final safety investigation report on this accident[15] concludes: 'In conclusion, the Team is unable to determine the real cause for the disappearance of MH370.'

CAT.GEN.MPA.205 requires, under certain conditions, the tracking of flights by the operator, and AMC1 CAT.GEN.MPA.205, point (b) specifies that 'The tracking of an individual flight should provide a position report at time intervals which do not exceed 15 minutes[16].' While aircraft tracking is

[12] The EASA Committee is composed of representatives of the European Commission and of EU Member States and is, among others, responsible for reviewing the opinions (draft regulations) issued by EASA. EASA has only the role of an observer in that Committee.

[13] CAT.GEN.MPA.210 is applicable to aeroplanes with an MCTOM of more than 27 000 kg and a maximum operational passenger seating configuration (MOPSC) of more than 19, and to aeroplanes with na MCTOM of more than 45 500 kg.

[14] For detailed information, please consult the official information that was published by the Australian Transportation Safety Bureau (https://www.atsb.gov.au/mh370.aspx).

[15] Safety Investigation Report, Malaysia Airlines Boeing B777-200ER (9M-MRO), 8 March 2014, issued on 2 July 2018 by the Malaysian ICAO Annex 13 Safety Investigation Team for MH370.

[16] This maximal duration of 15 min is harmonised with ICAO Annex 6, Part I, Chapter 3, Standard 3.5.3.

considered to facilitate approximately locating aeroplanes that fly in areas without sufficient ATC surveillance coverage, CAT.GEN.MPA.205 does not require the operator to accurately locate the aeroplane (the distance covered in 15 min by an aeroplane that cruises at Mach 0.8 is about 120 NM) and it does not require a robust means to locate the aeroplane. An aircraft tracking system is expected to facilitate detecting and responding to abnormal flight behaviours; however, as mentioned in the Explanatory Note to EASA Decision 2017/023/R: '[…] a 15-minute position reporting period would not facilitate the work of SAR or of investigation authorities.'

Therefore, CAT.GEN.MPA.210 requires that the same categories of aeroplanes as those within the scope of CAT.GEN.MPA.205 are '[…] equipped with robust and automatic means to accurately determine, following an accident during which the aeroplane is severely damaged, the location of the point of end of flight […] [when they are] first issued with an individual CofA on or after 1 January 2023 […].'

However, CAT.GEN.MPA.210 was drafted as a 'performance-based' requirement to define the minimum performance that any compliant means should meet instead of prescribing a technical solution. CAT.GEN.MPA.210 only provides for the general concept of location of an aircraft in distress and the applicability criteria. The performance objectives are defined in the proposed AMC to CAT.GEN.MPA.210 (for operational and data transmission aspects),in CSs (for airworthiness and performance of the airborne system) and in the AMC to CNS.OR.100 (for aspects related to the transmission service provider).

CAT.GEN.MPA.210 is considered to be the EU requirement that transposes ICAO Annex 6, Part I, Section 6.18 'Location of an aeroplane in distress', Standard 6.18.1. CAT.GEN.MPA.210 addresses the objective of Section 6.18 as stated in ICAO Annex 6, Part I, Appendix 9, i.e to establish 'to a reasonable extent, the location of an accident site within a 6 NM radius.' However, the applicability and scope of CAT.GEN.MPA.210 is not fully harmonised with that standard as CAT.GEN.MPA.210 had been adopted and published before this Standard was issued[17]. Appendix 1, Table 2 of this NPA shows the main differences between ICAO Annex 6, Part I, Section 6.18 and CAT.GEN.MPA.210. Appendix 1, Table 1 of this NPA presents the Standards and Recommended Practices (SARPs) of ICAO Annex 6, Part I that are related to location of an aircraft in distress.

4.1.2. The implementation issue

Today, no EU rule, CS or AMC provides for technical conditions that are applicable to means compliant with CAT.GEN.MPA.210. As a result, there is no clear baseline for the implementation of CAT.GEN.MPA.210. This regulatory gap allows for solutions that do not satisfactorily meet the needs of SAR authorities and the main objective of CAT.GEN.MPA.210, i.e to quickly and accurately locate accidents in oceanic and remote areas.

In addition, CAT.IDE.A.280 'Emergency locator transmitter (ELT)' requires to carry one ELT when the aeroplane has an MOPSC of 19 or less, and two ELTs when the aeroplane has a MOPSC of more than 19. Furthermore, CAT.IDE.A.280 requires that at least one ELT is automatic when the aeroplane was first issued with an individual CofA on or after 1 January 2008.

[17] ICAO Annex 6, Part I, Section 6.18 was adopted by the Council of ICAO at the 8th meeting of its 207th session on 2 March 2016.

However, CAT.IDE.A.280 also allows to replace the automatic ELT with 'one aircraft localisation means meeting the requirement of CAT.GEN.MPA.210, in the case of aeroplanes first issued with an individual CofA on or after 1 July 2008'. This means that:

— if the aeroplane has an MOPSC of more than 19, it may carry only a survival ELT (ELT(S)) and means compliant with CAT.GEN.MPA.210, instead of an automatic ELT and an ELT(S); and

— if the aeroplane has an MOPSC of 19 or less, it may carry only means compliant with CAT.GEN.MPA.210, instead of an automatic ELT.

As the rules do not provide for technical conditions that are applicable to means compliant with CAT.GEN.MPA.210, there is a risk that the automatic ELT is replaced by means that do not meet the objectives of CAT.GEN.MPA.210 and that do not even provide the service that is currently provided by an automatic ELT (refer to Section 4.2 of this NPA). For instance, most of the current aircraft tracking services that are used to comply with CAT.GEN.MPA.205 do not achieve the expected robustness and accuracy to serve the purposes of SAR operations and safety investigations.

The replacement of the automatic ELT by means compliant with CAT.GEN.MPA.210 should not decrease the chances of locating and rescuing survivors of an accident. This implies that the means compliant with CAT.GEN.MPA.210 have performance that is sufficient to support effective SAR operations. In this regard, the International Aeronautical and Maritime Search and Rescue Manual (IAMSAR Manual), Vol III shows that reduced visibility within the zone of an aeroplane accident (which may be due to many factors, e.g. local weather, night conditions, rough terrain, forrest, etc.) often forces mobile SAR facilities to cover the search area with reduced track spacing[18] (of a few hundreds of meters or less) at reduced speed (a few kt), which means that only a small area can be covered per hour of search. At the same time, the survivors of an aeroplane accident may well be injured and/or exposed to hostile conditions (coldness, heat, accident over water) and therefore, they need to be located and rescued as fast as possible.

Note 1

While the ELT(S) may be useful in some cases, its effectiveness is not equivalent to that of an automatic ELT. The ELT(S) first needs to be found and activated by survivors to transmit after a survivable accident. This might be possible but is not very likely as survivors may be severely injured, most of them will probably ignore the ELT(S) existence or its location in the aeroplane (unless a crew member is part of the survivors), or the ELT(S) may be hidden by debris, inaccessible or ejected outside of the wreckage. This is the reason for requiring the carriage of an automatic ELT on board aeroplanes with an MOPSC of more than 19. An automatic ELT is designed and installed to automatically start transmitting signals upon detection of a crash. In most historical accidents with large aeroplanes, when an ELT was activated, it was more often the automatic ELT than the ELT(S).

Note 2

NCC.IDE.A.215 and SPO.IDE.A.190 provide for the same alleviation as CAT.IDE.A.280 with regard to replacing the automatic ELT by a means compliant with CAT.GEN.MPA.210.

[18] The distance between adjacent parallel search tracks.

Furthermore, the lack of technical conditions that are applicable to means compliant with CAT.GEN.MPA.210 may result in approving solutions that do not properly serve safety investigation purposes. CAT.IDE.A.285 (Flight over water), point (f) requires that aeroplanes with a MCTOM of more than 27 000 kg and a MOPSC of more than 19 as well as aeroplanes with a MCTOM of more than 45 500 kg carry a 8.8-kHz (±1-kHz) frequency underwater locating device (8.8-kHz ULD)[19] when they are operated over water farther than 180 NM from shore. However, CAT.IDE.A.285, point (f) also allows for replacing this ULD with 'robust and automatic means to accurately determine, following an accident where the aeroplane is severely damaged, the location of the point of end of flight.' CAT.IDE.A.285, point (f)(2) actually refers to CAT.GEN.MPA.210, as explained in GM1 CAT.IDE.A.285(f)(2).

If the location of the point of end of flight after an accident is known with sufficient accuracy, then the underwater search area is small enough to be covered within a few days, which is a time period consistent with the transmission time of the ULDs that are fitted into the flight recorders. This is why CAT.IDE.A.285, point (f)(2) allows that an 8.8-kHz ULD is not installed on board an aeroplane that is equipped with means compliant with CAT.GEN.MPA.210. However, this alleviation was provided for because it is assumed that means compliant with CAT.GEN.MPA.210 also serve the purpose of an 8.8-kHz ULD, i.e. to locate the wreckage and the flight recorders within a few days, whether the accident is survivable or not. As no technical conditions are defined for means compliant with CAT.GEN.MPA.210, there is a risk that the 8.8-kHz ULD is replaced by means that do not serve such a purpose. For example, an automatic ELT is designed and certified against ELT industry standards (such as EUROCAE 62A or 62B), which specify crash test conditions that are representative of survivable accidents, while an 8.8-kHz ULD is designed against other industry standards (usually SAE Aerospace Standard AS6254A), which specify more stringent crash test conditions.

In conclusion, the scope of this NPA is not only limited to defining performance objectives and technical conditions for an effective implementation of CAT.GEN.MPA.210 'Location of an aircraft in distress'; it also includes laying down ELT-carriage requirements (CAT.IDE.A.280, NCC.IDE.A.215, SPO.IDE.A.190) and 8.8-kHz ULD carriage requirements on large aeroplanes (CAT.IDE.A.285, point (f)). Table 1 below shows the possible equipment combinations when considering CAT.GEN.MPA.210, CAT.IDE.A.280 and CAT.IDE.A.285, point (f) altogether, for an aeroplane that is operated in accordance with Part-CAT and was first issued with an individual CofA on or after 1 July 2008.

[19] The 8.8-kHz ULD carriage requirement facilitates locating the aeroplane wreckage after an accident over an oceanic area, where the underwater search area is very large and the seafloor is so deep that the signal from the ULDs that are attached to the flight recorders cannot be detected from the sea surface. In addition, the ULDs that are attached to the flight recorders transmit on a 37.5-kHz frequency, which is not a frequency commonly used by navies. In such a case, an 8.8-kHz ULD is advantageous as it has a greater signal range that allows for signal detection from the sea surface whatever the depth of the seafloor as well as for greater track spacing when covering the search zone, and because the sonars of most navies can detect 8.8-kHz signals. Fitting the aeroplane with an 8.8-kHz ULD increases the chances that the wreckage and flight recorders are located before the ULDs that are fitted into the flight recorders cease to transmit. Moreover, the technical standards that are applicable to the 8.8-kHz ULD (refer to the Certification Specifications for European Technical Standard Orders, CS ETSO-C200a) are such that this ULD can withstand conditions that are encountered in most accidents over water, and not only survivable ones.

Table 1 — Applicability of requirements for (a) the location of an aircraft in distress, (b) carriage of an automatic ELT, and (c) carriage of an 8.8-kHz ULD for aeroplanes that are operated for commercial air transport (CAT) and are first issued with an individual CofA on or after 1 July 2008.

Condition of MCTOM and MOPSC	MCTOM of ≤ 27 000 kg or (MCTOM of ≤ 45 500 kg and MOPSC of ≤ 19)	(MCTOM of > 27 000 kg and MOPSC of > 19) or MCTOM of > 45 500 kg
Typical categories of aeroplanes	Piston aeroplanes, turboprop aeroplanes, small turbojet aeroplanes, regional jet aeroplanes configured as business jets.	Regional jet aeroplanes configured for scheduled passenger transportation; single-aisle and twin-aisle turbojet aeroplanes configured for scheduled passenger transportation or cargo transportation.
Is an automatic ELT required by CAT.IDE.A.280?	Yes, but it may be replaced by means compliant with CAT.GEN.MPA.210.	Yes, but it may be replaced by means compliant with CAT.GEN.MPA.210.
Is an 8.8-kHz ULD required by CAT.IDE.A.285, point (f)?	No.	Yes, but it may be replaced by means compliant with CAT.GEN.MPA.210.
Is CAT.GEN.MPA.210 applicable?	No.	Yes, if the aeroplane is first issued with an individual CofA on or after 1 January 2023.
Equipment combinations that comply with CAT.GEN.MPA.210 (if applicable), CAT.IDE.A.280 and CAT.IDE.A.285, point (f) (if applicable)	— Automatic ELT, or — means compliant with CAT.GEN.MPA.210	Any of the following is a possible equipment combination: — automatic ELT and 8.8-kHz ULD and means compliant with CAT.GEN.MPA.210; — 8.8-kHz ULD and means compliant with CAT.GEN.MPA.210; — automatic ELT and means compliant with CAT.GEN.MPA.210; or — means compliant with CAT.GEN.MPA.210.
Equipment combinations that comply with CAT.GEN.MPA.210 (if applicable), CAT.IDE.A.280 and CAT.IDE.A.285, point (f) (if applicable) with the least equipment possible	— Automatic ELT, or — means compliant with CAT.GEN.MPA.210	Means compliant with CAT.GEN.MPA.210

4.1.3. Safety risk assessment

4.1.3.1 Related safety issues

A means compliant with CAT.GEN.MPA.210 is not critical for the safe conduct of a flight as it only provides the accurate location of the point of end of flight in case of an accident during which the aeroplane is severely damaged.

However, a means compliant with CAT.GEN.MPA.210 increases the chances of rescuing survivors after an accident (assisting SAR operations) and accelerates the recovery of flight recorder data (assisting safety investigations). If that means is not properly implemented, it will be ineffective, resulting in more accident fatalities (because survivors are not located on time) and an increased possibility of a similar accident occurring to other aircraft at risk (as the root causes of the first accident are not identified). In addition, without an accurate location of the point of end of flight, the SAR operational teams have to cover larger areas, which in turn increases their exposure to risks. Table 2 below shows examples of historical accidents where locating the accident site and survivors was very difficult due to the absence of accurate location information.

This issue as well as RMT.0400 are also included in the European Plan for Aviation Safety (EPAS) 2020-2024, Section 5.4 ‘Aircraft tracking, rescue operations and accident investigation’.

Table 2 — Historical accidents for which no accurate location of the point of end of flight was available

Aircraft type	Registration	Operator	Place of accident	Date of accident	Killed	Severely injured	Information
BOEING 757-200	N651AA	American Airlines	Cali (Columbia)	20.12.1995	159	4	Controlled flight into terrain (CFIT) in night visual meteorological conditions (VMC), crash at 21:48, SAR notified at 21:50, civil defence, red cross, police and army mobilised at 22:30. Crash site located at 6:30.
AIRBUS A310	7O-ADJ	Yemenia Airways	Comores	29.6.2009	151	1	Stall terminated in crash at sea and at night. 1 survivor recovered 9 hours after the crash.
AIRBUS A320	F-GGED	Air Inter	Mont Saint Odile (France)	20.1.1992	87	5	9 survivors found in the mountains 4 hours after the crash. 6 lives could have been spared if the SAR team had been on site within 30 min, and 2 lives if

							the SAR team had been on site within 2 hours. Crash site located about 1 km from the last reported point. Search area was 21 km².
BOEING 737-200	EX-037	Kam Air/ Phoenix Aviation	30 km SE of Kabul (Afghanistan)	3.2.2005	105	0	The crash area was mountainous, infested with mines, and covered by snow in bad weather conditions. The wreckage was found 3 days later. 1 soldier was killed and 3 were injured during the SAR operations due to the mines.

4.1.3.2 Related safety recommendations

The following safety recommendations (SRs) that were published by safety investigation authorities[20] are already addressed at rule level through the adoption of CAT.GEN.MPA.210. However, the circumstances of the accidents after which those SRs were issued were also considered when developing the draft amendments that are proposed in Chapter 3 of this NPA.

— Safety recommendation issued by the French Bureau d'Enquêtes et d'Analyses (BEA): 'The BEA recommends that EASA and ICAO study the possibility of making mandatory, for airplanes making public transport flights with passengers over maritime or remote areas, the activation of the emergency locator transmitter (ELT), as soon as an emergency situation is detected on board.' (Accident of an Airbus A330 (registered F-GZCP), on 1 June 2009, en route between Rio de Janeiro and Paris over the North Atlantic).

— Safety recommendation issued by the Australian Transport Safety Bureau (ATSB): 'Aircraft operators, aircraft manufacturers, and aircraft equipment manufacturers investigate ways to provide high-rate and/or automatically triggered global position tracking in existing and future fleets.' (The operational search for MH370 on 3 October 2017).

— Safety recommendation issued by the Malaysian ICAO Annex 13 Safety Investigation Team for MH370 and addressed to ICAO: 'To review the effectiveness of current ELTs fitted into passenger aircraft and consider ways to more effectively determine the location of an aircraft that enters water.' (Safety investigation report on the loss of Malaysia Airlines Boeing B777-200ER (9M-MRO) on 8 March 2014, issued on 2 July 2018).

