



International Civil Aviation Organization

**The Second Meeting of the ICAO Asia/Pacific Search and Rescue Task Force  
(APSAR/TF/2)**

Singapore, 27 – 30 January 2014

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**Agenda Item 3: Global update**

**COSPAS-SARSAT DEVELOPMENTS FOR FUTURE SYSTEM ENHANCEMENTS**

(Presented by INTERNATIONAL COSPAS-SARSAT PROGRAMME)

**SUMMARY**

This paper presents an overview of the developments and activities of Cospas-Sarsat to enhance the value of the System to users. This includes the current Demonstration and Evaluation phase of Medium-altitude Earth Orbit Search and Rescue (MEOSAR) spacecraft payloads, and the continuing development of specification for the next generation of Cospas-Sarsat beacons, including potentially new features for 406 MHz ELTs.

This paper relates to search-and-rescue.

**Strategic Objectives:**

A: *Safety – Enhance global civil aviation safety*

**1. STATUS OF THE MEOSAR SYSTEM DEVELOPMENT**

1.1 The MEOSAR development activities continue. A series of technical tests for Phase I of the MEOSAR Demonstration and Evaluation (D&E) commenced in January 2013. Operational tests are to begin in 2014. The Twenty-seventh Meeting of the Cospas-Sarsat Joint Committee (JC-27), 10-19 June 2013, discussed early test results and agreed a modified D&E test schedule. It is still anticipated that MEOSAR IOC (Initial Operational Capability) will be declared in late 2015. For details see document C/S R.018 at:

[http://www.cospas-sarsat.org/images/stories/SystemDocs/Current/cs\\_r018\\_oct\\_2013.pdf](http://www.cospas-sarsat.org/images/stories/SystemDocs/Current/cs_r018_oct_2013.pdf)

1.2 The following have announced the planned implementation of a MEOSAR ground segment: Algeria, Argentina, Australia, Brazil\*, Canada\*, China\*, the European Commission\* (Cyprus\*, France (used for Galileo satellite commissioning), Norway\*, Spain\*), France\*, India, Japan, New Zealand, Pakistan, Peru, Russia\*, South Africa, Turkey\*, UK\*, UAE\* and USA\*. The MEOSAR space segment currently is comprised of 12 GPS satellites carrying experimental DASS payloads (with an “S-band” downlink, rather than the standard operational “L-band” downlink), one Glonass-K satellite with an L-band downlink and two Galileo satellites (IOV 3 and 4) with operational L-band SAR payloads. The launch of the first two of a planned 22 Galileo FOC satellites (each of which will embark a SAR payload) is planned for mid-2014. Further Galileo launches are then planned every 3 months to reach a full deployment of 28 satellites with L-band SAR payloads by the end of 2018. Glonass-K2 has a planned launch date in early 2014. Operational (L-band) GPS/SAR launches are scheduled to begin in 2020.

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\* These Administrations are participating or intend to participate in the MEOSAR D&E Phase.

1.3 The SAR/Galileo component of the future MEOSAR system will provide a capability for a Return Link Service (RLS) to compatible distress beacons, with an interoperable capability under consideration for the Russian SAR/GLONASS. The Return Link Message is encoded at a very low data rate into the navigation signal transmitted by the Galileo spacecraft. (This creates some issues of message length and delivery latency.) The RLS Type 1, which has received general support from the international SAR community, would be an acknowledgment (by way, for example, of an indicator light on the beacon) that the distress alert signal had been successfully received. JC-27 agreed that the MEOSAR D&E tests would validate the performance of the RLS Type-1 (system acknowledgement) and RLS Type-2 (additional two-way communication), although the exact character and use of the latter remains under discussion within the international SAR community.

## **2. STATUS OF DEVELOPMENT OF SPECIFICATIONS FOR SECOND-GENERATION BEACONS**

2.1 An Experts Working Group (EWG-1/2013) meeting to address the technical specifications required to design and manufacture second generation beacons (SGBs) was held in February 2013. This work was considered by JC-27 and by the Cospas-Sarsat Council meeting in October 2013. Another meeting of the Experts Working Group is scheduled for 10-14 February 2014 (EWG-1/2014).

### ELTs Automatically Triggered In-flight

2.2 Regarding second-generation ELTs automatically activated in-flight, EWG-1/2013 agreed in principle to include future ICAO requirements related to in-flight distress alerts that could provide useful location data in advance of an aircraft crash (with a prediction-accuracy target for the crash location being considered as 6 nautical miles), however further work and consideration was required related to defining location accuracy and the types of aircraft for which the requirement would be applicable, and other methods of in-flight activation, such as manually triggered beacons.

