EUROPEAN
COMMISSION

Brussels, 19.1.2021
SWD(2021) 7 final

COMMISSION STAFF WORKING DOCUMENT

Union submission to the International Maritime Organization's 8th session of the Sub-Committee on Navigation, Communications and Search and Rescue on a Two Way Communication service for Cospas-Sarsat distress beacons using the SAR/Galileo Return Link Service

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PURPOSE

This Staff Working Document contains a draft Union submission to the International Maritime Organization's (IMO) 8th session of the Sub-Committee on Navigation, Communications and Search and Rescue (NCSR 8). It concerns a communication service for distress beacons using the Search and Rescue (SAR)/Galileo Return Link Service. Today the SAR/Galileo Return Link Service provides an acknowledgement to the beacon's user that an alert has been detected and localised. The communication service detailed in the draft Union submission will be an evolution of the SAR/Galileo Return Link Service.

NCSR is scheduled to hold its 8th session from 19 to 23 April 2021 in virtual format. The submission deadline is 12 February 2021. This submission is made in accordance with paragraphs 4.6 and 6.12.2 of the Organization and method of work of the Maritime Safety Committee and the Marine Environment Committee and their subsidiary bodies (MSC-MEPC.1/Circ.5/Rev.1).

Regulation (EU) No 1285/2013 of the European Parliament and of the Council of 11 December 2013 concerns the implementation and exploitation of European satellite navigation systems and repeals Council Regulation (EC) No 876/2002 and Regulation (EC) No 683/2008 of the European Parliament and of the Council[1]. It establishes the European satellite navigation policy providing the Union with two satellite navigation systems: The system established under the Galileo programme and the European Geostationary Navigation Overlay Service (EGNOS) system.

According to Art. 12 of the Regulation (EU) No 1285/2013, the Commission shall have overall responsibility for the Galileo and EGNOS programmes. The aim of the Galileo programme is to establish and operate the global satellite navigation and positioning infrastructure specifically designed for civilian purposes, which can be used by a variety of public and private actors in Europe and worldwide. According to Art. 3(d)(iv) of the Regulation (EU) No 1285/2013, the exploitation phase of Galileo programme comprises certification and standardisation operations associated with the programme. Moreover, Art. 13(1) of the Regulation (EU) No 1285/2013 provides that the Commission shall ensure the security of the Galileo programmes, including the security of the systems and their operation.

[1] OJ L 347, 20.12.2013, p. 1

The said draft Union submission therefore falls under EU exclusive competence.[2] This Staff Working Document is presented to establish an EU position on the matter and to transmit the document to the IMO prior to the required deadline of 12 February 2020.[3]

[2] An EU position under Article 218(9) TFEU is to be established in due time should the IMO Maritime Safety Committee eventually be called upon to adopt an act having legal effects as regards the subject matter of the said draft Union submission. The concept of '*acts having legal effects*' includes acts that have legal effects by virtue of the rules of international law governing the body in question. It also includes instruments that do not have a binding effect under international law, but that are '*capable of decisively influencing the content of the legislation adopted by the EU legislature*' (Case C-399/12 Germany v Council (OIV), ECLI:EU:C:2014:2258, paragraphs 61-64).

[3] The submission of proposals or information papers to the IMO, on issues falling under external exclusive EU competence, are acts of external representation. Such submissions are to be made by an EU actor who can represent the Union externally under the Treaty, which for non-CFSP (Common Foreign and Security Policy) issues is the Commission or the EU Delegation in accordance with Article 17(1) TEU and Article 221 TFEU. IMO internal rules make such an arrangement absolutely possible as regards existing agenda and work programme items. This way of proceeding is in line with the General Arrangements for EU statements in multilateral organisations endorsed by COREPER on 24 October 2011.

Sub-Committee on Navigation,
Communications and Search and Rescue
8th session
Agenda item 8

Document Symbol
Document date, i.e. 1 January 2019
Language: i.e. Original: ENGLISH
Pre-session public release: ☒

AGENDA ITEM TITLE

Two Way Communication service for Cospas-Sarsat distress beacons using the SAR/Galileo Return Link Service.

Submitted by European Commission on behalf of the European Union

SUMMARY

Executive summary: This document presents the result of the investigation on the possibility of introducing a two-way communication service on Cospas-Sarsat distress beacons to be provided by the Galileo system by using the SAR Return link. The architecture and the operational concept of the potential new services are presented. NCSR is invited to take note of the information provided and comment as appropriate on the two-way communication service under development by the European Commission via the Galileo Return Link service and the forward Cospas-Sarsat alert system.

Action to be taken: Paragraph 9

Introduction

1 At Cospas-Sarsat Joint Committee Meeting#34 in 2020, European Commission services presented a Working Paper (JC-34/9/3) highlighting its plans for further increasing the portfolio of services offered by the Galileo Return Link capability and their implementation on the 2nd Generation of Cospas-Sarsat Distress Beacons.