[20] Refer to Regulation (EU) No 996/2010 on the investigation and prevention of accidents and incidents in civil aviation and repealing Directive 94/56/EC (OJ L 295, 12.11.2010, p. 35) (https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1575024205219&uri=CELEX:32010R0996).

4.1.4. Links with other EASA rulemaking tasks

Issue 2 of the Certification Specifications for Airborne Communication, Navigation and Surveillance (CS-ACNS) was adopted on 26 April 2019. The proposed amendment to CS-ACNS in Chapter 3 of this NPA would be contained in a new section of CS-ACNS, Subpart E; its adoption would not create any interface issue with other ongoing RMTs.

A possible solution to comply with CAT.GEN.MPA.210 is based on installing an automatic deployable flight recorder (ADFR). Therefore, related AMC and GM are proposed to be inserted in the new section of CS-ACNS, which address the performance of a system based on an ADFR with regard to locating the point of end of flight (see Chapter 3). At the same time, Certification Specifications for Large Aeroplanes (CS-25) addresses the installation of an ADFR on large aeroplanes. Particularly CS 25.1457 'Cockpit voice recorders' and CS 25.1459 'Flight data recorders' contain specifications for the installation of an ADFR. CS 25.1457 and CS 25.1459 aim, among others, at ensuring that the flight recorders serve their intended purpose, i.e. to record and preserve data in case of an accident to facilitate the safety investigation. However, the purpose of the amendments proposed in Chapter 3 of this NPA is to reliably and accurately locate the point of end of flight in case of an accident, for SAR and safety investigation purposes. The flight recorder function of the ADFR is not within the scope of this NPA. Aspects such as the effect of unintended deployment are addressed by CS-25.1457, point (d)(7); therefore, the amendments proposed in this NPA refer to 'CSs applicable to the aircraft type' for such aspects.

NPA 2019-06 was published on 22 May 2019 under RMT.0457 'Regular update of CS-ETSO', which includes proposed amendments to ETSOs on ELTs (C126c) and flight recorders (C123d, C124d, C176b, and C177b). That NPA introduced the ELT(DT) (ETSO-C126c) and proposes a new ETSO that addresses the performance of ADFRs (ETSO-2C517). The proposed CS-ETSOs address performance aspects at equipment level, while this NPA is focussed on the performance of the aircraft system and of the transmission service. However, as a possible solution to comply with CAT.GEN.MPA.210 is based on installing an ELT(DT), and another possible solution is based on installing an ADFR, reference to ETSO-C126c (on ELTs) and to ETSO-2C517 (on ADFRs) proposed in NPA 2019-06 is made in this NPA.

Finally, aspects related to the minimum equipment list (MEL) are addressed in this NPA. A new item is proposed to be inserted in the Certification Specifications and Guidance Material for Master Minimum Equipment List (CS-MMEL) to address the equipment used for locating an aircraft in distress. A regular update of CS-MMEL is underway under RMT.0499 'Regular update of CS-MMEL': the related NPA 2018-08 was published on 22 August 2018 and its public consultation period was closed on 5 November 2018. The starting date of the following regular update of CS-MMEL is not yet known. Therefore, the new item addressing equipment used for locating an aircraft in distress is proposed in this NPA.

Coordination was ensured between RMT.0400, RMT.0457 and RMT.0499 to maintain consistency across certification specifications with regard to ELTs, ULDs, and ADFRs.

4.1.5. Who is affected

4.1.5.1 Affected stakeholders

The stakeholders affected by this issue are the following:

— large-aeroplane type certificate (TC)/supplemental type certificate (STC) holders and applicants;
— operators of large aeroplanes used in CAT;
— safety investigation authorities;
— SAR authorities;
— air navigation service providers (ANSPs), and particularly ATS units; and
— EASA and national aviation authorities (NAAs) of EASA Member States.

4.1.5.2 Affected aircraft

Aircraft models affected by this NPA are aeroplanes with an MCTOM of more than 27 000 kg and an MOPSC of more than 19, and aeroplanes with an MCTOM of more than 45 500 kg. The operators concerned are those that have their main place of business on the territory of an EASA Member State[21].

However, as CAT.GEN.MPA.210 is only applicable to aeroplanes first issued with an individual CofA on or after 1 January 2023, currently operated aeroplanes are not affected. Means compliant with CAT.GEN.MPA.210 are expected to be installed before first delivery of the aircraft in most cases.

4.1.5.3 Impact on other rules

As the automatic ELT may be replaced by means compliant with CAT.GEN.MPA.210 (in accordance with CAT.IDE.A.280), CAT.GEN.MPA.210 and related CS, AMC, and GM proposed in this NPA should take into account the international framework that is defined for SAR in ICAO Annex 12 'Search and Rescue' and for the alerting service provided by ATS units in ICAO Annex 11 'Air Traffic Services', Chapter 5. The data necessary to determine the position of the point of end of flight should be provided to the competent SAR centre in situations similar to the 'distress phase' as defined in ICAO Annex 11, Chapter 5[22]: according to ICAO Annex 12, Chapter 5, Section 5.2.3 during a distress phase, the RCC must 'ascertain the position of the aircraft, estimate the degree of uncertainty of this position, and on the basis of this information and the circumstances, determine the extent of the area to be searched'. Certain data is also expected to be provided to the competent SAR centre during an 'alert phase' as defined in ICAO Annex 11, Chapter 5[23] as, according to ICAO Annex 12,

[21] EASA Member States are EU Member States, Iceland, Liechtenstein, Norway, and Switzerland.

[22] According to Annex 11, Chapter 5, Section 5.2.1, a 'distress phase' corresponds to the following situations:
'1) following the alert phase, further unsuccessful attempts to establish communication with the aircraft and more widespread unsuccessful inquiries point to the probability that the aircraft is in distress, or when
2) the fuel on board is considered to be exhausted, or to be insufficient to enable the aircraft to reach safety, or when
3) information is received which indicates that the operating efficiency of the aircraft has been impaired to the extent that a forced landing is likely, or when
4) information is received or it is reasonably certain that the aircraft is about to make or has made a forced landing, except when there is reasonable certainty that the aircraft and its occupants are not threatened by grave and imminent danger and do not require immediate assistance.'

[23] According to Annex 11, Chapter 5, Section 5.2.1, an 'alert phase' corresponds to the following situations:
'1) following the uncertainty phase, subsequent attempts to establish communication with the aircraft or inquiries to other relevant sources have failed to reveal any news of the aircraft, or when
2) an aircraft has been cleared to land and fails to land within five minutes of the estimated time of landing and communication has not been re-established with the aircraft, or when

Chapter 5, Section 5.2.2, during an alert phase, the RCC must 'immediately alert search and rescue units and initiate any necessary action.'

Note

ATS.TR.100 of Part-ATS of Regulation (EU) 2017/373 requires that ATS providers demonstrate that their working methods and operating procedures are compliant with the standards of ICAO Annex 11. For further details on the approach proposed by ICAO, refer to Section 4.3.2 (Option 1) of this NPA.

4.1.6. How could the issue/problem evolve

The lack of means compliant with CAT.GEN.MPA.210 may well result in solutions that do not serve the intended purpose of the requirement and therefore, prevent SAR and safety investigation authorities from efficiently performing their missions.

Furthermore, inappropriate means may be installed instead of the automatic ELT and the 8.8-kHz ULD that are required to be carried on board some categories of aeroplanes (in accordance with the alleviations provided in CAT.IDE.A.280, CAT.IDE.A.285, NCC.IDE.A.215, and SPO.IDE.A.190). This would significantly compromise the chance of successfully locating survivors and the aeroplane.

The lack of means compliant with CAT.GEN.MPA.210 may also lead to many EU-based operators requesting an exemption, which would delay the implementation of CAT.GEN.MPA.210.

Note 1

When considering the safety benefit of carrying an automatic ELT, it should also be taken into account that the performance of the international COSPAS-SARSAT programme is being significantly enhanced with new payloads installed on board satellites in medium Earth orbit (MEO). This new constellation, the Medium Earth Orbit Search and Rescue (MEOSAR) system, is expected to permit near real-time worldwide coverage for the detection and independent location[24] of a transmitting ELT, which is not possible with the satellite constellations that are currently used by the international COSPAS-SARSAT programme[25]. In this impact assessment, it is assumed that after 1 January 2023, the MEOSAR system of the international COSPAS-SARSAT programme will be fully operational, and that an automatic ELT will be able to rely on this performant component to transmit its emergency signals.

Note 2

Part-CAT, including CAT.GEN.MPA.210, is only applicable to operators that have their main place of business in an EASA Member State. For a third-country operator (TCO), i.e. an operator holding an air operator certificate issued by a country that is not an EASA Member State, the applicable

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3) information has been received which indicates that the operating efficiency of the aircraft has been impaired, but not to the extent that a forced landing is likely, except when evidence exists that would allay apprehension as to the safety of the aircraft and its occupants, or when
4) an aircraft is known or believed to be the subject of unlawful interference.'

[24] 'Independent location' means in this context that the source of the signal can be located without using any location information that is contained in the signal.

[25] Those are the Low-altitude Earth Orbit Search and Rescue (LEOSAR) and the Geostationary Earth Orbit Search and Rescue (GEOSAR) systems.

regulation is Regulation (EU) No 452/2014[26]. In accordance with TCO.200 'General requirements' of Annex I (PART-TCO) to Regulation (EU) No 452/2014, a third-country operator must comply with the applicable standards that are contained in the ICAO Annexes. As CAT.GEN.MPA.210 is the EU requirement that transposes the ICAO Annex 6, Part I, Section 6.18.1 standard, TCO compliance with this ICAO standard will be checked at the latest as of 1 January 2023, when CAT.GEN.MPA.210 becomes applicable.

4.2. What we want to achieve — objectives

Refer to Section 2.2.

4.3. How it could be achieved — options

Table 3 — Selected policy options

Option No	*Short title*	Description
0	Do nothing	No policy change (no AMC and GM to CAT.GEN.MPA.210, and no changes to CSs; risks remain as outlined in the issue analysis).
1	ICAO Annex 6, Part I	Transpose ICAO Annex 6, Part I, Section 6.18 and Appendix 9 standards related to the location of an aeroplane in distress into AMC to CAT.GEN.MPA.210 and CSs.
2	Performance-based approach	Define common performance objectives (CPOs) that address both the intent of ICAO standards and the needs of SAR and safety investigation authorities.

4.3.1. Option 0

Option 0 consists in maintaining the status-quo without introduning any AMC/GM/CS related to CAT.GEN.MPA.210. As a result of Option 0, the IR (CAT.GEN.MPA.210) would enter in force on 1 January 2023 with no AMC or GM provided by EASA.

4.3.2. Option 1

Option 1 consists in transposing to the largest possible extent the related ICAO provisions and guidance (ICAO Annex 6, Part I, Section 6.18 and Appendix 9, and ICAO Doc 10054 'Manual on location of aircraft in distress and flight recorder data recovery'). These provisions prescribe a particular solution for locating the point of end of flight. This solution consists in the aeroplane autonomously transmitting information based on which the operator can determine a position at least every minute, when in distress (refer to ICAO Annex 6 Part I, Section 6.18.1). The main aspects of that solution are:

— automatic activation when the aeroplane is in distress, and capability of being manually activated (refer to ICAO Annex 6, Part I, Appendix 9);

[26] Commission Regulation (EU) No 452/2014 of 29 April 2014 laying down technical requirements and administrative procedures related to air operations of third country operators pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (OJ L 133, 6.5.2014, p. 1) (https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1575033561045&uri=CELEX:32014R0452).

— capability of the system to cope with circumstances associated with an accident scenario (refer to ICAO Doc 10054);

— deactivation of autonomous transmission only possible by using the same mechanism that activated the transmission (refer to ICAO Annex 6 Part I, Appendix 9);

— capability of transmitting information in the event of an aircraft electrical power loss ‘at least for the expected duration of the flight’ (refer to ICAO Annex 6 Part I, Appendix 9);

— transmission of signals on frequencies that are protected by the International Telecommunication Union (ITU) Radio Regulations, and belong to the protected aeronautical safety spectrum or to the protected distress spectrum (refer to ICAO Doc 10054);

— transmission of position information with a time stamp (refer to ICAO Annex 6, Part I, Appendix 9);

— accuracy of position information contained in a position report that meets ‘the position accuracy requirements established for ELTs’ (refer to ICAO Annex 6, Part I, Appendix 9);

— transmitted information sufficient to establish the location of the accident site within a 6-NM radius (refer to ICAO Annex 6, Part I, Appendix 9);

— transmission of position information starting no later than 5 s ‘after the detection of the activation event’ (refer to ICAO Annex 6, Part I, Appendix 9);

— operator alerted when aeroplane in distress (refer to ICAO Annex 6, Part I, Appendix 9);

— the operator’s responsibility to inform, and coordinate with, the relevant ATS unit when the operator ‘has reason to believe that an aircraft is in distress’ (refer to ICAO Annex 6, Part I, Appendix 9); and

— the operator’s responsibility to make the transmitted information available to the appropriate organisations ‘as established by the State of Operator’, which includes, as a minimum, the relevant ATS unit and the competent RCC (refer to ICAO Annex 6, Part I, Section 6.18.3 and Appendix 9).

These ICAO standards imply that there is a worldwide system in place that allows the aircraft position information to be transmitted to the operator concerned, and that the operator makes available the position information to the relevant ATS unit and the competent SAR centre. Therefore, Option 1 de facto excludes all ELT-based solutions as the international COSPAS-SARSAT programme does not transmit the ELT signals to the operator of the aircraft concerned, but directly to the competent SAR centre[27]. The ICAO GADSS ConOPs introduces the concept of a distress tracking repository to solve this issue and facilitate the sharing of distress tracking data between the operator, the relevant ATS units, and the competent SAR centre. In October 2019, ICAO published a tender for the creation of such a repository[28]. Should such a repository be successfully set up, it is

[27] The competent SAR centre contacts the competent ATS unit or directly the aircraft operator after receiving messages corresponding to an ELT transmission (according to ICAO Annex 12, Chapter 5). The relevant ATS unit then contacts the operator (according to ICAO Annex 11, Chapter 5).

[28] Contract reference: 12501031, title: ‘Location of an Aircraft in Distress Repository’, available on the ICAO e-tendering portal.

expected that the international COSPAS-SARSAT programme sends ELT messages to that repository in addition to delivering them to the competent SAR centre[29].

For convenience, the conditions proposed under Option 1 are presented in Table 1 of Appendix 2 to this NPA.

4.3.3. Option 2

4.3.3.1 The CPOs defined under Option 2

Option 2 consists in defining CPOs applicable to any means compliant with CAT.GEN.MPA.210, instead of prescribing a particular solution, such as Option 1. The CPOs are presented in Table 4 below, and their rationale in Appendix 3 to this NPA.

The CPOs defined under Option 2 are derived from the high-level objectives described in Section 2.2 and they do not prescribe a certain technology. Especially those solutions that are not based on tracking the aircraft may be considered compliant with CAT.GEN.MPA.210.

The approach followed under Option 2 results in some CPOs being more demanding than what is prescribed by the standards of ICAO Annex 6, Part I. Option 2 requires a 200-m 2-D location accuracy of the point of end of flight as well as the transmission of a 121.5-MHz homing signal when the accident is survivable. In addition, Option 2 includes CPOs that ensure the robustness of the means compliant with CAT.GEN.MPA.210, and that are not part of Option 1. Some of these CPOs are listed below:

— When the system relies on non-dedicated airborne resources, applications necessary for the functions of the system should have priority over concurrent applications, except those required for continued safe flight and landing. (CPO 23).

— The communication infrastructure that is used by the system should have sufficient performance to ensure successful transmission, and the performance parameters of the communication infrastructure should include as a minimum assumptions regarding availability, integrity, capacity, and coverage (CPO 16).

— The operational record-keeping function should include integral recording on the ground of the transmitted data and retention of that data for at least 30 days, as well as capability to retrieve recorded data within 30 minutes when it was recorded in the last 48 hours. (CPO 12).

However, when developing Option 2, care was taken to serve the purpose of ICAO Annex 6, Part I, Appendix 9: 'Location of an aeroplane in distress aims at establishing, to a reasonable extent, the location of an accident site within a 6 NM radius.'

4.3.3.2 Question to stakeholders regarding remote activation and remote deactivation

EASA was made aware of ongoing research and development projects that aim at providing to operators the capability to remotely control the activation and/or deactivation of ELTs.

Such capability raises several issues, and for the time being, no satisfactory operational concept for the use of this capability is known to EASA. The main issues are the following:

[29] C/S A.001 (COSPAS-SARSAT 'Data distribution plan', dated February 2019), Section 3.12 specifies that alert data corresponding to an ELT(DT) must be sent to the 'Autonomous Distress Tracking Data Repository' via the nodal MCC.

