International Civil Aviation Organization

Third Meeting of the Asia/Pacific Regional Search and Rescue Task Force (APSAR/TF/3)

Maldives, 25 – 29 January 2015

Agenda Item 3: Global update

406-MHz ELT SPECIFICATION DEVELOPMENT BY COSPAS-SARSAT

(Presented by International Cospas-Sarsat Programme)

SUMMARY

This document provides a survey of developments within the Radio Technical Commission for Aeronautics (RTCA), the European Organisation for Civil Aviation Equipment (EUROCAE), and ICAO considered relevant by the Cospas-Sarsat Secretariat to 406-MHz ELT specification development. This information should NOT be considered as a substitute for the formal reports of the meetings of these bodies.

1. INTRODUCTION

1.1 This document provides a survey of developments within the Radio Technical Commission for Aeronautics (RTCA), the European Organisation for Civil Aviation Equipment (EUROCAE), and ICAO considered relevant by the Cospas-Sarsat Secretariat to 406-MHz ELT specification development. This information should NOT be considered as a substitute for the formal reports of the meetings of these bodies. It does illustrate the thinking that may influence future ELT design.

2. DISCUSSION

Scene-Setting Decisions on In-Flight Triggering of ELTs

2.1 In June 2013, the ICAO's Air Navigation Commission (ANC), at its 193rd Session, reviewed several proposed amendments to Annex 6 of the ICAO Convention (16 proposals in total) related to "accident site location". One of these proposals, from the ANC's Working Group, Program Deliverable Production (WG/PDP) concerned means to quickly locate wreckage within a 6 NM radius, including potentially through in-flight triggering of ELTs. The ANC voiced concerns with respect to the language and maturity of the proposal. Concern also was expressed with regard to retrofit requirements and compliance issues. Based on the discussion, the ANC agreed to refer the proposal back to the Flight Recorder Panel (FLIRECP) for further consideration after an ANC-WG/SRP (Strategic Review and Planning) review that would clarify expectations. There was no disagreement on the need to quickly locate wreckage within a 6 NM radius. The question was, however, on the best options to do this.

2.2 Concurrent with discussions at ICAO on the matter, the EUROCAE Council recognized that:

- a number of fatal accidents had occurred overwater, in which flight data and cockpit voice recorders had taken very long to recover;

- the delay in time or non-recovery of recorders greatly reduced the likelihood of the actual cause of these accidents being timely determined;,
- in order to promote the timely recovery of wreckage and flight recorders following a crash, ED-62A "Minimum Operational Performance Specifications for Aircraft Emergency Locator Transmitters (406 MHz and 121.5 MHz (Optional 243 MHz)" had defined performance standards for ELTs;
- review and possible amendment of these standards was required in order to ascertain if they were sufficient for application to all aircraft used in commercial operations or were under or over prescriptive;
- a number of recommendations resulted from the studies, in particular recommendations that the European Aviation Safety Agency (EASA) and ICAO define the regulatory requirements for new generations of ELTs; and
- prior to these requirements being completed and implemented there was a need to improve the ED-62A and to create a MASPS (Minimum Aviation System Performance Standard) defining triggering criteria.

2.3 Accordingly, the EUROCAE Council adopted in June 2013 the terms of reference of a new working group (WG-98) to address the following areas:

- create a new class of automatically activated (prior to impact) next-generation ELTs;
- define ELT technical requirements;
- define criteria for in-flight activation;
- define criteria for termination of an ELT alert triggered in flight; and
- define the frequency of transmission of data and applicable parameters.

2.4 WG-98 decided to coordinate its activities with RTCA (as it did in developing the original ED 62A specification) in order to achieve a requirement "harmonized" between the two organisations.

EUROCAE WG-98/RTCA SC-229 Meetings

2.5 The first Meeting of the EUROCAE Working Group 98 "Aircraft Emergency Locator Transmitters" was held in Paris, France November 27-28, 2013. Twenty-four participants from various manufacturers (aircraft and beacons), universities and from various agencies either involved in aircraft accident investigations (NTSB, BEA), ELT regulations (EUROCAE, EASA, FAA, Cospas-Sarsat) or search-and-rescue operations, attended the meeting in person or via WebEx.

2.6 Considering that the last EUROCAE working group mandated to discuss ELT matters was dissolved in 2008, the first part of the meeting was used to review presentations made by the BEA, the FAA, EASA and the Cospas-Sarsat Secretariat, ensuring that the members of the Working Group were aware of the latest developments of the Cospas-Sarsat systems and of the improvements that were expected to be made for ELTs in the future.