2 The Joint Committee recommended an action for Participants to further detail two-way-messaging Return Link Service (RLS) functionalities, taking in consideration the outcome of the discussion held at JC-34 on the matter and to submit the results of their work at relevant Cospas-Sarsat.

3 The Joint Committee also noted that before starting the technical activities in the revision of the standard of the 2nd Generation Distress Beacon for this new service, the interest in the service would have been to be confirmed by Cospas-Sarsat main stakeholders (IMO, ICAO) as for any new service to be introduced in the Cospas-Sarsat system.

4 This paper is presented in order to inform the Sub Committee of the intention of the European Commission to:
- Develop a beacon prototype and perform a demonstration of the TWC service
- Identify SAR services needs with the objective to finalize the requirement for the service.
- Discuss the technical interest in investigating further its development
- Collect advice that could for instance consist of comments and suggestions on the service from a user perspective or the existence of specifications on similar two-way communication services dedicated to search and rescue.

Background

5 The European Commission has completed a study under the Horizon 2020 research programme to investigate the opportunity for developing new services based on the Galileo Return Link Message. One of these services, subject of the present paper, is the two-way communication/messaging over Return Link. The messaging service is a SAR/Galileo service which may use both the Forward Link in the 406 MHz frequency band and the Return Link channels (L1 navigation frequency channel) to exchange messages between the RCC and the user for an active 406 MHz distress beacon.

6 The European Commission has now launched a follow-on activity under the Horizon 2020 research programme in order to develop beacon prototypes and perform a service demonstration. As part of project, the European Commission will endeavour to involve SAR operational services through a wide consultation in order to further elaborate the user requirements, to improve the operational concept and maximise the benefits for the SAR community.

Overview of the two ways communication service

7 The messaging service is a means to improve the situational awareness of a person in distress and can be beneficial in managing the rescue operation. It offers the RCC operator the possibility of sending instructions or collecting information on the on-going distress situation by contacting the beacon user directly: for instance, giving instruction to facilitate the rescue, obtaining information about the number of people to be rescued, the urgency of the situation, etc.

8 It is based on a Short Messaging Service (SMS) using the 406MHz Forward link channel for the communication from Beacon to RCC, and the Navigation frequency bandwidth on the Return-Link Messages (RLM) for the communication from RCC to the beacon.

Application

8.1 Several applications for the two way messaging are set out below, which can be used both in the aviation and maritime domain on condition that the person in distress has access to the beacon (survival, portable):
- To collect additional information on the on-going distress situation regarding the persons in distress, their immediate environment and their equipment.
- To guide the persons in distress to optimize the rescue operation: direct them to an area where they can be easily picked-up,
- To inform the persons in distress on how to behave to maximise their chances of survival.
- To confirm distress in case of manual activation (avoiding a false alert).

8.2 The benefits of this service are to provide a better overview of the distress situation, and to facilitate rescue operations by reducing the time needed for the rescue and for the activation of the rescue services.
In addition, this service could reduce the rate of false alerts thereby avoiding unnecessary mobilization of rescue resources.

Stakeholder Needs

8.3 The user needs for the Two Way Communication Service were gathered since June 2016 by the H2020 projects GRICAS, GaReLiSE and GRIMASSE and presentations in international fora (ICAO/IMO JWG, Cospas-Sarsat JC) provided an opportunity to tackle the essential aspects of the service.

8.4 The conclusion of these consultations identified the RCC operators as primary users of the Two-Way Communication Service during the preparation and coordination of SAR operations. In addition a number of minimum requirements were identified and are described in the following section.

8.5 The demonstration project launched by the European Commission intends to further consolidate the identification of these requirements by involving a large number of SAR operational services in all domains (aeronautical, maritime and land-based SAR).

Minimum requirement

8.6 This type of bidirectional communication is intended for Second Generation Beacons only, thanks to the flexibility they offer on the Forward Link message. In order to receive the message the beacon should be Return Link Capable. After the RCC activates the messaging service, the beacon should maintain the Galileo GNSS receiver continuously powered.

8.7 The two way communications messages will get priority through the Galileo infrastructure providing very short latencies. At present the latency requirements specified for the two way communication service are as follows:
- RCC to beacon : less than 3 minutes
- Beacon to RCC : less than 3 minutes (at the condition that the message is detected and channelled through Galileo ground infrastructure)

The solution should solve language barrier issues and shall be easy to be operated under stressful situations.

Description of the service

8.8 Once the alert is localized and sent by the Cospas-Sarsat System to the RCC responsible for the area of the alert, the RCC operator, informed that the beacon is TWC-capable, will be able to decide whether and when to start the Two-Way Communication Service.