— the potential impact on SAR centres and ATS units in terms of false alerts or missed alerts as according to CPO 22, the distribution service should automatically make data corresponding to activation and deactivation signals available to the relevant ATS unit and the competent SAR centre;

— an operator does not immediately see the consequences of remote activation or remote deactivation of the means compliant with CAT.GEN.MPA.210 unless they also receive data corresponding to activation and deactivation signals;

— in ICAO Annexes, the operator has no central role in the management of emergencies, unlike the ATS units and SAR centres (refer to ICAO Annex 11, Chapter 5 and to ICAO Annex 12);

— most operators have limited knowledge of the responsibilities of SAR centres and ATS units for the management of emergencies and particularly, for the management of ELT messages;

— most operators have little practical experience, as an ELT is seldom activated on an aeroplane of their fleet; and

— there is no international mechanism to control the appropriate use by operators of the remote activation and deactivation capability, and sanction the misuse of that capability (especially when the impacted SAR centres and ATS units are in another country than the country of the operator, or even on another continent).

This NPA does not contain proposals that forbid or restrict remote control of the means compliant with CAT.GEN.MPA.210 as this is still at the concept stage. However, stakeholders, particularly SAR authorities and ANSPs, are invited to share their views on enabling the remote control of the system by operators when this is implemented together with Option 2, especially according to CPO 22.

Table 4 — CPOs under Option 2

CPO No	CPO text	Addressed aspect	Covered by Option 1
1	The system should be automatically armed when the aeroplane becomes airborne.	Start and end of operation	Yes
2	The scope includes accidents that correspond to point (b) of the definition of an accident in ICAO Annex 13 and distress situations when the accident or distress situation take place between take-off from, and landing at, an airfield.	Scope	Yes
3	(a) The system should be capable of automatically activating upon detection that an accident that severely damaged the aeroplane or a distress situation have occurred, are occurring or are very likely to occur within minutes. The system should, to the extent possible, not automatically activate without indication that severe damage or a distress situation occurred, or is likely to occur, to the aeroplane within minutes. (b) As soon as the system is activated: — it should automatically start transmitting signals within a time frame that maximises the	Detection and transmission	Yes

CPO No	CPO text	Addressed aspect	Covered by Option 1
	likelihood that at least a set of data corresponding to an activation signal is received; and — it should transmit signals at time intervals that do not exceed 1 min, at least until reaching the point of end of flight or it is deactivated. (c) Upon deactivation, the system automatically transmits deactivation signals to the communication infrastructure within 1 min of the deactivation time. (d) Automatic deactivation results only from the automatic detection by the aircraft of a confirmed return to safe flight conditions.		
4	The system performance should not be affected by the environmental conditions that are encountered during most accidents within the scope of CAT.GEN.MPA.210.	Robustness	Yes
5	(a) The system remains armed as long as the aircraft is airborne. (b) In addition, the system should remain armed or activated throughout the maximum possible duration of a flight without propulsive power on any engine, followed in the case where equipment is deployed, by a period of 15 min on ground without any propulsive power on any engine.	Start and end of operation	Yes
6	(a) The system should perform its intended function, and activation signals should be detected by the communication infrastructure: — in the whole flight envelope of the aircraft; — when the aircraft is experiencing high attitude values, high attitude rate values, overspeed or high vertical speed, which are typically encountered during loss of control in flight; and — wherever the accident occurs. (b) Deactivation signals should be detected by the communication infrastructure at aircraft attitudes, altitudes, and speeds that correspond to normal operation.	Robustness	No
7	The system should perform its intended function in case of accidents over water as well as over land.	Robustness	Yes
8	In case of a survivable accident: — data that is received on the ground within 20 min after the aircraft reached the point of end of flight should be sufficient to locate that point with a 200-m 2D location accuracy (95 % probability); and — a 121.5-MHz homing signal, compatible with	Location accuracy	No

CPO No	CPO text	Addressed aspect	Covered by Option 1
	standard homing direction finders, is automatically transmitted for at least 48 hours, or until transmission is manually stopped by the flight crew, or until the aircraft is submersed.		
9	Data that is received on the ground within 20 min after the aircraft reached the point of end of flight should be sufficient to locate this point with a 6-NM 2D location accuracy (95 % probability).	Location accuracy	Yes
10	The transmission service that is used by the system should include: — a communication infrastructure that detects and transmits activation and deactivation signals, and converts them into data; — an operational record-keeping function that records and retains that data; and — a distribution service that delivers that data to the competent SAR centre and makes available that data to the relevant ATS unit.	Detection and transmission	Yes
11	Whether the system is armed or not, the flight crew should have means to: — manually activate the system (but not deploy any equipment); — manually deactivate the system when the system was manually activated and the transmitter is not detached from the aircraft; — manually trigger a 121.5-MHz homing signal at least when the aircraft is not airborne; and — manually stop transmission of the 121.5-MHz homing signal.	Manual control	Yes
12	The operational record-keeping function should include: — integral recording on the ground of the transmitted data and retention of that data for at least 30 days, and — capability to retrieve recorded data within 30 min when it was recorded in the last 48 hours.	Recording and retrieval of data	No
13	The reliability of the airborne equipment that is used by the system as well as the serviceability tasks should be such that the aircraft operator can ensure the continued serviceability of that airborne equipment.	Reliability	Yes
14	When the system includes deployable equipment, the safety risks for third parties that result from unintended deployment should be addressed.	Safety of third parties	Yes
15	No means of disabling the system, except circuit protective devices, should be provided during the flight.	Manual control	No
16	The communication infrastructure that is used by the system should have sufficient performance to ensure	Robustness	No

CPO No	CPO text	Addressed aspect	Covered by Option 1
	successful transmission, and the performance parameters of the communication infrastructure should include as a minimum assumptions regarding: — availability, — integrity, — capacity, and — coverage.		
17	The system is designed commensurate with a major failure condition that results from erroneous automatic activation.	Reliability	Yes
18	The operator should: — have means and procedures to assess whether an aircraft is likely to be in a distress situation; — inform the relevant ATS unit without delay whether an aircraft is believed to be in distress; and — have means and procedures to limit the negative impact of nuisance activation on SAR centres.	Reliability	Yes
19	The distribution service should deliver the data to the competent SAR centre in plain text. In addition, that text should be presented in a format that is internationally recognised by SAR authorities.	Interoperability	No
20	(a) When the system is activated, it should transmit signals that are sufficient to obtain the following data: — indication that the system is activated; — latitude, longitude, and time at which they were valid; — the individual aircraft identification; — the type of airborne equipment that transmitted the signals; and — when practicable: — the estimated accuracy of latitude and longitude; — indication of whether latitude and longitude were valid and refreshed; — indication of whether activation was automatic or manually triggered; and — altitude, ground speed, ground track, and vertical speed. (b) When the system is deactivated, it should transmit, before ceasing transmission, signals that are necessary to obtain the following data:	Minimum data content	Yes

CPO No	CPO text	Addressed aspect	Covered by Option 1
	— individual aircraft identification; — indication that the system is deactivated; and — the type of airborne equipment that transmitted the signals.		
21	The system should transmit activation and deactivation signals on frequencies that are protected by ITU Radio Regulations, and that belong to the protected aeronautical safety spectrum or the protected distress spectrum.	Robustness	Yes
22	The distribution service should: — automatically make data corresponding to activation and deactivation signals available to the relevant ATS unit; — automatically deliver data corresponding to activation and deactivation signals to the competent SAR centre; — make data corresponding to activation and deactivation signals available to the relevant ATS unit within 15 min of being received from the communication infrastructure; and — deliver data corresponding to activation and deactivation signals to the competent SAR centre within 15 min of being received from the communication infrastructure.	Detection and transmission	No
23	When the system relies on non-dedicated airborne resources, applications necessary for the functions of the system should have priority over concurrent applications, except those required for continued safe flight and landing.	Robustness	No

4.4. What are the impacts

4.4.1. Safety impact

To better assess the safety impacts of the various options, different scenarios corresponding to possible outcomes for SAR and investigation authorities were defined, for the case of an accident where no other source of information is available to locate the accident site.

The scenarios are described in Table 5.

Table 5 — Scenarios corresponding to possible outcomes for SAR and investigation authorities

Scenario No	Scenario description
1	No or very inaccurate information on the location of the accident is available, and the aeroplane is not equipped with an 8.8-kHz ULD so that: — an extremely large area must be covered by SAR operations, and the chances of survival for aeroplane occupants are close to 0; — whether the accident occurs over land or water, an extremely large area must be covered to locate the aeroplane wreckage; and — in case of an accident over water, it is likely that the 37.5-kHz ULDs attached

	to the flight recorders cease transmitting before their signal is detected; in that case, the underwater search operations may last for several years and the wreckage may eventually never be found (case of MH370). Note: even if the aeroplane is tracked by the operator at 15-min time intervals, as specified by AMC1 CAT.GEN.MPA.205, point (b), this cannot be considered as an accurate source of information on the location of the aeroplane (see Section 4.1.1 of this NPA).
1a	No or very inaccurate information is available on the location of the accident, but the aeroplane carries an 8.8-kHz ULD and the accident occurs over water; as a result: — an extremely large area must be covered by SAR operations, and the chance of survival for aeroplane occupants are close to 0; and — an extremely large area must be covered to locate the aeroplane wreckage; it is possible but not certain that the signal of the 8.8-kHz ULD is detected before it ceases transmitting, in which case the aeroplane wreckage is found within a few weeks and the safety investigation is not significantly delayed; otherwise, the underwater search operations may last for several years and the wreckage may eventually never be found (case of MH370).
2	The location of the accident is known with an accuracy of 6-NM so that: — SAR operations need several hours and up to several days to cover the search area, and the chances of survival for aeroplane occupants are very reduced; and — whether the accident occurs over land or water, the wreckage and flight recorders can be retrieved within a few weeks so that the safety investigation is not significantly delayed.
3	The accident site can be quickly and accurately located so that: — SAR operations need little time to cover the search area and the chances of survival for aeroplane occupants are not significantly reduced by delays in locating the aeroplane; and — whether the accident occurs over land or water, the wreckage can be located within a few days and the safety investigation is not significantly delayed.

4.4.1.1 Option 0

The safety impact of Option 0 is expected to be medium negative, for the following reasons:

— In the absence of performance requirements for the means compliant with CAT.GEN.MPA.210, that rule may be implemented by using means that are not fit for purpose (not robust enough or not accurate enough) and therefore, do not facilitate the work of SAR and safety investigation authorities.

— If, in addition, aeroplanes do not carry an automatic ELT (as allowed by CAT.IDE.A.280, NCC.IDE.A.215, and SPO.IDE.A.190 when a means compliant with CAT.GEN.MPA.210 is installed), the SAR centres have no effective means left to locate a survivable accident. An ELT(S) alone is not considered effective (refer to Subsection 4.1.2 of this NPA). This would result in reducing the chances of rescuing potential survivors after such accidents.

— The 8.8-kHz ULD may be removed from (or not be installed on board) aeroplanes within the scope of CAT.IDE.A.285. This, combined with the first point, would result in reducing the chances of locating the aeroplane wreckage.

Replacing the automatic ELT by inadequate means contributes most to the negative rating of Option 0, as the survivability of accidents would diminish, compared to the current situation for all aeroplanes, and not only those within the scope of CAT.GEN.MPA.210. As shown in Table 6 below, the likely scenario in case of an accident where no other source of information is available is Scenario 1.

Table 6 — Potential impact of Option 0 for aeroplanes operated for CAT and first issued with an individual CofA on or after 1 July 2008

Condition on MCTOM and MOPSC	MCTOM of ≤ 27 000 kg or (MCTOM of ≤ 45 500 kg and MOPSC of ≤ 19)	(MCTOM of > 27 000 kg and MOPSC of > 19) or MCTOM of > 45 500 kg
Typical categories of aeroplanes	— Piston aeroplanes, — turboprop aeroplanes, — small turbojet aeroplanes, — regional jet aeroplanes configured as business jets.	— Regional jet aeroplanes configured for scheduled passenger transportation; — single-aisle and twin-aisle turbojet aeroplanes, configured for scheduled passenger transportation or cargo transportation.
Probable effect of Option 0 on aircraft equipment	The aircraft does not carry an automatic ELT and the means used to comply with CAT.GEN.MPA.210 is not adequate.	The aircraft does not carry an automatic ELT, or an 8.8-kHz ULD, and the means used to comply with CAT.GEN.MPA.210 is not adequate.
Probable outcome(s) in case of an accident if no other source of information is available to locate the accident site	Scenario 1	Scenario 1

4.4.1.2 Option 1

Option 1 brings some safety benefits compared to Option 0. This Option provides for automatic means to locate the point of end of flight and addresses some of the robustness aspects. The standards in ICAO Annex 6, Part I, Section 6.18 and Appendix 9 require that those automatic means:

— are capable of being automatically activated upon detection of a distress situation;

— start transmitting within 5 s of detecting the distress condition;

— continue to transmit information in the event of an aircraft electrical power loss; and

— can only be deactivated through the same mechanism as the one that activated them (this implies that if the means were automatically activated, they cannot be manually deactivated).

The installation of a system that fulfils all Option 1 requirements would probably be expensive. The associated cost would probably significantly exceed EUR 10 000, and therefore, overweigh the savings made by not carrying an automatic ELT and/or the 8.8-kHz ULD (refer also to Section 4.4.4 of this NPA for cost estimates of carrying an automatic ELT and 8.8-kHz ULD). Hence, it is assumed that for aeroplanes models that are not within the scope of CAT.GEN.MPA.210, i.e. aeroplanes with an MCTOM of 27 000 kg or less and aeroplanes with an MCTOM of 45 500 kg or less and an MOPSC of 19 or less, the ELT and/or the 8.8-kHz ULD are not replaced by a means compliant with CAT.GEN.MPA.210.

A system compliant with Option 1 would provide the accident site location with a 2D-location accuracy of 6 NM, which is sufficient for safety investigation purposes. A 6-NM-radius circle has a surface area of about 388 km^2, which can be covered within a few days with aerial means (in case of an accident over land) or within a few days with underwater search means (in case of an accident over water[30]). This timespan is commensurate with the time frame of a safety investigation. Therefore, it could be acceptable to not install a 8.8-kHz ULD on board an aeroplane that is equipped with a means that provides the location of the point of end of flight with a 2D location accuracy of 6 NM.

However, Option 1 still has a low negative safety impact, for the following reasons:

Option 1 has several significant drawbacks for SAR. Option 1 does not provide for accurately locating the accident site. Similar to Option 0, the automatic ELT may not be installed if a means compliant with CAT.GEN.MPA.210 is installed, as allowed by CAT.IDE.A.280, NCC.IDE.A.215, and SPO.IDE.A.190. As a result, in case of an accident, the accident site would not need to be known with a 2D location accuracy greater than 6-NM. For example, assuming a track spacing of 500 m and a speed of 20 kt, a visual search with a mobile SAR facility could only cover an area of 18.5 km^2 per hr, so that roughly 21 hours would be needed to cover the surface of a circle with a radius of 6 NM (388 km^2). With a track spacing of 200 m and a speed of 10 kt, more than 100 hours would be needed to cover the same area. This is not acceptable, considering the need to quickly rescue accident survivors. The 2D location accuracy of the point of end of flight that is needed by mobile SAR facilities to be able to rescue accident survivors is of the order of a few tens to a few hundreds of meters, not 6 NM. This was confirmed during an 'end-users' workshop, which was held by EASA with representatives of SAR and safety investigation authorities in July 2018. At that workshop, SAR representatives shared their concerns that a 6-NM 2D location accuracy is not appropriate for their missions.

In addition, if the automatic ELT was removed, the 121.5-MHz homing capability that is provided by the automatic ELT would also be lost. At the end-users workshop of July 2018, the SAR representatives were strongly opposed to solutions that do not include an automatically activated 121.5-MHz homing signal transmitter, for the following reasons:

— the signal carrying the position information (406-MHz signal in the case of an ELT) might remain undetected, e.g. because it is partially masked or not powerful enough;

— data contained in the signal that is carrying the position information may not be refreshed, e.g. the GNSS receiver may be damaged or the GNSS signal masked by the aircraft wreckage;

— relying only on one type of signal to locate the accident site decreases the chances of timely locating accident survivors; and

[30] It is possible to cover about 100 km^2 per 24 hours of operation with a towed sonar or an autonomous underwater vehicle.

— all mobile SAR facilities worldwide are equipped with a homing direction finder, which is provenly a practical and robust way to find the accident site.

Furthermore, according to Option 1, the operator is the recipient of the position information and it must make this information 'available to the appropriate organisations, as established by the State of the Operator', including, as a minimum, the relevant ATS unit (in charge of the alerting service in the airspace where the aeroplane is indicated to be by the data transmitted by the system) and competent SAR centre (i.e. the RCC or SPOC responsible for the area where the aeroplane is indicated to be according to data transmitted by the system). According to the ICAO Annex 6, Part I standards, the data does not need to be delivered to the competent SAR centre or relevant ATS unit, it only needs to be made available to them, and it may be manually validated before being made available. Today, the data transmitted through an ELT 406-MHz signal is delivered (not only made available) to the competent SAR centre in an internationally recognised format, automatically, and within a few minutes of the ELT signal detection by a satellite. At the end-users workshop of July 2018, the SAR representatives expressed their concerns about solutions that rely on the operators to transmit data to them. EASA shares those concerns and considers that adding intermediary steps in the information transmission chain makes it more prone to information loss or excessive delays in the transmission of information.