2.7 The second part of the meeting focused on the review of the terms of reference (TOR) proposed by EUROCAE, including the scope of the work and a description of the matters to be addressed. Two documents were expected as final outputs of the group's work:

- a revision of ED-62A (i.e., ED-62B) "Minimum Operational Performance Specification for Aircraft Emergency Locator Transmitters" as applicable, and

provision of a Technical Report on the practicability of the use of the amendments with respect to their effectiveness,

- a MASPS (new EUROCAE Document (ED)) for in-flight triggering criteria covering the function that would trigger the ELT alert, defining some high-level concepts and the typical functional interface requirements between the ELT and the emergency triggering element.

2.8 The group also agreed that there was a need to improve the wording in certain sections of ED 62A and that these improvements should be part of the scope of the group. However any major changes in ED-62A (such as improving shock sensors, allowing rechargeable batteries, or protection of the antenna cable from detaching from ELTs) would require that the revised scope of the TORs be updated by EASA.

Outcomes of the First Joint RTCA SC 229/EUROCAE WG-98 Meeting (March 2014)

2.9 In December 2013, the RTCA's Program Management Committee (PMC) approved the terms of reference for a new RTCA Special Committee which would review document DO-204A Minimum Operational Performance Standards for 406-MHz Emergency Locator Transmitters (ELTs). The revision of the document was to consider that:

- Cospas-Sarsat was upgrading its satellite ELT detection system;
- analysis of recent aircraft accidents had revealed a potential requirement to develop standards for pre-accident automatic ELT activation; and
- GPS technology now allowed for ELTs to report to the Cospas-Sarsat System accurate accident positioning to be relayed to first responders.

2.10 The terms of reference of the group included a review of the Cospas-Sarsat beacon requirements, and from an aviation perspective, the development of technical standards for both first and second-generation Cospas-Sarsat 406-MHz beacon systems which would include the following:

- Global Positioning System requirements;
- improved antenna and cabling specifications, specifically to withstand crash forces; and
- optional in-flight activation requirements.

2.11 The terms of reference also included the following additional related tasks:

- the development of the aviation community's requirements for second-generation beacon proposals/papers for consideration by the Cospas-Sarsat Council, covering topics related to second-generation 406-MHz ELTs, as required;
- a review and possible amendment to the current crash safety requirements and tests to ensure that ELTs remain secured and operable in mountings after a crash;
- an evaluation of the operational requirement for 121.5 MHz homing signals on 406-MHz ELTs to determine if the 121.5 MHz homing signal is the most efficient means to support search and rescue authorities; and
- a harmonization between RTCA and EUROCAE ELT requirements.

2.12 Following a WebEx conference involving key participants, held in January 2014, it was agreed to organise a joint meeting of the two groups in March 2014.

2.13 The first joint RTCA SC 229/EUROCAE WG-98 meeting was held in Washington from 10 March to 12 March. As with the first EUROCAE WG-98 meeting, the first part of this joint meeting consisted of presentations from agencies (BEA, FAA, EASA, Cospas-Sarsat, NOAA, ACC, NASA) to inform the participants of the latest developments of the Cospas-Sarsat systems and of the improvements that were expected to be made for ELTs. The second part of the meeting was used to discuss the terms of reference between the two groups and ensure that both terms-of-reference documents would address all matters that needed to be reviewed. Modifications of the TOR documents would need to be approved by the authorities that mandated both groups (EASA and FAA respectively).

2.14 Considering the scope of the work to be undertaken it was agreed to subdivide the work into sub-groups as follows:

- Sub-Group 1: In-flight triggered ELTs,
- Sub-Group 2: Crash Safety,
- Sub-Group 3: Second Generation Homing,
- Sub-Group 4: GNSS/Return-link/Power Source.

Outcomes of the Second Joint RTCA SC 229/EUROCAE WG-98 Meeting (September 2014)

2.15 The second joint RTCA SC 229/EUROCAE WG-98 meeting was held in Toulouse from 3 to 5 September 2014 and was hosted by the CNES. The meeting was a continuation of the meeting held in March. Several presenters reviewed the status the work undertaken by the various groups and agencies. The group was also debriefed on specific topics such as the Return Link System (presentation made by the EC) and on specific difficulties encountered in helicopter accidents.

2.16 A large part of the meeting was devoted to allowing sub-group activities. The work of sub-group 1 (in-flight triggered ELTs) was focused on developing and expending the questionnaire which would be used to develop triggering criteria for the in-flight activation, while the work on sub-group 2 (crash safety) focused on the upcoming test campaign to be undertaken by NASA to verify the performance of various ELTs (and g-switch) in a test aimed at stimulating the crash of an aircraft.