2.3 In June 2013, ICAO's ANC, at its 193rd Session, reviewed several proposed amendments to Annex 6 of the ICAO Convention (16 proposals in total) including the one originally proposed by the ANC WG/PDP (Working Group, Program Deliverable Production) on "accident site location". Despite the fact that support was voiced for the performance-based proposal presented by the FLIRECP (Flight Recorder Panel), the ANC voiced concerns with respect to the language and maturity of the proposal. Concern was also expressed with regard to retrofit requirements and compliance difficulties. Other comments related to ELTs as a primary means for locating wreckage. Based on the discussion, the ANC agreed to refer the proposal back to the FLIRECP for further consideration after an ANC-WG/SRP (Working Group, 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.

2.4 As a consequence of the outcome of the 193rd Session review, no proposed amendments to Annex 6 of the ICAO Convention related to an "accident site location" were to be reviewed at the 194th Session of the ANC (October-November 2013). Instead, the Cospas-Sarsat Secretariat understands that the matter will be reconsidered as part of the next round of review of Annex 6, which could take another 1 to 3 years to be completed. This ICAO activity schedule may be reasonably compatible with Cospas-Sarsat second-generation beacon development, and use of new localization technologies with MEOSAR.

2.5 In parallel with the development of regulations at ICAO, the EUROCAE Council created in July 2013 a new WG-98 on Aircraft Emergency Locator Transmitters with the objective to improve the ED-62A Minimum Operational Performance Specifications for second-generation ELTs and to develop Minimum Aviation System Performance Specification (MASPS) for in-flight activation criteria. The terms of reference for WG-98 address the following areas:

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

2.6 The activities of WG-98 will be harmonized with a new RTCA (U.S. Radio Technical Commission for Aeronautics) SC-229 group created by the RTCA Program Management Committee (PMC) in December 2013. SC-229 will be dealing with second-generation 406-MHz ELT requirements and pre-accident automatic ELT activation. It is planned to have three coordinated meetings per year to discuss the matter, with meetings being held alternatively in France and the USA. The Cospas-Sarsat Secretariat has been asked to participate in these working groups. The activities of both WG-98 and SC-229 are expected to be completed by the end of 2015.

2.7 The benefits of using ELTs with the capability to be triggered in-flight could be considerable for SAR and recovery team operations, as it would address issues related to the uncertainty of ELTs surviving a crash. Furthermore, the concept has support, as evidenced by the initiatives described above.

#### General Second-Generation Beacon Issues

2.8 The Cospas-Sarsat EWG-1/2013 last year reviewed a summary of the USA's experience with on-scene direction-finding and locating using 406-MHz receiving equipment, and agreed that choices of homing technology for SGBs required further discussion in the SAR community. That EWG also continued review of candidate waveforms for second-generation beacons, namely narrow-band and spread-spectrum approaches. An agreed parallel-path approach (simultaneous development of narrow-band and spread-spectrum technologies) was maintained to allow for continued work on both technologies, pending future decisions about whether to adopt one or both. EWG-1/2014, scheduled for February 2014, is expected to refine specific recommendations on the matter.

2.9 SGB message structure and content were discussed at length at both the EWG-1/2013 and the JC-27 meetings and would benefit from further guidance from ICAO and IMO experts. The position of IMO's COMSAR 17 (January 2013) on this matter was noted: that any beacon coding system should provide reliable, accurate, timely and complete information to SAR authorities and that a simplified beacon coding system for next generation beacons should include potential use of the country code, TAC number and a serial number as a beacon unique ID, provided that provision was also made for transmission of the MMSI number. The JC-27 participants noted from discussion that:

- the “country code” must be part of the beacon ID;
- the “mobile identification information” (e.g., MMSI, tail number, 24-bit address, radio call sign, etc.) must be a part of the beacon message and must be transmitted in every burst in a protected field (PDF protected by BCH); and
- there was no objection that, as a minimum, the “country code + TAC number + serial number” should form the beacon ID where “TAC number + serial number” would be unique worldwide.

2.10 At the JC-27 Meeting, the Joint Committee also noted the observation that the proposed scheme to use a 15-Hex ID in the SGB message to provide a unique ID by only including a country code, TAC number and serial number would not address all registration needs of some SPOCs (including RCCs), even if vessel IDs were transmitted during every beacon burst with equal priority and availability as the unique ID, and that consideration should be given to creating a Hex-ID longer than 15 characters to allow both the unique ID and the vessel ID to be contained in a single Hex-ID. The Joint Committee also noted other views that a Hex-ID longer than 15 characters would present issues of compatibility with LEOSAR SARPs and data distribution through the ground network, and that transmitting the vessel ID in a separate, protected field in every burst, with equal priority should be sufficient. The Joint Committee agreed to invite participants to study and propose an extended Hex-ID (more than 15 characters) for second-generation beacons to transmit in the Hex-ID both the beacon unique ID (TAC number, serial number + country code) and the vessel or aircraft ID for database lookup.