Finally, Option 1 does not address several aspects of a robust solution, such as ensuring that:

— when the system relies on non-dedicated airborne resources, applications that are needed by the system have a high priority;

— the system relies on a communication infrastructure that has sufficient performance in terms of coverage, availability, integrity, and capacity; or

— data is recorded on the ground and quickly retrievable from the recording.

As shown in Table 7 below, selecting Option 1 would not change today's situation for piston, turboprop, and business jet aeroplanes: the ELT assists in locating the accident site only if the accident is survivable. When considering regional jet, single aisle, and twin-aisle aeroplanes, Option 1 only makes a difference for those that are manufactured on or after 1 January 2023: for those aeroplanes, Scenario 2 is the applicable one.

To conclude, the negative safety impact of Option 1 on SAR missions outweighs the safety benefits of this Option. The aeroplane categories that are impacted by Option 1 are those within the scope of CAT.GEN.MPA.210, while Option 0 impacts all categories of aeroplanes.Therefore, the overall safety impact of Option 1 is considered low negative and is less severe than the safety impact of Option 0.

Table 7 — Potential impact of Option 1 on CAT-operated aeroplanes and first issued with an individual CofA on or after 1 July 2008

Condition on MCTOM and MOPSC	**MCTOM of ≤ 27 000 kg or (MCTOM of ≤ 45 500 kg and MOPSC of ≤ 19)**	**(MCTOM of > 27 000 kg and MOPSC of > 19) or MCTOM of > 45 500 kg**
Typical categories of aeroplanes	— Piston aeroplanes, — turboprop aeroplanes, — small turbojet aeroplanes, — regional jet aeroplanes	— Regional jet aeroplanes configured for scheduled passenger transportation; — single-aisle and twin-aisle turbojet aeroplanes,

	configured as business jets.	configured for scheduled passenger transportation or cargo transportation.
Probable effect of Option 1 on aircraft equipment	The aeroplane carries an automatic ELT (as this is cheaper than complying with CAT.GEN.MPA.210). The aeroplane is not required to carry an 8.8-kHz ULD.	Aeroplane manufactured before 1 January 2023: the aeroplane carries an automatic ELT and an 8.8-kHz ULD (as this is cheaper than complying with CAT.GEN.MPA.210). Aeroplane manufactured after 1 January 2023: the aeroplane does not carry an automatic ELT, or an 8.8-kHz ULD as those are replaced by a means compliant with CAT.GEN.MPA.210. The latter means has a location accuracy of 6 NM.
Probable outcomes(s) in case of an accident if no other source of information is available to locate the accident site	No difference with the current situation: — Survivable accidents: the automatic ELT provides accurate location information (Scenario 3). — Non-survivable accidents: the automatic ELT is destroyed (Scenario 1).	Aeroplane manufactured before 1 January 2023: the aeroplane carries an automatic ELT and an 8.8-kHz ULD): — Survivable accidents: the automatic ELT provides accurate location information (Scenario 3). — Non-survivable accidents over land: the automatic ELT is destroyed, the 8.8-kHz ULD is useless (Scenario 1). — Non-survivable accidents over water: the automatic ELT is destroyed, the 8.8-kHz ULD assists in locating the aeroplane wreckage (Scenario 1a). — Aeroplane manufactured after 1 January 2023: the aeroplane carries only a means compliant with CAT.GEN.MPA.210: The means that is used to comply with CAT.GEN.MPA.210 provides for the location of the point of end of flight with a 6-NM 2D location accuracy, whether the accident is survivable or not. However, there are no accurate means to locate the aeroplane and no assurance that the position information will reach the competent SAR centre on time (Scenario 2).

4.4.1.3 Option 2

The safety impact of Option 2 is expected to be low positive and better than that of the other options, for the following reasons.

Option 2 includes several CPOs that make the means compliant with CAT.GEN.MPA.210 fully robust (see Table 4), for example:

— show system performance under environmental conditions;

— show system performance when the aeroplane is experiencing high attitude values, high attitude rate values, overspeed or high vertical speed;

— only allow circuit protective devices to disable the system;

— show the performance of the communication infrastructure ;

— use frequencies that are protected for transmissions; and

— set high priority to the functions of the system when the system relies on non-dedicated airborne resources.

Option 2 includes accuracy and time objectives that are essential for SAR missions:

— in case of a survivable accident, data that is received within 20 min after the aeroplane reached the point of end of flight is sufficient to locate that point with a 200-m 2D accuracy (95 % probability);

— in case of a survivable accident, a 121.5-MHz homing signal is automatically transmitted; and

— the distribution service should automatically send data corresponding to activation and deactivation signals to the competent SAR centre within 15 min of being received from the communication infrastructure.

Option 2 includes other objectives that are important for SAR purposes:

— CPO-3: upon deactivation, the system automatically transmits deactivation signals;

— CPO-12: record on the ground of the transmitted data, retain that data for at least 30 days, and be able to retrieve recorded data within 30 min;

— CPO-17: the equipment reliability is such that cases of erroneous automatic activation are seldom; and

— CPO-19: data is delivered to the competent SAR centre in plain text and in a format that is internationally recognised.

However, the installation of a system that fulfils all Option 2 objectives would probably be expensive. The associated cost would probably significantly exceed EUR 10 000 per aeroplane, and therefore, overweigh the savings made by not carrying an automatic ELT and/or the 8.8-kHz ULD. Hence, it is assumed that for aeroplane models that are not within the scope of CAT.GEN.MPA.210, i.e. aeroplanes with an MCTOM of 27 000 kg or less and aeroplanes with an MCTOM of 45 500 kg or less and an MOPSC of 19 or less, the ELT is not replaced by a means compliant with CAT.GEN.MPA.210.

In addition, Option 2 only has a decisive advantage over Option 1 for accidents of aeroplanes within the scope of CAT.GEN.MPA.210 and only when the location of the aeroplane is not accurately known through other means.

Therefore, although Option 2 is considered to be better than Option 1 and Option 0 in safety terms, the overall safety impact of Option 2 is considered slightly positive. Table 8 below shows the impact of Option 2 on aircraft equipment as well as the probable outcomes(s) in case of an accident if no other source of information is available to locate the accident site.

Table 8 — Potential impact of Option 2 on CAT-operated aeroplanes and first issued with an individual CofA on or after 1 July 2008

Condition on MCTOM and MOPSC	MCTOM of ≤ 27 000 kg or (MCTOM of ≤ 45 500 kg and MOPSC of ≤ 19)	(MCTOM of > 27 000 kg and MOPSC of > 19) or MCTOM of > 45 500 kg
Typical categories of aeroplanes	— Piston aeroplanes, — turboprop aeroplanes, — small turbojet aeroplanes, — regional jet aeroplanes configured as business jets	— Regional jet aeroplanes configured for scheduled passenger transportation; — single-aisle and twin-aisle turbojet aeroplanes, configured for scheduled passenger transportation or cargo transportation.
Probable effect of Option 2 on aircraft equipment	The aeroplane carries an automatic ELT (as this is cheaper than complying with CAT.GEN.MPA.210).	The aeroplane does not carry an automatic ELT, or an 8.8-kHz ULD, but the means that are used to comply with CAT.GEN.MPA.210 is robust, accurate, and adequate for SAR and safety investigation purposes.
Probable outcomes(s) in case of an accident if no other source of information is available to locate the accident site	No difference with the current situation: — Survivable accidents: the automatic ELT provides accurate location information (Scenario 3). — Non-survivable accidents: the automatic ELT is destroyed (Scenario 1).	Aeroplane manufactured before 1 January 2023: the aeroplane carries an automatic ELT and an 8.8-kHz ULD: — Survivable accidents: the automatic ELT provides accurate location information (Scenario 3). — Non-survivable accidents over land: the automatic ELT is destroyed, the 8.8-kHz ULD is useless (Scenario 1). — Non-survivable accidents over water: the automatic ELT is destroyed, the 8.8-kHz ULD assists in locating the aeroplane wreckage (Scenario 1a). — Aeroplane manufactured after 1 January 2023: the aeroplane carries only means compliant with

Condition on MCTOM and MOPSC	MCTOM of ≤ 27 000 kg or (MCTOM of ≤ 45 500 kg and MOPSC of ≤ 19)	(MCTOM of > 27 000 kg and MOPSC of > 19) or MCTOM of > 45 500 kg
		CAT.GEN.MPA.210: Survivable accidents: the means that is used to comply with CAT.GEN.MPA.210 provides very accurate location information (200-m location accuracy) and a 121.5-MHz homing signal (Scenario 3). Non-survivable accidents: the means that is used to comply with CAT.GEN.MPA.210 provides location information with an accuracy of 6 NM that is adequate for safety investigation purposes (Scenario 3).

4.4.1.4 Summary of safety impact

Table 9 — Summary of safety impact

Option	Option 0	Option 1	Option 2
Safety impact	Medium negative CAT.GEN.MPA.210 is implemented through means that are not fit for purpose, and CAT.GEN.MPA.210 is invoked to remove the automatic ELT and the 8.8-kHz ULD (when applicable). This results in decreasing the accident survivability for all aeroplanes as well as the chances of locating aeroplanes within the scope of CAT.GEN.MPA.210, after an accident, compared to the current situation.	Low negative CAT.GEN.MPA.210 is implemented in a way that does not fully address SAR needs and is not very robust. This results in decreasing the accident survivability for aeroplanes within the scope of CAT.GEN.MPA.210 (as the location accuracy is low and the homing signal that is transmitted by the automatic ELT is not available). This Option has no safety impact when considering other categories of aeroplanes.	Low positive CAT.GEN.MPA.210 is implemented in an effective way, which has a safety benefit for a subset of the accidents that occur to aeroplanes within the scope of CAT.GEN.MPA.210 (accidents where no or insufficient information on the location of the accident site is available).

4.4.2. Environmental impact

None of the options has a foreseeable environmental impact.

4.4.3. Social impact

None of the options has a foreseeable social impact.

4.4.4. Economic impact

4.4.4.1 Option 0

Economic impact on industry

As explained in Section 4.4.1.1, Option 0 allows to replace the automatic ELT by means that are inadequate for SAR purposes and that do not serve the purpose of CAT.GEN.MPA.210. This affects aeroplanes beyond the scope of CAT.GEN.MPA.210.

In addition, Option 0 allows aeroplanes within the scope of CAT.GEN.MPA.210 (regional jets, single-aisle, and twin-aisle aeroplanes) not to carry an 8.8-kHz ULD.

However, as automatic ELTs and 8.8-kHz ULDs have a relatively low purchase price, limited weight, and dedicated batteries, and require little maintenance, the savings of their removal are rather limited.

Table 10 below shows rough estimates of cost and weight for that equipment.

Table 10

Equipment type	Automatic-fixed ELT	8.8-kHz ULD
Rough estimate of weight	2 kg	1 kg
Rough estimate of purchase cost per aeroplane	EUR 1 000	N/a
Rough estimate of total cost for purchase and installation per aeroplane	N/a	EUR 5 000

Hence, the economic impact of Option 0 on industry is considered to be low positive.

Economic impact on EASA Member States

With Option 0, SAR centres may lack any effective means to locate survivable aeroplane accidents as the automatic ELT is removed. This is applicable to all aeroplane categories, not only those within the scope of CAT.GEN.MPA.210. This means that when there is no accurate information from another source on the location of the accident site, SAR units may have to cover large areas without the help of any homing signal, which could take several days or even weeks. Usually, a SAR operation is declared completed only after all reasonable attempts to locate and rescue survivors have been exhausted.

Moreover, Option 0 means that in case of an accident that occurs to an aeroplane within the scope of CAT.GEN.MPA.210 in an oceanic area, the responsible investigation authority cannot rely on the 8.8-kHz ULD signal as that ULD is probably removed or not installed (refer to Table 6 above). As a result, the responsible investigation authority would need to perform underwater search operations in a very large area.

As the cost of underwater search operations grows with the area to be covered, very long search operations translate into very high cost. For example, in the case of the Airbus A330 (registered F-GZCP) accident of 1 June 2009 (flight number AF447), the estimated cost of SAR operations was

EUR 80 million, and the estimated cost of underwater search operations was EUR 31 million[31]. In the case of the Boeing B777, registered 9M-MRO and operated by Malaysia Airlines (flight MH370), the estimated cost for underwater search operations was AUD 198 million[32] (corresponding to about EUR 130 million in October 2017 when it was estimated).

However, in most historical aeroplane accidents, the accident location was known with such an accuracy that the accident site was found at a lower cost than in those examples, even in the absence of an ELT signal. 85 % of accidents to turbojet aeroplanes with an MCTOM of more than 27 000 kg occur during a ground phase, take-off, climb, or approach (15 % during cruise or descent)[33], hence, in the vicinity of an airfield. Most aeroplanes with an MCTOM of 27 000 kg or less have a short range, so most of the times, are tracked through ATC surveillance means.

Therefore, Option 0 would increase the cost of SAR operations in many aeroplane accidents. Option 0 would also cause the cost of underwater search operations to be occasionally very high (several tens of millions of euros).

Overall, the economic impact of Option 0 on EASA Member States is considered to be high negative.

Impact on harmonisation with ICAO and with other regulators

The references that are considered for harmonisation of the options with the ICAO SARPs are the following:

— ICAO Annex 6, Operation of aircraft, Part I 'International commercial air transport — Aeroplanes' including amendments 1 to 43, July 2018, and particularly, Sections 6.17 and 6.18, and Appendix 9; and

— ICAO Doc 10054 'Manual on location of aircraft in distress and flight recorder data recovery', 1st edition, 2019.

Whichever the option, this RMT does not propose to amend CAT.GEN.MPA.210, CAT.IDE.A.280, or CAT.IDE.A.285, but only means to comply with CAT.GEN.MPA.210. Differences in scope or applicability between these points and the ICAO Annex 6 Part I standards on ELTs, 8.8-kHz ULDs or the location of an aeroplane in distress cannot be resolved through this RMT.

Furthermore, the US have not transposed the ICAO standards on the 8.8-kHz ULDs and location of an aeroplane in distress into their air operation requirements. In addition, there is no US air operation requirement to carry an automatic ELT. Therefore, no option would resolve the lack of harmonisation of EU rules with the current US air operation requirements.

Option 0 would probably result in implementing CAT.GEN.MPA.210 without addressing the intent of the standards related to location of an aeroplane in distress in ICAO Annex 6, Part I. In addition, it would probably result in removing the 8.8-kHz ULD from aeroplanes within the scope of CAT.IDE.A.285, thus decreasing even further the level of harmonisation.

Hence, the overall impact on harmonisation of Option 0 is considered to be medium negative.

[31] Source: 'Opérations de recherches en mer, Accident survenu le 1er juin 2009 à l'Airbus A330-203 immatriculé F-GZCP exploité par Air France, vol AF 447 Rio de Janeiro - Paris', dated October 2012 and published by the French BEA.

[32] Source:'The operational search for MH370', dated 3 October 2017 and published by ATSB.

[33] Source: 'Statistical summary of commercial jet airplane accidents, worldwide operations, 1959-2017', dated October 2018 and published by Boeing Commercial Airplanes.

Therefore, the overall economic impact of Option 0 is medium negative.

4.4.4.2 Option 1

Economic impact on industry

Option 1 would result in savings by not installing an automatic ELT or an 8.8-kHz ULD on regional jets, single-aisle, and twin-aisle turbojet aeroplanes (aircraft categories within the scope of CAT.GEN.MPA.210).

However, Option 1 requires a system to autonomously transmit information based on which a position can be determined, and includes requirements that cannot be met by current communication systems (e.g. the capability to continue to transmit is spite of an aircraft electrical power loss; refer to Section 4.3 of this NPA for more details). The installation of a system fulfilling all requirements contained in Option 1 on an already approved aircraft model would most probably require a major change or an STC. The associated cost would probably overweigh the savings of removing the automatic ELT. Therefore, it is probable that for aeroplane categories that are not within the scope of CAT.GEN.MPA.210, i.e. piston, turboprop, and small turbojet aeroplanes, the automatic ELT would not be replaced by a means compliant with CAT.GEN.MPA.210 in accordance with Option 1.

The scope of CAT.GEN.MPA.210 includes aeroplane first issued with an individual CofA on or after 1 January 2023, and it is expected that aircraft manufacturers will develop and install systems to comply with CAT.GEN.MPA.210 before delivery of the aeroplanes concerned (forward-fit). It can be assumed that an aircraft manufacturer is best positioned to purchase equipment at a lower price by distributing the installation design, test, and certification costs over a large number of individual aeroplanes. Furthermore, for forward fit, there is no additional cost due to aircraft downtime, and the number of hours that are needed to install the equipment is reduced compared to retrofit.