2.17 It also was agreed by participants that the work of the group would need to be further extended beyond the original mandate-completion date (Dec 2015) until Dec 2016, with the exception of the MASP (in-flight triggering criteria) for which the deliverable remained at Dec 2015 to comply with the expected ICAO needs for the document.

2.18 The extension of the end date for most of the deliverable of the group was agreed by the RTCA at a follow-up RTCA board of directors meeting held on the third week of September.

Outcomes of ICAO Air Navigation Commission Working Group, Strategic Review and Planning (ANC-WG/SRP) (February 2014)

2.19 As anticipated, the ANC-WG/SRP met in February 2014 to clarify what would be expected of the next FLIRECP. Two main actions were identified for completion by the FLIRECP in the months following:

- development of performance-based provisions for locating, within a reasonable timeframe, the accident site and the flight recorders when an accident occurs in an inaccessible, hidden or otherwise difficult to find location; and

- development of guidance on measures to locate, within a reasonable timeframe, the accident site and the flight recorders when an accident occurs in an inaccessible, hidden or otherwise difficult to find location.

Outcomes of FLIRECP Meeting (October 2014)

2.20 As anticipated, an FLIRECP meeting was held at ICAO Montreal from 30 September to 2 October 2014. Ten topics were on the agenda of the meeting including the one related to accident site location and one related with Automatic Deployable Flight Recorder (ADFR) integrated with ELTs. These two items alone took approximately 75% of the time of the meeting. The Cospas-Sarsat Secretariat participated in the meeting as an observer.

2.21 Participants of the FLIRECP reviewed the main actions requested by the ANC-WG/SRP and proposed revised draft amendments (as of October 24) to Annex 6 of the ICAO Convention. The proposed amendments were aimed at maintaining a performance based requirement for accident site location (allowing different technologies to be used to address it) but at the same time specifying the basic requirements requested from ICAO participants. As much as possible, the proposed text referred to other ICAO documents to ensure consistency of terminology.

2.22 It should be noted that the requirements contained in the proposed amendments are within the parameters set by Cospas-Sarsat in the operational requirements for second-generation beacons with in-flight triggering capability (section 4.4 of document C/S G.008) and for the second-generation beacon specifications currently under development in document C/S T.018. This would allow second-generation beacons to be considered as a means to comply with the ICAO requirements if an anticipated amendment to Annex 6 of the ICAO Convention would be adopted by the ICAO Delegations. FLIRECP participants also agreed to allow ADFR integrated with ELTs to be a means of compliance with this requirement.

2.23 In addition to the amendments proposed, the FLIRECP also reviewed a report from the ICAO Global Aeronautical Distress & Safety System (GADSS), an Ad-hoc Working Group on Aircraft Tracking, which met in September 2014. The report had identified the need to have an autonomous distress system which would provide a capability for broadcast during distress situation, independent of aircraft power or systems, including aircraft tracking information. Some members of the group were of the view that the requirement for the location system to be independent of aircraft power and other systems should be included in the proposed amendments to Annex 6, but a consensus among the group could not be reached and no requirement for an autonomous system was incorporated in the proposed amendments.

2.24 Similarly, some participants were of the view that a distress system, which would provide the possible location of a crash site, should have the capability to be remotely activated from the ground (by air-traffic services, for example) if needed in cases where it was believed that the aircraft was likely in distress and that the distress system had not been activated as expected (including any case when the system was intentionally deactivated). For these cases it was also expected that the system would only be deactivated using the same means, i.e., via a remote ground command. Again, no consensus was reached by the group on the need to mandate remote ground activation capability for such systems however it was agreed that such capability be allowed in the amendments proposed.

2.25 The proposed amendments to Annex 6 proposed by the FLIRECP will be further reviewed by a group of ICAO commissioners and then by the ICAO PDP in the first quarter of 2015. Administrations willing to participate in these discussions are invited to contact their ICAO representative and convey their view on the proposed amendments.

Outcomes of the ICAO Special Multi-disciplinary Meeting on Global Airline Flight Tracking (May 2014)

2.26 The unprecedented and unusual circumstances of the flight MH 370 disappearance, which has been particularly difficult for civil aviation officials to resolve, has highlighted the need for continuing to review new means of expediting the location of accident sites, including using the triggered transmission of flight data.

2.27 In response to recent occurrences that raised global concern about the ability to globally track flights, ICAO held a Special Multi-disciplinary Meeting on Global Airline Flight Tracking among States, industry, chairs and co-chairs of several panels, and related specialists to explore the need for globally tracking airline flights. The meeting took place at ICAO Headquarters in Montréal on 12 and 13 May 2014, and was attended by the Cospas-Sarsat Secretariat.