#### Beacon GNSS Update Intervals

2.11 Distress beacons that have the capability to provide position data in the distress message (using position information from a local GNSS receiver) operate under the requirement (section 4.5.5.2 of document C/S T.001) that states: “If the beacon has the capability to provide updated position data, subsequent transmissions of the updated position shall not occur more frequently than every 5 minutes.” So although beacons cannot update position more frequently than every 5 minutes, there is no requirement to update positions at any minimum interval once the initial position has been transmitted. JC-27 considered a proposal to establish a maximum position update interval of 20 minutes, to be applied to new beacons submitted for type approval (not to be retroactively applied). The Joint Committee agreed in principle to the concept of including a mandatory GNSS position update schedule, however further work to define the specifics was required, and would be further considered at JC-28.

#### Beacon Return Link Service and IMO Recommendations

2.12 JC-27 took note of the COMSAR 17 guidance related to Return Link Service (RLS), that:

- the current proposals for RLS Type-2 acknowledgements (acknowledgements from the RCC to the beacon) were not supported;
- the current proposals for two-way messaging under the currently developed specifications were not supported;
- the current proposals to have functionality for manipulating distress beacon operating characteristics were not supported;
- the exploration of two-way technology was worthy of future detailed study.

2.13 JC-27 noted from discussion of the COMSAR 17 position, Return Link Service generally, and two-way technologies:

- that the MEOSAR D&E tests would validate RLS Type 1 and Type 2 performance;
- the general interest and agreement to further test the two way communication with RLM Type 2 using “canned messages” (i.e., predetermined messages), even if this new functionality would be mainly relevant to PLBs and not to EPIRBs nor ELTs;
- the future MEOSAR D&E testing of the RLS Type-1 and Type-2 would provide latency statistics, which were of major concern to the ICAO/IMO JWG; but
- as document C/S T.001 beacon compliant protocols did not provide a capability to answer the RLM with “canned messages”, the future tests involving “canned messages” could not be fully representative.

2.14 JC-27 invited participants to further develop RLS capability by way of investigations, tests, trials and development of specifications, including the development of potential standardized two-way messages, and report on their results and findings to future Cospas-Sarsat meetings

2.15 Based on advice from the European Commission, the implementation date for Return Link Service (RLS) protocol beacons was amended to November 2015 (from November 2014).

#### Personal Locator Beacons (Including Those Sometimes Used in Aviation)

2.16 The Joint Committee discussed concerns related to the registration and operation of PLBs in many countries based on a document submitted by France, Switzerland and the UK. Concerns were raised indicating that some Administrations did not allow PLBs and it was not clear whether adequate SAR structure existed to respond to alerts from PLBs. There was no international organization providing guidance on PLB issues (similar to the work of the IMO with EPIRBs and ICAO with ELTs), and as a result there existed no harmonized guidance or regulations regarding PLBs. After extensive discussion, the Joint Committee established a correspondence group led by France on PLB issues, to specifically address:

- revision of document C/S G.003 “Introduction to the Cospas-Sarsat System” to provide clear information and guidance (e.g., PLB issues, battery pack, testing beacons, etc.) to owners or prospective owners, and retailers, of serially-encoded PLBs (who may be unfamiliar with Cospas-Sarsat) to enable them to make well informed decisions regarding PLB purchases and registration;
- provision of guidance to the Secretariat on specific measures to consider in the course of Cospas-Sarsat website redesign ways to provide the above information in an interactive fashion on the website, and to advise on resource requirements for implementation;
- proposals for an appropriate text on to provide guidance on PLB coding and registration for inclusion in the Handbook of Beacon Regulations, document C/S S.007;
- development of an understanding of the level of SAR response to PLB alerts globally; and
- the work necessary to revise document C/S S.007 to include information about the ways that Participants allowed use of serially-encoded PLBs by their citizens or by those who might be under their jurisdiction (for example those non-citizens who might be temporarily visiting for recreational purposes).

2.17 This is a more complex issue than it may initially seem, because some Administrations allow PLBs to be encoded as ELTs, and some Administrations specifically encourage the carriage of PLBs by pilots of light recreational aircraft, such as ultralights, who otherwise might fly without a distress alerting device.

#### General Beacon Issues

2.18 At JC-20 (JC-20/Report, section 5.7.15-16) the Joint Committee noted that as of 1 March 2006, in accordance with the document C/S T.007, Issue 4, approved at CSC 35, new and modified beacons with short format location protocols were no longer accepted. At JC-27, in June 2013, the Joint Committee agreed changes to the filtering process at all MCCs to indicate that all short format Location Protocol beacon messages were invalid.

2.19 A number of Administrations have on a voluntary basis adopted the addition of a checksum feature to provide verification of the 15-Hex ID to help improve the accuracy of beacon registration data. At JC-27, the Joint Committee developed guidelines for inclusion in document C/S G.005 to ensure that the checksum feature was implemented consistently by all Administrations that choose to use it. The Joint Committee invited Administrations that allowed or required the use of a checksum when registering beacons in the IBRD or their national databases to note this requirement within their country’s summary-of-beacon-regulations pages in document C/S S.007 “Handbook of Beacon Regulations”.

**3. ACTION BY THE MEETING**

- 3.1 The meeting is invited to:
- a) note the information contained in this paper; and
  - b) discuss any relevant matters as appropriate.

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