However, Option 1 excludes ELT-based solutions (e.g. ELT(DT) or ADFR) as it requires that the position of an aeroplane in distress is determined and transmitted by the operator to the competent SAR centre and relevant ATS unit, while the international COSPAS-SARSAT programme distributes ELT messages to SAR centres only. In that context, Option 1 restricts the possibilities of industry to rely on existing (and proven) ELT technology to locate the point of end of flight in case of an accident. To solve this issue, the concept of a global distress tracking repository was created in ICAO GADSS ConOps, and ICAO is currently trying to implement this concept by setting up the Location of an Aircraft in Distress Repository (LADR)[34]; however, it is not known whether the LADR will be successfully implemented and as of when it could be fully operational.

Therefore, the overall impact of Option 1 on industry is considered to be medium negative.

Economic impact on EASA Member States

Option 1 would only affect aeroplanes within the scope of CAT.GEN.MPA.210 (regional jets, as well as single-aisle, and twin-aisle turbojet aeroplanes that are manufactured after 1 January 2023). Option 1 does not affect other aircraft.

[34] The LADR is described in ICAO 'Location of an aircraft in distress repository functional specification', draft version 3.1, dated 15.8.2019.

Regarding SAR operations, based on Option 1, location information is expected to be delivered even when the accident is not survivable (i.e. when it is not expected that the automatic ELT withstands the accident conditions). However, SAR centres would be deprived of accurate means to locate survivable accidents of aeroplanes within the scope of CAT.GEN.MPA.210. This means that when there is no accurate information from another source on the location of the accident site, SAR units may have to cover large areas without the help of any homing signal, which could take several days or even weeks. This is applicable to accidents over land as well as over water.

However, accidents with aeroplanes within the scope of CAT.GEN.MPA.210 are not so frequent. According to the statistical summary of CAT jet aeroplane accidents that is published by Boeing[35], during the period 2008-2017, there were 55 fatal accidents of CAT jet aeroplanes worldwide, and only 20 % (11 accidents) occurred during climb with flaps up, cruise or descent. The remaining accidents occurred during a flight phase where it is likely that information on the location of the point of end of flight could be obtained from other sources: ATC surveillance systems, providers of automatic dependent surveillance — broadcast (ADS-B) data, witnesses on the ground, etc.).

Regarding underwater search operations, the 2D location accuracy objective of Option 1 is 6 NM, would significantly reduce the cost of surface and/or underwater search operations in the rather seldom case where there is no other source of information available (as with the AF447 and MH370 accidents). A 6-NM radius circle has an area of about 388 km^2, which can be covered within a few days with aerial means (in case of an accident over land) and underwater search means (in case of an accident over water). However, this would translate into significant savings in only a few cases per decade as for most accidents, there is a source of information that is external to the aircraft and that provides information on the location of the point of end of flight.

Overall, the economic impact of Option 1 on EASA Member States is considered to be low negative.

Impact on harmonisation with ICAO and with other regulators

Option 1 would result in implementing CAT.GEN.MPA.210 in a manner that is harmonised to a great extent with ICAO Annex 6, Part I standards on location of an aeroplane in distress. However, Option 1 would not remove the difference in scope between those ICAO standards (track the aircraft when in distresss) and CAT.GEN.MPA.210 (accurately locate the point of end of flight), or in applicability (aeroplanes with an MCTOM of more than 27 000 kg versus aeroplanes with an MCTOM of more than 27 000 kg and an MOPSC of more than 19 or with an MCTOM of more than 45 500 kg).

Hence, the overall impact on harmonisation of Option 1 is considered to be medium positive.

Overall, the economic impact of Option 1 is low negative.

4.4.4.3 Option 2

Economic impact on industry

The cost impact of Option 2 on industry is similar to that of Option 1, with one significant difference: Option 2 is less prescriptive than Option 1 as it does not require to track the aeroplane to locate the point of end of flight and it can be implemented with ELT-based solutions. The greater flexibility of

[35] Statistical Summary of Commercial Jet Airplane Accidents, Worldwide Operations 1959-2017, dated October 2018 and published by Boeing Commercial Airplanes.

Option 2 enables industry to come up with solutions that are more cost-effective than the solution prescribed by Option 1.

Therefore, the cost impact of Option 2 on industry is considered to be low negative.

Economic impact on EASA Member States

Option 2 would only affect aeroplanes within the scope of CAT.GEN.MPA.210 (regional jets, as well as single-aisle, and twin-aisle turbojet aeroplanes that are manufactured after 1 January 2023). Option 2 does not affect other aircraft.

The performance objectives of Option 2 make the means that comply with CAT.GEN.MPA.210 adequate to support SAR operations and therefore an acceptable substitute for an automatic ELT. Particularly in case of a survivable accident, locating the point of end of flight with a 200-m 2D location accuracy, combined with the transmission of a homing signal, would enable mobile SAR facilities to locate the aeroplane as soon as they arrive in the search zone. Option 2 is also expected to provide location information with a 6 NM 2D location accuracy even when the accident is not survivable (i.e when it is not expected that an automatic ELT withstands the accident conditions).

However, such accidents are not so frequent. Over the period 2008-2017, only 11 accidents of CAT jet aeroplanes occurred during climb with flaps up, cruise or descent. The remaining occurred during a flight phase where it is likely that rather accurate information on the location of the point of end of flight is available otherwise.

Regarding underwater search operations, similar to Option 1, Option 2 would result in significant savings for only a few cases per decade.

Therefore, the economic impact of Option 2 on EASA Member States is considered to be low positive.

Impact on harmonisation with ICAO and with other regulators

Option 2 would result in implementing CAT.GEN.MPA.210 in a manner that is harmonised to a lesser extent than Option 1 with the ICAO Annex 6, Part I standards on location of an aeroplane in distress. Option 2 does not prescribe the transmission of a position report every minute. However, Option 2 addresses the intent of the ICAO standards on location of an aeroplane in distress, which is to facilitate locating accidents to large CAT aeroplanes.

The overall impact on harmonisation of Option 2 is considered to be low positive.

Considering all the above elements, the overall economic impact of Option 2 is therefore low positive.

4.4.4.4 Summary of economic impact

Table 11 — Summary of economic impact

Option	Option 0	Option 1	Option 2
Economic impact on industry	Low positive Aeroplane operators make limited savings by removing the automatic ELT.	Medium negative Cost for aeroplanes within the scope of CAT.GEN.MPA.210 is increased. However, the required equipment is	Low negative Cost for aeroplanes within the scope of CAT.GEN.MPA.210 is increased. However, the required equipment

Option	Option 0	Option 1	Option 2
		only forward-fitted on aeroplanes that are manufactured on or after 1 January 2023 (no retrofit) so that the cost increase is limited. In addition, the Option is technology-prescriptive and does not allow for solutions that are based on an ELT (e.g. ELT(DT) or ADFR), thus reducing the options for industry.	is only forward-fitted on aeroplanes that are manufactured on or after 1 January 2023 (no retrofit) so that the cost increase is limited.
Economic impact on EASA Member States	High negative The cost of SAR operations is increased (due to the removal of the automatic ELT) for all CAT aeroplanes and not only for aeroplanes within the scope of CAT.GEN.MPA.210. The cost of underwater search operations for accidents to aeroplanes within the scope of CAT.GEN.MPA.210 also increases (due to the removal of the ULD).	Low negative The cost of SAR operations for survivable accidents to aeroplanes within the scope of CAT.GEN.MPA.210 is increased as the position information is less accurate and obtained with delay, compared to the position information obtained through an automatic ELT. In the seldom event of an accident over water, the cost of underwater search operations is limited, thanks to the 6 NM location accuracy.	Low positive After a non-survivable accident to an aeroplane within the scope of CAT.GEN.MPA.210, the location of the accident is known with a 6 NM accuracy even if the ELT is destroyed. This reduces the cost of search operations. In the case of a survivable accident, this Option provides for performance that is equivalent to that of an automatic ELT; therefore, it has no economic impact on EASA Member States (for survivable accidents only).
Economic impact on rules harmonisation	Medium negative The intent of ICAO standards on location of an aeroplane in distress remains unaddressed, and therefore, this Option negatively affects harmonisation with the ICAO standard that prescribes an 8.8-kHz ULD.	Medium positive This Option is the most harmonised with the ICAO standards on location of an aeroplane in distress.	Low positive This Option adresses the intent of ICAO standards on location of an aeroplane in distress, but is less harmonised than Option 1 with those standards.
Overall economic impact	Medium negative	Low negative	Low positive

4.4.5. General Aviation and proportionality issues

CAT.GEN.MPA.210 is not applicable to aeroplanes with an MCTOM of 27 000 kg or less, and not applicable to aeroplanes with an MCTOM of 45 500 kg or less unless their MOPSC exceeds 19. In addition, CAT.GEN.MPA.210 is only applicable to CAT-operated aeroplanes. Therefore, none of the options considered has an impact on General Aviation.

4.5. Conclusion

4.5.1. Comparison of options

4.5.1.1 Result of the impact assessment

Option 0 does not meet EASA's objectives. This Option has a medium negative impact on safety. The low positive impact of this Option for industry is obtained at the cost of a high negative economic impact on SAR and investigation authorities, as well as of a medium negative impact on rules harmonisation.

Option 1 has a low negative impact on safety, and its economic impact is overall low negative (medium negative when considering industry alone).

Option 2 has a slightly positive impact on safety, and its economic impact is overall low positive (low negative when considering industry alone).

An overview of the impacts of each option is presented in Table 12 below.

Table 12 — Overview of impacts

Option	**Option 0 — Do nothing**	**Option 1 — ICAO Annex 6, Part I**	**Option 2 — Performance-based approach**
Safety impact	Medium negative	Low negative	Low positive
Economic impact	Overall medium negative: — low positive for industry; — high negative for SAR and investigation authorities; and — medium negative on rules harmonisation.	Overall low negative: — medium negative for industry; — low negative for SAR and investigation authorities; and — medium positive on rules harmonisation.	Overall low positive: — low negative for industry; — low positive for SAR and investigation authorities; and — low positive on rules harmonisation.

4.5.1.2 Other considerations

Option 0

Strong public concerns were raised after the accident of flight MH370 as that event showed that international efforts to locate a missing large aeroplane that carried 200 passengers were unsuccessful. The same concerns were echoed after the accident of flight AF447 on 1 June 2009, when the responsible investigation authority faced a similar issue, and for which almost two years of underwater search operations were needed until the aeroplane wreckage could eventually be located on the ocean floor. Option 0 does not address these concerns.

In addition, Option 0 increases the risk exposure of SAR teams (in the absence of accurate and reliable information on the location of an accident, large areas need to be searched). Furthermore, Option 0 may have side effects on others that need to be rescued (ships, helicopters, individuals) as it increases the resources that are claimed by SAR services after aeroplane accidents.

Option 1

As Option 1 prescribes only 6 NM location accuracy, Option 1 also increases the risk exposure of SAR teams, as well as the resources claimed by SAR services, however, to a lesser extent than Option 0.

4.5.1.3 Conclusion

In conclusion, **Option 2 is the preferred option** as its safey impact is positive and its economic impact is limited.

4.5.1.4 Question to stakeholders

Stakeholders are invited to provide any other quantitative information that they may find necessary to bring to the attention of EASA.

As a result, the relevant parts of the IA might be adjusted on a case-by-case basis.

4.6. Monitoring and evaluation

<u>Monitoring of the implementation</u>

The monitoring of the implementation of CAT.GEN.MPA.210 should consist in checking if the means that meet the CSs and AMC proposed in Chapter 3 are developed and made available on time before the applicability date of CAT.GEN.MPA.210, and if the associated cost is reasonable for operators.

In practice, as CAT.GEN.MPA.210 is only applicable to aeroplanes that are first issued with an individual CofA on or after 1 January 2023, it is assumed that the aircraft manufacturers concerned will develop and install airborne systems to comply with CAT.GEN.MPA.210 before delivery of the aeroplanes concerned (forward-fit). However, to comply with CAT.GEN.MPA.210, other aspects than the design of the airborne system need to be addressed, which are the subject of the proposed AMC to CAT.GEN.MPA.210 in Chapter 3.

To monitor the timely implementation of CAT.GEN.MPA.210, the following approach is proposed in Table 13 below:

Table 13 — Example of approach to monitor the timely implementation of CAT.GEN.MPA.210

	Starting date	Action
18 months before the applicability date	1 June 2021	Check whether manufacturers of aeroplane models within the scope of CAT.GEN.MPA.210 have identified the airborne systems that are used to comply with CAT.GEN.MPA.210, e.g. by checking the certification projects (for European manufacturers) and by consulting with the relevant advisory bodies (ABs).
12 months before the applicability date	1 January 2022	Inform the EASA Member States of the entry into force of CAT.GEN.MPA.210 and check whether

		they have issues relating to its implementation, e.g. by consulting with the relevant ABs.

4.6.1. Evaluation of effectiveness

The evaluation should consist in checking whether the implementation of CAT.GEN.MPA.210 has reached the intended objectives: assist SAR and safety investigation authorities in quickly and accurately locating the point of end of flight after an accident to an aeroplane to which CAT.GEN.MPA.210 is applicable.

The evaluation might rely on safety investigation reports that are produced by safety investigation authorities. For example, the format of the final safety investigation report template of ICAO Annex 13, Appendix 1 includes the following Subheadings 1.12 'Wreckage and impact information' and 1.15 'Survival aspects'.

'1.12 **Wreckage and impact information.** General information on the site of the accident and the distribution pattern of the wreckage, detected material failures or component malfunctions. Details concerning the location and state of the different pieces of the wreckage are not normally required unless it is necessary to indicate a break-up of the aircraft prior to impact. Diagrams, charts and photographs may be included in this section or attached in the appendices.

[…]

1.15 **Survival aspects.** Brief description of search, evacuation and rescue, location of crew and passengers in relation to injuries sustained, and failure of structures such as seats and seat-belt attachments.'

On the basis of the information collected from safety investigation reports on search and rescue aspects, issues relating to the implementation of CAT.GEN.MPA.210 could be identified.

Another source of information are SAR authorities. SAR authorities could be consulted on aspects that affect the effectiveness of CAT.GEN.MPA.210, e.g. the timely distribution of information to the competent SAR centre, the rate of false alerts, or the format of transmitted data.

For the evaluation of the effectiveness of CAT.GEN.MPA.210, the following approach is proposed in Table 14 below.

In addition, the following action is proposed: recommend safety investigation authorities to systematically address issues related to locating the aircraft and survivors in the final safety investigation report following accidents to aeroplanes with an MCTOM of more than 27 000 kg.

Table 14 — Example of approach to assess the effectiveness of CAT.GEN.MPA.210

	Starting date	Action
6 months after the applicability date	1 July 2023	Survey SAR authorities on non-genuine activation data that are caused by the means compliant with CAT.GEN.MPA.210. Request from the COSPAS-SARSAT Secretariat statistics on false alerts.
3 years after the applicability date	1 January 2026	Study investigation reports on accidents to aeroplanes within the scope of

		CAT.GEN.MPA.210 to assess the long-term effectiveness of CAT.GEN.MPA.210.

5. Proposed actions to support implementation

— Focused communication for AB meetings (Technical Bodies (TeBs) and Technical Committees (TECs)) after the decisions amending the proposed CSs, AMC and GM in Chapter 3 are published.

— Focused communication for the ICAO working groups (WGs) as well as active WGs of standardisation organisations that address the implementation of the ICAO GADSS ConOps with regard to SAR, safety investigations, flight recorders, and ELTs.