2.28 Ten documents were presented and reviewed by experts attending the conference (see http://www.icao.int/Meetings/GTM/Pages/Documentation.aspx). Various presentations depicting possible solutions addressing or partly addressing the near-, mid- and long-term options for global flight-tracking needs also were reviewed, including a short presentation by the Secretariat on the future Cospas-Sarsat MEOSAR and second-generation beacon planned developments. Two of the documents presented (by the EU and France) also highlighted the efforts made so far by the Cospas-Sarsat Programme on this matter, and promoted the use of the future Cospas-Sarsat infrastructure to address future global tracking for aircraft in distress. To address the need to locate planes in distress in non-cooperative situation, the document submitted by France further proposed to use the future Return Link Service (RLS) of the Galileo component of Cospas-Sarsat to trigger an ELT in-flight during an emergency situation.

2.29 Conclusions and recommendations of the meeting can be found at:

http://www.icao.int/Meetings/GTM/Documents/Final%20Global%20Tracking%20Meeting%20Conclusions%20and%20%20Recommendations.pdf. Of particular relevance, the Special Multi-disciplinary Meeting on Global Airline Flight Tracking made a mid-term recommendation ("o"), directed at the Cospas-Sarsat Programme:

"o) COSPAS-SARSAT should be invited to continue to investigate, within its own program and in partnership with the industry, the means of improving the reliability and utility of emergency locator transmitter (ELTs), particularly in the context of flight tracking during a distress event;"

Summary

RTCA, EUROCAE and ICAO

2.30 Activities related to the development of revised MASPS for 406-MHz ELTs are progressing at RTCA and EUROCAE. These new requirements will:

- consider improvements to be made to the overall reliability of ELTs;
- consider the upcoming changes in the Cospas-Sarsat systems (from a LEOSAR-GEOSAR operational configuration to a MEOSAR-GEOSAR operational configuration);
- consider the upcoming introduction of Cospas-Sarsat second-generation beacons offering improved performance and new services, including a Return Link Service (which also can be implemented in existing technology beacons);

- create a new class of automatically-activated ELTs that activate prior to impact (in-flight triggering);
- provide activation/deactivation criteria for in-flight triggered ELTs; and
- review possible changes that would take advantage of the latest technological developments in GNSS performance and batteries.

2.31 The work and deliverables expected from RTCA SC-229 and EUROCAE WG-98 are essential to ensure that ELTs with improved reliability and performance could be deployed in the shortest time-frame possible, consistent with other Cospas-Sarsat Programme developments, such as MEOSAR.

2.32 The ICAO FLIRECP is now proposing new amendments to Annex 6 of the ICAO Convention that would require that certain types of aeroplanes be equipped with a distress system which would reliably allow the location of an aeroplane accident site within a 6 NM radius. Such new requirements could significantly increase future deployment of ELTs if it can be demonstrated that in-flight triggered, second-generation ELTs, operating in a MEOSAR environment, would be a suitable choice to address the new ICAO requirements.

2.33 As a result of the MH370 disappearance and the difficulty to locate the aircraft, ICAO is under significant pressure to provide a means to ensure that no aircraft in distress would disappear without being located. There is an unprecedented desire from many ICAO participants to provide means to avoid similar situations in the future, hence the growing interest of ICAO on this matter and the need to timely develop a means to address these requirements in order to be able to take advantage of this momentum to ensure that future aircraft are equipped with the best means to be located in distress situations.

Near-Term Developments

2.34 ICAO will be convening the Second High-Level Safety Conference from 2 to 5 February 2015, "planning for global aviation safety improvement". The meeting will aim to build consensus, obtain commitments and formulate recommendations deemed necessary for the effective and efficient progress of key aviation safety activities; this, in particular, given the tragic and unusual events that occurred with flights MH 370 and MH 17.

2.35 The Reuters news service reported on 12 January that "Airbus has begun talks with a European regulator on proposals to make ejectable flight recorders available on its two largest models, the A380 and the new A350 … also not ruling out expanding the use of ejectable recorders, which combine both voice and data recordings, to new versions of its popular A330 and A320 planes." "Used in military planes for decades, ejectable or 'deployable' recorders separate from the tail during a crash and float," while emitting a 406-MHz satellite distress signal.

(http://www.reuters.com/article/2015/01/12/indonesia-airplane-ejectable-recorders-idUSL6N0UR1NM20150112)

2.36 Cospas-Sarsat will convene its next Task Group Meeting on Second-Generation 406-MHz Beacon Specifications (TG-1/2015) from Monday to Friday, 23 - 27 February 2015, in Montreal, Quebec, Canada.

3. ACTION BY THE MEETING

3.1 The meeting is invited to note the information contained in this paper.

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