6. References

6.1. Related regulations

— Commission Regulation (EU) No 748/2012 of 3 August 2012 laying down implementing rules for the airworthiness and environmental certification of aircraft and related products, parts and appliances, as well as for the certification of design and production organisations (OJ L 224, 21.8.2012, p. 1)

— Commission Regulation (EU) No 965/2012 of 5 October 2012 laying down technical requirements and administrative procedures related to air operations pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (OJ L 296, 25.10.2012, p. 1)

— Commission Implementing Regulation (EU) 2017/373 of 1 March 2017 laying down common requirements for providers of air traffic management/air navigation services and other air traffic management network functions and their oversight, repealing Regulation (EC) No 482/2008, Implementing Regulations (EU) No 1034/2011, (EU) No 1035/2011 and (EU) 2016/1377 and amending Regulation (EU) No 677/2011 (OJ L 62, 8.3.2017, p. 1)

6.2. Affected decisions

— Decision 2014/004/R of the Executive Director of the Agency of 31 January 2014 adopting Certification Specifications and Guidance Material for Master Minimum Equipment List, CS-MMEL — Initial issue

— Decision 2013/031/R of the Executive Director of the Agency of 17 December 2013 adopting Certification Specifications for Airborne Communications Navigation and Surveillance (CS ACNS), CS-ACNS Initial Issue

— Decision N° 2012/015/Directorate R of the Executive Director of the Agency of 24th October 2012 on Acceptable Means of Compliance and Guidance Material to Commission Regulation (EU) No 965/2012 of 5 October 2012 laying down technical requirements and administrative procedures related to air operations pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council, Guidance Material to Annex I — Definitions

— Decision 2014/015/R of the Executive Director of the Agency of 24 April 2014 adopting Acceptable Means of Compliance and Guidance Material to Part-CAT of Regulation (EU) No 965/2012 and repealing Decision 2012/018/R of the Executive Director of the Agency of 24 October 2012 'AMC and GM to Part-CAT — Issue 2'

— Decision N°2013/021/Directorate R of the Executive Director of the Agency of 23 August 2013 on adopting Acceptable Means of Compliance and Guidance Material for non-commercial operations with complex motor-powered aircraft (Part-NCC)

— Decision 2014/016/R of the Executive Director of the European Aviation Safety Agency of 24 April 2014 adopting Acceptable Means of Compliance and Guidance Material to Part-NCO of Regulation (EU) No 965/2012 and repealing Decision 2013/022/R of the Executive Director of the Agency of 23 August 2013, 'AMC and GM to Part-NCO – Issue 2'

— Decision 2014/018/R of the Executive Director of the Agency of 24 April 2014 adopting Acceptable Means of Compliance and Guidance Material to Part-SPO of Regulation (EU) No 965/2012, 'AMC and GM to Part-SPO'

— Executive Director Decision 2017/001/R of 8 March 2017 issuing Acceptable Means of Compliance and Guidance Material to Commission Implementing Regulation (EU) 2017/373 'Common requirements for providers of air traffic management/air navigation services and other air traffic management network functions and their oversight'

6.3. Other reference documents

— Commission Regulation (EU) No 452/2014 of 29 April 2014 laying down technical requirements and administrative procedures related to air operations of third country operators pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (OJ L 133, 6.5.2014, p. 12)

— Decision No. 2003/2/RM of the Executive Director of the Agency of 17 October 2003 on certification specifications, including airworthiness codes and acceptable means of compliance, for large aeroplanes ('CS-25')

— ICAO Annex 6, Operation of aircraft, Part I International commercial air transport — Aeroplanes, incorporating amendments 1 to 43, July 2018

— ICAO Annex 11, Air traffic services (Air traffic control service, flight information service, alerting service), incorporating amendments 1 to 51, July 2018

— ICAO Annex 12, Search and rescue, incorporating amendments 1 to 17, July 2004

— ICAO Annex 13, Aircraft accident and incident investigation, incorporating amendments 1 to 16, July 2016

— ICAO Doc 10054, Manual on location of aircraft in distress and flight recorder data recovery, 1st edition, 2019

— ICAO Working paper — Multidisciplinary meeting regarding Global tracking, Montreal, 12-13 May 2014 (https://www.icao.int/safety/globaltracking/Pages/Homepage.aspx)

— ICAO Global Aeronautical Distress & Safety System, Concept of Operations (GADSS ConOps), Version 6.0, 7 June 2017 (https://www.icao.int/safety/globaltracking/Pages/Homepage.aspx)

— ICAO Location of an aircraft in distress repository, functional specification, draft version 3.1, 15 August 2019 (https://www.icao.int/safety/globaltracking/Pages/Homepage.aspx).

— FAA Part 91, general operating and flight rules, 3 January 2020 (https://www.faa.gov/regulations_policies/faa_regulations/)

— FAA Advisory Circular 91-44A, Installation and inspection procedures for emergency locator transmitters and receivers, 1 February 2018 (https://www.faa.gov/regulations_policies/advisory_circulars/)

— Canadian Aviation Regulations (CARs), Part V (Airworthiness), Standard 571 (Maintenance), 1 December 2010 (https://www.tc.gc.ca/en/transport-canada/corporate/acts-regulations/regulations/sor-96-433/part5-standards-571s-1827.htm)

— BEA report — Triggered transmission of flight data working group, 18 March 2011 (https://www.bea.aero/uploads/tx_elyextendttnews/triggered.transmission.of.flight.data.pdf)

— ATSB Transport safety report — MH370 — Definition of underwater search areas, 18 August 2014, and update of 3 December 2015 (https://www.atsb.gov.au/mh370/)

— ATSB Transport safety report — MH370 — Flight path analysis, update, 8 October 2014 (https://www.atsb.gov.au/mh370/)

— ATSB Transport safety report — The operational search for MH370, 3 October 2017 (https://www.atsb.gov.au/mh370/)

— Ministry of Transport of Malaysia, Safety investigation report, Malaysia Airlines Boeing B777-200ER (9M-MRO), 8 March 2014, by the Malaysian ICAO Annex 13 safety investigation team for MH370, 2 July 2018 (http://www.mot.gov.my/en/)

— BEA sea search operations — Accident on 1st June 2009 to the Airbus A330-203 registered F-GZCP (https://www.bea.aero/en/investigation-reports/notified-events/detail/event/accident-de-lairbus-a330-203-immatricule-f-gzcp-et-exploite-par-air-france-survenu-le-01062009-da/)

— EUROCAE Document 112A — Minimum operational performance specification for crash protected airborne recorder systems, September 2013

— EUROCAE Document 237 — Minimum aviation system performance specification for criteria to detect in-flight aircraft distress events to trigger transmission of flight information, February 2016

— EUROCAE Document 62B — Minimum operational performance standard for aircraft emergency locator transmitters, 406 MHz, December 2018

— RTCA DO 204B — Minimum operational performance standard for aircraft emergency locator transmitters, 406 MHz, December 2018

— COSPAS-SARSAT C/S T.001 — Specification for COSPAS-SARSAT 406 MHz distress beacons, issue 4, revision 4, February 2019

(https://www.cospas-sarsat.int/images/stories/SystemDocs/Current/CS-T001-FEB-2019.pdf)

— COSPAS-SARSAT C/S T.007 — COSPAS-SARSAT 406 MHz distress beacon type approval standard, issue, 5 revision 3, February 2019

(https://www.cospas-sarsat.int/images/stories/SystemDocs/Current/CS-T007-FEB-2019.pdf)

— COSPAS-SARSAT C/S T.018 — Specification for second-generation COSPAS-SARSAT 406-MHz distress beacons, issue 1, revision 4, February 2019

(https://www.cospas-sarsat.int/images/stories/SystemDocs/Current/CS-T017-FEB-2018.pdf)

— COSPAS-SARSAT C/S T.019 — COSPAS-SARSAT MEOLUT performance specification and design guidelines, issue 2, revision 3, February 2019

(https://www.cospas-sarsat.int/images/stories/SystemDocs/Current/CS-T019-FEB-2019.pdf)

— COSPAS-SARSAT C/S A.001 — COSPAS-SARSAT data distribution plan (DDP), issue 8, revision 1, February 2019 (https://www.cospas-sarsat.int/images/stories/SystemDocs/Current/CS-A001-FEB-2019.pdf)

— COSPAS-SARSAT C/S A.003 — COSPAS-SARSAT system monitoring and reporting, issue 3, revision 1, February 2019 (https://www.cospas-sarsat.int/images/stories/SystemDocs/Current/CS-A003-FEB-2019.pdf)

— COSPAS-SARSAT C/S A.005 — COSPAS-SARSAT Mission control centre (MCC) performance specification and design guidelines, issue 5, revision 1, February 2019 (https://www.cospas-sarsat.int/images/stories/SystemDocs/Current/CS-A005-FEB-2019.pdf)

— COSPAS-SARSAT R.007 — Report on System Status and Operations, No 34, January-December 2017 (https://www.cospas-sarsat.int/images/stories/SystemDocs/Current/CS-R007-FEB-2019.pdf)

— COSPAS-SARSAT C/S R.012 — COSPAS-SARSAT 406 MHz MEOSAR implementation plan, issue 1, revision 14, February 2019 (https://www.cospas-sarsat.int/images/stories/SystemDocs/Current/CS-R012-FEB-2019.pdf)

7. Appendices

7.1. Appendix 1 — ICAO Annex 6, Part I provisions relating to location of an aircraft in distress, ELTs, and ULDs

Table 1 — ICAO Annex 6, Part I SARPs on location of an aircraft in distress, ELTs and ULDs, and corresponding EU requirements

ICAO Annex 6, Part I SARP	**Corresponding EU requirement**
CHAPTER 6. AEROPLANE INSTRUMENTS, EQUIPMENT AND FLIGHT DOCUMENTS	
6.5.3 All aeroplanes on long-range over-water flights	CAT.IDE.A.285 Flight over water
6.5.3.1 In addition to the equipment prescribed in 6.5.1 or 6.5.2 whichever is applicable, the following equipment shall be installed in all aeroplanes when used over routes on which the aeroplane may be over water and at more than a distance corresponding to 120 minutes at cruising speed or 740 km (400 NM), whichever is the lesser, away from land suitable for making an emergency landing in the case of aircraft operated in accordance with 5.2.9 or 5.2.10, and 30 minutes or 185 km (100 NM), whichever is the lesser, for all other aeroplanes: a) [...]; b) […]; and c) at the earliest practicable date, but not later than 1 January 2018, on all aeroplanes of a maximum certificated takeoff mass of over 27 000 kg, a securely attached underwater locating device operating at a frequency of 8.8 kHz. This automatically activated underwater locating device shall operate for a minimum of 30 days and shall not be installed in wings or empennage.	(f) By 1 January 2019 at the latest, aeroplanes with an MCTOM of more than 27 000 kg and with an MOPSC of more than 19 and all aeroplanes with an MCTOM of more than 45 500 kg shall be fitted with a securely attached underwater locating device that operates at a frequency of 8,8 kHz ± 1 kHz, unless: (1) the aeroplane is operated over routes on which it is at no point at a distance of more than 180 NM from the shore; or (2) the aeroplane is equipped with robust and automatic means to accurately determine, following an accident where the aeroplane is severely damaged, the location of the point of end of flight.
6.17 EMERGENCY LOCATOR TRANSMITTER (ELT)	CAT.IDE.A.280 Emergency locator transmitter (ELT)
6.17.1 Recommendation.— *All aeroplanes should carry an automatic ELT.*	Not transposed
6.17.2 Except as provided for in 6.17.3, all aeroplanes authorized to carry more than 19 passengers shall be equipped with at least one automatic ELT or two ELTs of any type.	(a) Aeroplanes with an MOPSC of more than 19 shall be equipped with at least: (1) […] (2) one automatic ELT or two ELTs of any type or one aircraft localisation means meeting the requirement of CAT.GEN.MPA.210, in the case of aeroplanes first issued with an individual CofA on or before 1 July 2008.
6.17.3 All aeroplanes authorized to carry more than 19 passengers for which the	(a) Aeroplanes with an MOPSC of more than 19 shall be equipped with at least:

ICAO Annex 6, Part I SARP	Corresponding EU requirement
individual certificate of airworthiness is first issued after 1 July 2008 shall be equipped with either: a) at least two ELTs, one of which shall be automatic; or b) at least one ELT and a capability that meets the requirements of 6.18.	(1) two ELTs, one of which shall be automatic, or one ELT and one aircraft localisation means meeting the requirement of CAT.GEN.MPA.210, in the case of aeroplanes first issued with an individual CofA after 1 July 2008;
6.17.4 Except as provided for in 6.17.5, all aeroplanes authorized to carry 19 passengers or less shall be equipped with at least one ELT of any type.	(b) Aeroplanes with an MOPSC of 19 or less shall be equipped with at least: (1) […] (2) one ELT of any type or one aircraft localisation means meeting the requirement of CAT.GEN. MPA.210, in the case of aeroplanes first issued with an individual CofA on or before 1 July 2008.
6.17.5 All aeroplanes authorized to carry 19 passengers or less for which the individual certificate of airworthiness is first issued after 1 July 2008 shall be equipped with at least one automatic ELT.	(b) Aeroplanes with an MOPSC of 19 or less shall be equipped with at least: (1) one automatic ELT or one aircraft localisation means meeting the requirement of CAT.GEN.MPA.210, in the case of aeroplanes first issued with an individual CofA after 1 July 2008;
6.17.6 ELT equipment carried to satisfy the requirements of 6.17.1, 6.17.2, 6.17.3, 6.17.4 and 6.17.5 shall operate in accordance with the relevant provisions of Annex 10, Volume III.	Transposed into AMC2 CAT.IDE.A.280
6.18 LOCATION OF AN AEROPLANE IN DISTRESS	CAT.GEN.MPA.210 Location of an aircraft in distress — Aeroplanes
6.18.1 All aeroplanes of a maximum certificated take-off mass of over 27 000 kg for which the individual certificate of airworthiness is first issued on or after 1 January 2021, shall autonomously transmit information from which a position can be determined by the operator at least once every minute, when in distress, in accordance with Appendix 9.	The following aeroplanes shall be equipped with robust and automatic means to accurately determine, following an accident during which the aeroplane is severely damaged, the location of the point of end of flight: (1) all aeroplanes with an MCTOM of more than 27 000 kg, with an MOPSC of more than 19 and first issued with an individual CofA on or after 1 January 2023; and (2) all aeroplanes with an MCTOM of more than 45 500 kg and first issued with an individual CofA on or after 1 January 2023.
6.18.2 Recommendation.— *All aeroplanes of a maximum certificated take-off mass of over 5 700 kg for which the individual certificate of airworthiness is first issued on or after 1 January 2021, should autonomously transmit information from which a position can be determined at least once every minute, when in distress, in accordance with Appendix 9.*	Not transposed

ICAO Annex 6, Part I SARP	**Corresponding EU requirement**
6.18.3 The operator shall make position information of a flight in distress available to the appropriate organizations, as established by the State of the Operator.	Transposed into the proposed AMC1 CAT.GEN.MPA.210, see Section 3.2.2
APPENDIX 9. LOCATION OF AN AEROPLANE IN DISTRESS	
1. PURPOSE AND SCOPE	
Location of an aeroplane in distress aims at establishing, to a reasonable extent, the location of an accident site within a 6 NM radius.	Transposed into the proposed CS-ACNS, see Section 3.3.2
2. OPERATION	
2.1 An aeroplane in distress shall automatically activate the transmission of information from which its position can be determined by the operator and the position information shall contain a time stamp. It shall also be possible for this transmission to be activated manually. The system used for the autonomous transmission of position information shall be capable of transmitting that information in the event of aircraft electrical power loss, at least for the expected duration of the entire flight.	Transposed into the proposed CS-ACNS, see Section 3.3.2
2.2 An aircraft is in a distress condition when it is in a state that, if the aircraft behaviour event is left uncorrected, can result in an accident. Autonomous transmission of position information shall be active when an aircraft is in a distress condition. This will provide a high probability of locating an accident site to within a 6 NM radius. The operator shall be alerted when an aircraft is in a distress condition with an acceptable low rate of false alerts. In case of a triggered transmission system, initial transmission of position information shall commence immediately or no later than five seconds after the detection of the activation event.	Transposed into the proposed CS-ACNS, see Section 3.3.2
2.3 When an aircraft operator or an air traffic service unit (ATSU) has reason to	Regarding the ATS unit: contacting the aircraft operator is part of the alerting service

ICAO Annex 6, Part I SARP	Corresponding EU requirement
believe that an aircraft is in distress, coordination shall be established between the ATSU and the aircraft operator.	as defined in ICAO Annex 11, Chapter 5. SERA.10001 of the Annex (Rules of the air) to Regulation (EU) No 923/2012[36] requires that ATS units of EU Member States provide the alerting service. Regarding the operator: the proposed AMC1 CAT.GEN.MPA.210 (see Section 3.2.2) addresses communication with the relevant ATS unit.
2.4 The State of the Operator shall identify the organizations that will require the position information of an aircraft in an emergency phase. These shall include, as a minimum: a) air traffic service unit(s) (ATSU); and b) SAR rescue coordination centre(s) (RCC) and sub-centres.	Transposed into the proposed AMC1 CAT.GEN.MPA.210, see Section 3.2.2
2.5 When autonomous transmission of position information has been activated, it shall only be able to be deactivated using the same mechanism that activated it.	Transposed into the proposed CS-ACNS, see Section 3.3.2
2.6 The accuracy of position information shall, as a minimum, meet the position accuracy requirements established for ELTs.	Transposed into the proposed CS-ACNS, see Section 3.3.2

Table 2 — Main differences between standards in Section 6.18 and Appendix 9 of ICAO Annex 6, Part I and CAT.GEN.MPA.210

Aspect	ICAO Annex 6, Part I, Section 6.18 and Appendix 9	CAT.GEN.MPA.210
Applicability (categories of aircraft)	Aeroplanes with an MCTOM of more than 27 000 kg	Aeroplanes with an MCTOM of more than 27 000 kg and an MOPSC of more than 19, and aeroplanes with an MCTOM of more than 45 500 kg
Applicability (date criteria)	Individual CofA first issued on or after 1 January 2021	Individual CofA first issued on or after 1 January 2023
Applicability (event)	When the aeroplane is in distress	Accident where the aeroplane is severely damaged
Required information	Information from which a position can be determined at least once every minute	Accurate location of the point of end of flight
Required means	Autonomous transmission	Robust and automatic means

[36] Commission Implementing Regulation (EU) No 923/2012 of 26 September 2012 laying down the common rules of the air and operational provisions regarding services and procedures in air navigation and amending Implementing Regulation (EU) No 1035/2011 and Regulations (EC) No 1265/2007, (EC) No 1794/2006, (EC) No 730/2006, (EC) No 1033/2006 and (EU) No 255/2010 (OJ L 281, 13.10.2012, p. 1) (https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1575402561712&uri=CELEX:32012R0923)

Required recipient of the information	The aircraft operator	Not specified

7.2. Appendix 2 — Comparison between Option 1, Option 2, and ICAO Annex 6, Part I provisions

Table 1 — Option 1 conditions and corresponding provisions in ICAO Annex 6, Part I or ICAO Doc 10054, compared with Option 2 CPOs

Option 1 conditions	**Corresponding provisions in ICAO Annex 6, Part I or ICAO Doc 10054**	**Comparison with Option 2** **(If the objective is the same as of Option 1, the corresponding CPO No is provided)**	**Nature of the difference with Option 2 (if applicable)**
The aeroplane autonomously transmits information from which the operator can determine a position at least every minute when the aeroplane is in distress.	Section 6.18.1: 'All aeroplanes of a maximum certificated take-off mass of over 27 000 kg for which the individual certificate of airworthiness is first issued on or after 1 January 2021, shall autonomously transmit information from which a position can be determined by the operator at least once every minute, when in distress, in accordance with Appendix 9.'	The objective is the same: see CPO No 3.	
Automatic activation when the aeroplane is in distress, and capability of being manually activated.	Appendix 9, Section 2.1: 'An aeroplane in distress shall automatically activate the transmission of information from which its position can be determined by the operator and the position information shall contain a time stamp. It shall also be possible for this transmission to be activated manually. The system used for the autonomous transmission of position information shall be capable of transmitting that information in the event of aircraft electrical power loss, at least for the expected duration of the entire flight. Note 1. — Aircraft behaviour events can	The objective regarding the activation condition is slightly different: see CPO No 3. The CPO is the same regarding manual activation: see CPO No 11.	Under Option 2, the activation condition is an accident that severely damages the aeroplane or a distress situation. A system that is only activated after the accident meets that objective.

Option 1 conditions	Corresponding provisions in ICAO Annex 6, Part I or ICAO Doc 10054	Comparison with Option 2 (If the objective is the same as of Option 1, the corresponding CPO No is provided)	Nature of the difference with Option 2 (if applicable)
	include, but are not limited to, unusual attitudes, unusual speed conditions, collision with terrain and total loss of thrust/propulsion on all engines and ground proximity warnings.’		
The deactivation of the transmission is only possible by using the same mechanism that activated the transmission.	Appendix 9, Section 2.5: ‘When autonomous transmission of position information has been activated, it shall only be able to be deactivated using the same mechanism that activated it.’	The objective is the same: see CPO No 11.	
The capability of transmitting information in the event of an aircraft electrical power loss ‘at least for the expected duration of the flight’.	Appendix 9, Section 2.1.	The objective is the same: See CPO No 5.	
Transmission of at least position information with a time stamp.	Appendix 9, Section 2.1.	The objective is the same: see CPO No 20.	
Accuracy of position information contained in a position report that meets ‘the position accuracy requirements established for ELTs’ as long as the transmitter is capable of transmitting.	Appendix 9, Section 2.6: ‘The accuracy of position information shall, as a minimum, meet the position accuracy requirements established for ELTs.’	The objective is different: see CPOs No 8, 9, and 20.	Under Option 2, there is an objective regarding the accuracy of the position of the point of end of flight, not position reports that are sent before reaching the point of end of flight. However, when practicable, the estimated accuracy of latitude and longitude in position reports should also be transmitted.
Transmitted information is sufficient to establish the location of the accident site within a 6-NM radius.	Appendix 9, Section 1. PURPOSE AND SCOPE: ‘Location of an aeroplane in distress aims at establishing, to a reasonable extent, the location of an accident site	The objective is different: see CPOs No 8, and 9.	Under Option 2, the accuracy objective regarding the location of the point of end of flight is 200 m when the accident is survivable. Otherwise, it is 6 NM. In addition, if the accident is survivable, a 121.5-MHz homing signal is automatically

Option 1 conditions	**Corresponding provisions in ICAO Annex 6, Part I or ICAO Doc 10054**	**Comparison with Option 2** **(If the objective is the same as of Option 1, the corresponding CPO No is provided)**	**Nature of the difference with Option 2 (if applicable)**
	within a 6 NM radius.’		transmitted, which facilitates further locating the aircraft.
Transmission of position information starting no later than 5 s after the detection of the activation event.	Appendix 9, Section 2.2: ‘An aircraft is in a distress condition […] In case of a triggered transmission system, initial transmission of position information shall commence immediately or no later than five seconds after the detection of the activation event.’	The objective is slightly different: see CPO No 3.	Under Option 2, the system should automatically start transmitting signals within a time frame that maximises the likelihood that at least a set of data corresponding to an activation signal is received. This time frame can be adjusted depending on the selected solution (ADFR, ELT(DT), HRT, etc.).
The operator is alerted when the aeroplane is in distress ‘with an acceptable low rate of false alerts’.	Appendix 9, Section 2.2	The objective is different: see CPOs No 10, 19, and 22.	Under Option 2, the data is automatically sent to the competent SAR centre and automatically made available to the relevant ATS unit. Transmission to the operator is optional as there is no need for validation by the operator before transmitting the data to the competent stakeholders.
The operator shall inform, and coordinate with, the relevant ATS unit when the operator ‘has reason to believe that an aircraft is in distress’.	Appendix 9, Section 2.3: ‘When an aircraft operator or an air traffic service unit (ATSU) has reason to believe that an aircraft is in distress, coordination shall be established between the ATSU and the aircraft operator.’	The objective is the same: see CPO No 18.	
The operator is responsible for making the transmitted information available to the appropriate organisations ‘as established by the State of Operator’ (as a minimum, the relevant ATS unit, and the competent SAR centre).	Section 6.18.3: ‘The operator shall make position information of a flight in distress available to the appropriate organizations, as established by the State of the Operator 2.4 The State of the Operator shall identify the organizations that will	The objective is different: see CPOs No 10, 19, and 22.	Under Option 2, the operator is not required to make the transmitted information ‘available’, because it is not required that the operator receives that data. In Option 2, the data is directly provided to the competent SAR centre and automatically made available to the relevant ATS unit.

Option 1 conditions	**Corresponding provisions in ICAO Annex 6, Part I or ICAO Doc 10054**	**Comparison with Option 2** **(If the objective is the same as of Option 1, the corresponding CPO No is provided)**	**Nature of the difference with Option 2 (if applicable)**
	require the position information of an aircraft in an emergency phase. These shall include, as a minimum: a) air traffic service unit(s) (ATSU); and b) SAR rescue coordination centre(s) (RCC) and sub-centres.'		
The system should transmit signals on frequencies that are protected by the ITU Radio Regulations, and belong to the protected aeronautical safety spectrum or to the protected distress spectrum.	The objective is not addressed in ICAO Annex 6, Part I, but recommended by ICAO Doc 10054.	The objective is the same: see CPO No 21.	

7.3. Appendix 3 — Language and rationale of the Option 2 CPOs

The terms that are used in the Option 2 CPOs are explained in Table 1. The rationale of the CPOs is presented in Table 2.

Table 1 — Explanation of the terms used in the CPOs

Term	Explanation
Point of end of flight	Point where the aircraft: — crashed into land or water; or — landed on land or water; or — was destroyed in case of in-flight destruction.
System	Set of airborne applications and airborne equipment that is organised to meet CAT.GEN.MPA.210.
Transmission service	Service that relies on the communication infrastructure, the distribution service, and the recording snd retrieval service to make the information sent by the system available to the competent stakeholders.
Communication infrastructure	Network of sensors, repeaters, and stations that are used to detect activation and deactivation signals sent by the system to process into data the information contained in these signals, and transmit this data to the ground; this infrastructure typically includes satellites and ground stations.
Distribution service	Service that automatically distributes data that is received from the communication infrastructure to the competent stakeholders.
Armed system	All the functions of the system are operating or ready to operate immediately (particularly, the detection of accident condition and the signal transmission).
Activated system	The system is transmitting activation signals.
Activation of the system	Transition of the system from another state to the activated state.
Nuisance activation	Automatic activation of the airborne system that is not desirable as it does not correspond to an accident condition within the scope of CAT.GEN.MPA.210.
Competent SAR centre	The RCC or the SAR point of contact (SPOC) that are responsible for the area where the aeroplane is indicated to be by data transmitted by an activated system.
Relevant ATS unit	The ATS unit competent to provide the alerting service (refer to ICAO Annex 11, Chapter 5) in the airspace where the aeroplane is indicated to be by data transmitted by an activated system.
Signals	Information transmitted by the system; a signal may contain some of the data required to meet CAT.GEN.MPA.210, or it may not (e.g. post-processing of the signal may be needed to compute that data).
Homing signal	Signal that allows mobile SAR facilities in the vicinity of the transmitter to continuously proceed towards the transmitter.
Survivable accident	Accident where some crew members or passengers may survive.

Table 2 — Rationale of the CPOs

CPO No	CPO text	Addressed aspect	Justification
1	The system should be automatically armed when the aeroplane becomes airborne.	Start and end of operation	CAT.GEN.MPA.210 requires 'robust and automatic means'. In addition, until lift-off, the aeroplane is easy to locate.
2	The scope includes accidents that correspond to point (b) of the definition of an accident in ICAO Annex 13 and distress situations when the accident or distress situation take place between take-off from, and landing at, an airfield.	Scope	— Definition of an accident according to ICAO Annex 13: 'Accident. An occurrence associated with the operation of an aircraft which, in the case of a manned aircraft, takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked, (…), in which: a) a person is fatally or seriously injured as a result of: (...); or b) the aircraft sustains damage or structural failure which: — adversely affects the structural strength, performance or flight characteristics of the aircraft, and — would normally require major repair or replacement of the affected component, except for engine failure or damage, when the damage is limited to a single engine (including its cowlings or accessories), to propellers, wing tips, antennas, probes, vanes, tires, brakes, wheels, fairings, panels, landing gear doors, windscreens, the aircraft skin (such as small dents or puncture holes), or for minor damage to main rotor blades, tail rotor blades, landing gear, and those resulting from hail or bird strike (including holes in the radome); or c) the aircraft is missing or is completely inaccessible.' — Accidents that do not seriously damage the aircraft are out of the scope. — 'Severely damaged' aircraft does not only mean hull loss. The accidents to be considered include survivable and non-survivable accidents. — Distress situations are also within the scope even if they do not result in an accident. An example is loss of all propulsive power on all engines, which forces the crew to prepare for an emergency landing. — Events that take place on an airfield do not require the aircraft to be equipped with with locating equipment.

CPO No	CPO text	Addressed aspect	Justification
3	(a) The system should be capable of automatically activating upon detection that an accident that severely damaged the aeroplane or a distress situation have occurred, are occurring or are very likely to occur within minutes. The system should, to the extent possible, not automatically activate without indication that severe damage or a distress situation occurred, or is likely to occur, to the aeroplane within minutes. (b) As soon as the system is activated: — it should automatically start transmitting signals within a time frame that maximises the likelihood that at least a set of data corresponding to an activation signal is received; and — it should transmit signals at time intervals that do not exceed 1 min, at least until reaching the point of end of flight or it is deactivated. (c) Upon deactivation, the system automatically transmits deactivation signals to the communication infrastructure within 1 min of the deactivation time. (d) Automatic deactivation results only from the automatic detection by the aircraft of a confirmed return to safe flight conditions.	Detection and transmission	(a) CAT.GEN.MPA.210 requires means to locate the point of end of flight, therefore, activation of the system after an accident occurs is acceptable. CAT.GEN.MPA.210 requires those means to be automatic. The scope includes 'accidents during which the aeroplane is severely damaged' (see CPO No 2). Accidents during which the aeroplane is not severely damaged (e.g. an aircraft occupant suffers serious or fatal injuries, without severe damage to the aircraft) are out of the scope. In addition, abnormal or risky situations that are not likely to result in severe damage to the aeroplane or a distress situation are also out of the scope. Therefore, the system is not expected to activate without indication that severe damage or a distress situation occurred, or is likely to occur, to the aeroplane within minutes. (b) Transmission of signals sufficient to locate the point of end of flight should start as fast as possible to increase probability of at least one successful transmission: — for pre-crash transmission (e.g ELT(DT), HRT), the transmission should start within a few seconds, since there may be little time between the time of activation and time of crash; signal transmission at intervals of maximum 1 min until the point of end of flight is reachedis: — consistent with CPO No 9; and — needed by data recipients (ATS units and/or SAR entres) to recognise when the aircraft enters/leaves their area of competence; and — for post-crash transmission (e.g ADFR), a longer delay could be acceptable. (c) To spare SAR resources, the system also sends a signal when it is deactivated. It is important for SAR purposes to know whether the transmission of signals stopped because the system automatically deactivated (e.g because the aircraft returned to safe flight conditions) or due to another reason. Together with CPOs No 17 and 18, this aims at limiting the impact of nuisance activation. (d) The transmission of activation signals should be stopped when it is not needed anymore, to avoid unnecessary action to be taken by SAR centres. For example, in case of loss of control in flight, the transmission of activation signals should be stopped some time after safe flight conditions are recovered.
4	The system performance should not be affected	Robustness	The system should be able to withstand conditions that are associated with an accident

CPO No	CPO text	Addressed aspect	Justification
	by the environmental conditions that are encountered during most accidents within the scope of CAT.GEN.MPA.210.		scenario, such as the following: — crash test conditions for that part of the airborne equipment that is used by the system and expected to be operating after a crash; and — demanding environmental test conditions for that part of the airborne equipment that is expected to be operating until the crash (e.g high level of vibrations due to engine failure, depressurisation, etc.). The scope of CAT.GEN.MPA.210 includes survivable and non-survivable accidents (while automatic ELTs are designed for survivable accidents); therefore, the test conditions are not limited to those of survivable accidents. However, there might be specific accident scenarios where it would be too challenging to show successful performance of the system.
5	(a) The system remains armed as long as the aircraft is airborne. (b) In addition, the system should remain armed or activated throughout the maximum possible duration of a flight without propulsive power on any engine, followed in the case where equipment is deployed, by a period of 15 min on ground without any propulsive power on any engine.	Start and end of operation	(a) An accident might occur at any stage of a flight. (b) In a distress situation, some power sources may be lost, and the operation of the system should remain possible even if some engines failed or were shut down. In accordance with CAT.IDE.A.280, the system may replace an automatic ELT, and an automatic ELT keeps operating whatever the status of the aircraft engine(s). In several past accidents, all engines were lost at cruise flight level. The maximum possible gliding duration is close to 30 min for current large aeroplane models. In case equipment is deployed, after a ‘soft’ landing or ditching (automatic deployment is not triggered), all aircraft power sources may be lost. In that case, manual activation (and, if applicable, automatic deployment based on hydrostatic detection) must remain possible for at least 15 min, as recommended by EUROCAE ED-62B.
6	(a) The system should perform its intended function, and activation signals should be detected by the communication infrastructure: — in the whole flight envelope of the aircraft; — when the aircraft is experiencing high attitude values, high attitude rate	Robustness	During a sequence of events leading to an accident, the aircraft might experience abnormal attitude angles, attititude rates, speeds, and vertical speed. Flight data recorder (FDR) data from historical accidents to large aeroplanes suggest the following operational domain: — pitch, roll: +/– 60°, — pitch rate and yaw rate: +/- 20°/s, roll rate: +/– 30°/s; — altitude: 0 ft to the absolute ceiling of the aircraft, — longitude, latitude: E/W 180° and N/S 90°; — speed: from 0 kt to Vd/Md (design diving speed); and

CPO No	CPO text	Addressed aspect	Justification
	values, overspeed or high vertical speed, which are typically encountered during loss of control in flight; and — wherever the accident occurs. (b) Deactivation signals should be detected by the communication infrastructure at aircraft attitudes, altitudes, and speeds that correspond to normal operation.		— vertical speed: from maximum negative vertical speed at Vd to maximum positive vertical speed. Aeroplanes with an MCTOM of more than 27 000 kg have a significant range and might depart from their planned route for unforeseen reasons (refer to the example of flight MH370). Accidents to aeroplanes with an MCTOM of more than 27 000 kg might occur almost anywhere, including outside the normal area of operation. To stop unnecessary SAR response when a distress situation is recovered, the detection of deactivation signals should be possible when the aircraft is operated normally. Note: 'The system should perform its intended function' means that: — the system successfully transmits signals; and — the signals contain the necessary information to locate the aircraft.
7	The system should perform its intended function in case of accidents over water as well as over land.	Robustness	The means compliant with CAT.GEN.MPA.210 should work in accident scenarios such as those of flights AF447 and MH370, where the accidents occurred in oceanic areas and far away from any shore. This includes the cases where the location of the point of end of flight relies on transmission of signals after the accident (e.g. any deployed equipment should be floatable).
8	In case of a survivable accident: — data that is received on the ground within 20 min after the aircraft reached the point of end of flight should be sufficient to locate that point with a 200-m 2D location accuracy (95 % probability); and — a 121.5-MHz homing signal, compatible with standard homing direction finders, is automatically transmitted for at least 48 hours, or until transmission is manually stopped by the flight crew, or until the aircraft is submersed.	Location accuracy	As in accordance with CAT.IDE.A.280, the means compliant with CAT.GEN.MPA.210 may replace an automatic ELT, those means should allow to accurately determine the location of the aircraft after a survivable accident to support SAR operations: — Transmission of a 121.5-MHz homing signal is essential for SAR operations as that signal is easy to use during SAR operation and provides for a back-up to activation signals, and because every mobile SAR facility is equipped with a homing direction finder. — However, after a landing over water or a ditching, the aircraft may sink before mobile SAR facilities are within reach of the homing signal. Therefore, the information obtained through activation signals should be sufficient to locate the point of end of flight with a 200-m 2D location accuracy: — 200-m accuracy is consistent with SAR needs (refer to IAMSAR Manual, Vol III, regarding visibility and sweep width by aerial means). — 200-m accuracy is achievable either with a second-generation beacon (2D accuracy of independent locating: 100 m and 30 min with 95 % probability in accordance with COSPAS/SARSAT system document C/S G.008), or with a

CPO No	CPO text	Addressed aspect	Justification
			first-generation beacon with an integrated GNSS receiver (encoded position data, 120 m resolution of position data). — A 20-min time objective is compatible with the time needed by SAR centres to deploy mobile facilities. Information is expected to arrive on the ground before mobile facilities are deployed as this information is key to determine which mobile facilities to deploy. That time objective is for receiving the data on the ground, and not for reception by a SAR centre so that it does not include the time taken by the distribution service (see CPO No 10). The time objective applicable to the distribution service is addressed in CPO No 22. — 'within 20 min after reaching the point of end of flight' does not mean within 20 min after activation: the system might be activated long before reaching the point of end of flight, but CAT.GEN.MPA.210 requires to accurately locate the point of end of flight only after an accident.
9	Data that is received on the ground within 20 min after the aircraft reached the point of end of flight should be sufficient to locate this point with a 6-NM 2D location accuracy (95 % probability).	Location accuracy	When the accident is not survivable, a position of the point of end of flight with a 6-NM 2D location accuracy is sufficient to locate the wreckage and flight recorders within a time consistent with the time frame of a safety investigation. In the particular case of an accident over water, a 6-NM 2D location accuracy provides for a search area that is small enough to detect the ULDs of a non-deployable recorder before the recorder stops transmitting. A 6-NM location accuracy is consistent with the objective of locating an aeroplane in distress, as stated in ICAO Annex 6, Part I, Appendix 9, i.e 'establishing, to a reasonable extent, the location of an accident site within a 6 NM radius'. 20 min is consistent with CPO No 8.
10	The transmission service that is used by the system should include: — a communication infrastructure that detects and transmits activation and deactivation signals, and converts them into data; — an operational record-keeping function that records and retains that data; and — a distribution service that delivers that data to the competent SAR centre and makes	Detection and transmission	The current path followed by the 406-MHz signal within the international COSPAS-SARSAT programme is the following: — ELT — transmits signals; — satellite — detects and repeats signals; — LUT — processes the ELT signals into data and transmits to the MCC; — MCC — delivers the data to the competent SAR centre depending on the ELT position that is provided in the data; and — competent SAR centre (responsible RCC or SPOC).

CPO No	CPO text	Addressed aspect	Justification
	available that data to the relevant ATS unit.		In practice, CPO No 10 implies that the following functions are performed by the transmission service: — detects and automatically converts the activation and deactivation signals from a transmitting system into the data that are defined in CPO No 20; — automatically records a copy of the data (see also CPO No 12); and — automatically transmits relevant activation and deactivation data to the competent SAR centre and automatically makes this data available to the relevant ATS unit (see also CPO No 22). The operator is alerted by the relevant ATS unit in accordance with ICAO Annex 11, Chapter 5 'Alerting service' if they are not made aware through other means. In addition, CPO No 17 is to limit the rate of erroneous automatic activation, and the risk of inappropriate manual activation is limited through CPO No 18. Therefore, the operator does not need to validate the data from an activated system prior to transmission to the competent SAR centre.
11	Whether the system is armed or not, the flight crew should have means to: — manually activate the system (but not deploy any equipment); — manually deactivate the system when the system was manually activated and the transmitter is not detached from the aircraft; — manually trigger a 121.5-MHz homing signal at least when the aircraft is not airborne; and — manually stop transmission of the 121.5-MHz homing signal.	Manual control	The system may replace an automatic ELT in accordance with CAT.IDE.A.280; therefore, it should offer the possibility of being manually activated even if it is not armed. Manual activation mitigates the risk of failed transition to the armed state. Manual activation may be needed in cases such as an emergency landing, fire on board, etc. Manually triggering the 121.5-MHz homing signal may be blocked in flight to avoid conflict with the use of the emergency radio. Note: 'manual activation' does not mean 'manual deployment'. There should be no means for the flight crew to command manual deployment (see CPO No 14).
12	The operational record-keeping function should include: — integral recording on the ground of the transmitted data and retention of that data	Recording and retrieval of data	The recording service is part of the transmission service (see CPO No 10). The data transmitted from the system is key for search operations, therefore, they should: — be recorded without loss;

CPO No	CPO text	Addressed aspect	Justification
	for at least 30 days, and — capability to retrieve recorded data within 30 min when it was recorded in the last 48 hours.		— retained for sufficient duration; and — be quickly retrievable, when needed. COSPAS-SARSAT system document C/S A.005, Section 5.8 specifies that MCCs 'shall archive alert data and messages for at least 30 days' and that they 'shall respond to requests for alert data and messages covering the preceding 48 hour period within 30 minutes.' Note: the data to be recorded and retained is only that corresponding to activation and deactivation signals. It should not be confused with data recorded by a crash-protected flight recorder.
13	The reliability of the airborne equipment that is used by the system as well as the serviceability tasks should be such that the aircraft operator can ensure the continued serviceability of that airborne equipment.	Reliability	The system used to comply with CAT.GEN.MPA.210 will be seldom activated but it must work, when activated. Dispatching the aircraft with the system inoperative will need to be addressed in the operator's minimum equipment list. To ensure that the system is serviceable most of the time in operation: — a minimum level of reliability is expected; as a matter of comparison, loss of any function of the system is a minor failure condition in accordance with ETSO-C126b (406- MHz and 121.5-MHz ELT); and — serviceability tasks should be compatible with the time constraints of commercial operation and affordable.
14	When the system includes deployable equipment, the safety risks for third parties that result from unintended deployment should be addressed.	Safety of third parties	Any risk to aircraft occupants, ground staff, other aircraft, and people on the ground, due to unintended deployment, needs to be carefully addressed. This is relevant particularly if the system includes deployable equipment. To limit such risks: — no one should be able to manually deploy the deployable equipment (however, it should be possible to manually command the transmission of activation signals: see CPO No 11); — the risk that unintended deployment affects the safe conduct of the flight should be assessed; and — the risk of injuring people on the ground should be considered.
15	No means of disabling the system, except circuit protective devices, should be provided during the flight.	Manual control	Meeting CPO No 15 ensures that the system is operative when it is needed. Nuisance activation should not be addressed by simply disabling the system. CPO No 15 is not to make the system resistant to tampering. In addition, the flight crew should keep the possibility of powering off the system when its failure may affect the

CPO No	CPO text	Addressed aspect	Justification
			safe conduct of the flight. In that case, the flight crew may use a circuit protective device.
16	The communication infrastructure that is used by the system should have sufficient performance to ensure successful transmission, and the performance parameters of the communication infrastructure should include as a minimum assumptions regarding: — availability, — integrity, — capacity, and — coverage.	Robustness	The communication infrastructure that is used by the transmission service (see CPO No 10) should have performance sufficient to ensure successful transmission. The parameters that describe the performance of a communication infrastructure should include as a minimum availability, integrity, capacity, and coverage: — availability: relates to the probability that the communication infrastructure can process the information that is contained in activation signals into data and transmit this data; — integrity: relates to the probability that the information contained in activation signals is processed and transmitted with no undetected error(s) generated by the communication infrastructure; — capacity: relates to the maximum amount of information that can be processed and transmitted by the communication infrastructure; and — coverage: relates to the geographical zones and range of altitudes where the communication infrastructure can detect activation signals at any point in time.
17	The system is designed commensurate with a major failure condition that results fromerroneous automatic activation.	Reliability	SAR centres have limited operational capacity and SAR operations can be risky (depending on the area of operations as well as weather and visibility conditions). Nuisance activation twice per 100 000 FH is the maximum acceptable rate of nuisance activation (see EUROCAE ED-237). Note: the scope of CPO No 17 includes automatic activation only (not manual activation).
18	The operator should: — have means and procedures to assess whether an aircraft is likely to be in a distress situation; — inform the relevant ATS unit without delay whether an aircraft is believed to be in distress; and — have means and procedures to limit the negative impact of nuisance activation on	Reliability	SAR centres have limited operational capacity and SAR operations can be risky. Therefore, the impact of undesirable activation should be limited by the operator: — at aircraft level, through procedures for the use of the system by the flight crew, including manual activation only in cases of emergency (i.e. where the flight crew needs to declare a state of emergency to the ATS) and handling of nuisance deactivation; — at the level of operational control over the flights: — through procedures for assessing the genuineness of activation data (e.g checking aircraft tracking data, contacting the flight crew or the ATS unit,

CPO No	CPO text	Addressed aspect	Justification
	SAR centres.		etc.); and — means and procedures for identifying the relevant ATS unit and informing it of the status of the aircraft (whether it is in distress or not); the relevant ATS unit then informs the competent SAR centre (as per ICAO Annex 11, Chapter 5). — after the flight: — through maintenance instructions; and — by analysing cases of undesirable activation to determine the probable cause.
19	The distribution service should deliver the data to the competent SAR centre in plain text. In addition, that text should be presented in a format that is internationally recognised by SAR authorities.	Interoperability	A large aeroplane accident might occur anywhere, i.e. involve any SAR centre. Therefore, the data should be provided in a form that is commonly understood by SAR centres worldwide. This means: — the data should be received in plain text; no special tool or special service should be needed to read the data corresponding to activation and deactivation signals; — the format of the text should be internationally recognised; dealing with multiple formats is a waste of time for SAR centres, and time is critical for SAR operations; and — IAMSAR Manual, Vol II, Section 2.28 states: 'When a commercial locating, tracking and emergency notification service provider (non-Cospas–Sarsat) must pass distress alert information to an RCC, there is need for consistency of formats and styles, for all essential information to be provided, and for the information to be easily and clearly understandable.' Note: format examples are available in COSPAS-SARSAT system document G.007, Chapter 5 (MCC messages), and in IAMSAR Manual, Volume II, Appendix B.
20	(a) When the system is activated, it should transmit signals that are sufficient to obtain the following data: — indication that the system is activated; — latitude, longitude, and time at which they were valid; — the individual aircraft identification;	Minimum data content	(a) The activation signals should contain sufficient information to address the questions: Who? Where? When? The information content of the activation signals should also be consistent with international standards on distress information sharing, particularly the following: — COSPAS-SARSAT system document C/S T.001, Annex A (user-location protocols); and — GADSS ConOps, Section 3.4 The type of airborne equipment that transmitted the signals can be used in case the

CPO No	CPO text	Addressed aspect	Justification
	— the type of airborne equipment that transmitted the signals; and — when practicable: — the estimated accuracy of latitude and longitude; — indication of whether latitude and longitude were valid and refreshed; — indication of whether activation was automatic or manually triggered; and — altitude, ground speed, ground track, and vertical speed. (b) When the system is deactivated, it should transmit, before ceasing transmission, signals that are necessary to obtain the following data: — individual aircraft identification; — indication that the system is deactivated; and — the type of airborne equipment that transmitted the signals.		required information is incomplete or erroneous as the the provider of the transmission service used by that equipment may be contacted to collect additional information. (b) The deactivation signals should contain sufficient information to determine on which aircraft the system deactivated. The type of the source equipment (ELT or other) is also useful information for analysing cases of undesirable activation. Note: the transmission of deactivation signals may have to be repeated to increase the probability that the signals are successfully transmitted. However, this does not automatically imply acknowledgement of receipt from the ground.
21	The system should transmit activation and deactivation signals on frequencies that are protected by ITU Radio Regulations, and that belong to the protected aeronautical safety spectrum or the protected distress spectrum.	Robustness	Using frequencies of the protected aeronautical safety spectrum or the protected distress spectrum is essential to successfully transmit signals from the aircraft to the communication infrastructure. ICAO GADSS ConOps recommends that for locating an aeroplane in distress or an accident site, only frequencies of the protected aeronautical safety spectrum or the protected distress spectrum are used. However, data transmission between elements of the communication infrastructure does not need to use protected frequencies. Note: example of eligible frequencies: — 1090 MHz is a frequency of the protected aeronautical safety spectrum; and

CPO No	CPO text	Addressed aspect	Justification
			— 406 MHz is a frequency of the protected distress spectrum.
22	The distribution service should: — automatically make data corresponding to activation and deactivation signals available to the relevant ATS unit; — automatically deliver data corresponding to activation and deactivation signals to the competent SAR centre; — make data corresponding to activation and deactivation signals available to the relevant ATS unit within 15 min of being received from the communication infrastructure; and — deliver data corresponding to activation and deactivation signals to the competent SAR centre within 15 min of being received from the communication infrastructure.	Detection and transmission	The distribution service is part of the transmission service (see CPO No 10). — Within the international COSPAS-SARSAT programme, the 406-MHz signals are automatically processed into data and automatically transmitted to the competent SAR centre. This has proven to be a very effective solution.The international COSPAS-SARSAT programme was established to support the transmission of signals from beacons (ELTs, EPIRBs, PLBs) after an accident occurs. This is consistent with the mission of SAR authorities, i.e. to search (locate persons in distress) and rescue (retrieve persons in distress, provide for their initial medical or other needs, and deliver them to a safe place). — However, the AFMs of several large turbojet aeroplane models require to manually activate the ELT(AF) before an emergency landing or ditching. In addition, CPOs No 2, 3, 17, and 18 are to limit the frequency of activation to less than 1000 (including 50 genuine distress situations) per year worldwide, while currently around 20 000 false alerts are triggered by emergency beacons (ELTs, EPIRBs, PLBs). Undesirable activation of systems that are compliant with CAT.GEN.MPA.210 will not trigger more than a few additional false alerts per year, when considering a single competent SAR centre. — When activation signals are received from an aircraft in flight, the competent SAR centre coordinates with the relevant ATS unit and it may prepare the deployment of SAR teams, but the entities responsible for assisting with safe flight and landing remain the operator and the relevant ATS unit. In this context, the ATS unit is responsible for coordinating the alerting service and particularly, for plotting the aircraft's position in a state of emergency (see ICAO Annex 11, Section 5.4), as well as for informing the operator, in accordance with ICAO Annex 11, Chapter 5. Therefore, data corresponding to system activation and deactivation must be made available to ATS units without delay. — The data corresponding to activation and deactivation signals is required to be 'made available' and not delivered to the relevant ATS unit as there is no service comparable to the distribution service of the international COSPAS/SARSAT programme to deliver data to ATS units. 'Make available' means in this context that the ATS unit receives the data corresponding to activation and deactivation signals or that it has free-of-charge access to a repository where that data is clearly

CPO No	CPO text	Addressed aspect	Justification
			identified and readily available for download. — It is neither required nor forbidden to send data to the operator (see also CPO No 10). Whatever the accident or distress situation, quick data transmission is important for the effectiveness of the alerting service, of the SAR service, and of the safety investigation. Therefore, CPO No 22 does not make distinction between survivable and non-survivable accidents. Relevant specifications of the international COSPAS-SARSAT programme are the following: — COSPAS SARSAT system document C/S A.005, Section 5.2.1 'MCC performance specifications' states: 'An MCC shall receive all distress alert data transmitted by a LUT within 10 minutes from the completion of LUT processing 99% of the time'; — COSPAS SARSAT system document C/S A.005, Section 5.6 states: 'An MCC shall process each alert within 5 minutes of reception 99% of the time'; — this makes a total transmission time of 15 minutes from the LUT to the competent SAR centre; and — therefore, a time limit of 15 minutes was selected for providing the distribution service. Note: CPO No 8 is that data received within 20 minutes after the aircraft reached the point of end of flight is sufficient to locate that point with a 200-m 2D-accuracy. CPO No 8 is an objective relating to the content of the data received from the communication infrastructure within 20 min of reaching the point of end of flight, while CPO No 22 is a time objective for the distribution service, relating to the time needed to identify and notify the competent SAR centre based on the location information contained in the data.
23	When the system relies on non-dedicated airborne resources, applications necessary for the functions of the system should have priority over concurrent applications, except those required for continued safe flight and landing.	Robustness	The objective of location of an aircraft in distress is to maintain or improve survivability of accidents. The processes that are used by the system are time-critical, therefore, they should have high priority. Only applications that are essential for the continued safe flight and landing should have higher priority than those needed by the system.

8. Quality of the document

If you are not satisfied with the quality of this document, please indicate the areas which you believe could be improved and provide a short justification/explanation:

— **technical quality** of the draft proposed rules and/or regulations and/or the draft proposed amendments to them

— text clarity and readability

— quality of the impact assessment (IA)

— application of the better regulation principles [delete if not applicable]

— others (please specify)

Note: Your replies and/or comments to this section shall be considered for internal quality assurance and management purposes only and will not be published in the related CRD.