8.9 In order to be able to activate the communication with the beacon in distress, the RCC will access the Galileo system via a secured interface. Through this interface, the RCC will be able to select the questions that, in a form of a command to the beacon, are forwarded to the Galileo Return Link Service Provider (RLSP). The RLSP will then forward the request (command) to the Galileo core system that broadcasts it, embedded in the Navigation signal, via the satellites that are over the area of the distress (from at least two satellites in visibility of the beacon).

8.10 The flexibility given to the RCCs to select different questions, based on scenario and type of beacon in alert, is under study. The objective is to activate several questions with a single command to the beacon.

8.11 Once the Return Link Message, including the command from the RCC, is received by the beacon, the user of the beacon will be able to see on the beacon interface the list of questions. The type of interface and the questions have to be simple enough to be answered by a person in distress. To this aim, the use of pre-defined questions and answers (multiple choices or YES/NO) will be preferable. Nevertheless, the possibility of having a free text interface is not discarded even if language barrier and stressful situation might impair the efficiency of this alternative.

8.12 The beacon will then embed the replies in the appropriate rotating field of the Forward Link Alert Message (FLAM) over the 406 MHz standard alert signal. The alert message containing the replies is then received by the Cospas-Sarsat System and sent to the RCC originator of the question.

8.12 According to the scenario, the beacon may implement algorithms that will down select the questions according to the answer as they are received from the user. This will allow for faster and more accurate collection of information.
The figure below illustrates an example of the operational concept of the Two-Way Communication Service.

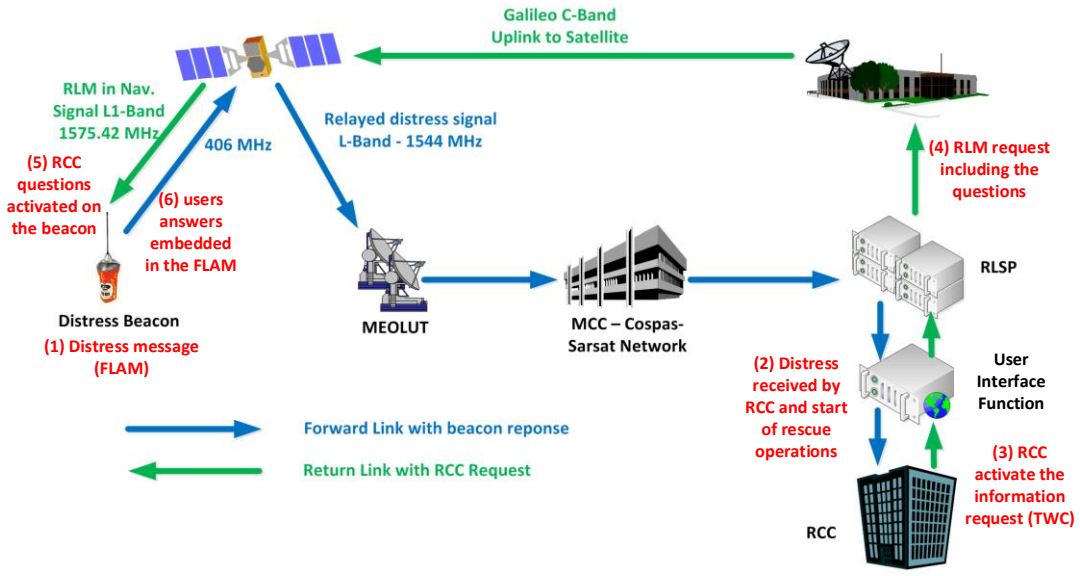

Figure 1 Messaging Return Link Service

Pre-defined text messaging

8.13 The pre-defined question methodology is inspired by the military emergency procedure Medevac used for medical evacuation in stressful situation (battlefield).
The method can been tailored for the emergency situation according to the type of beacons (maritime, PLB, ELT survival) and is currently under development.

8.14 The RCC operator will be able to select the pre-defined questions, based on the scenario and on the type of beacon, via the dedicated secured interface. On beacon side, the

pre-defined answers will be embedded in the beacon in the language of choice of the user on a YES/NO or multiple choice mode.

8.15 The use of pre-defined answers has been conceived to respond to the concern raised at ICAO/IMO JWG regarding the language barrier that might be encountered with users in foreign countries due to the worldwide coverage of the Cospas-Sarsat system.

8.16 Upon receipt of a 2-way messaging request (through the RLM), the beacon displays the questions one after the other and proposes the predefined answers for each. The beacon user selects the appropriate answer on the interface proposed by the beacon. The beacon encodes the responses in the appropriate rotating field of the alert message.

8.17 An example of the pre-defined question which can be tailored according to the domain of application is as follows:

Line 1: Type of distress: A – Sinking B – Fire on-board C –False alert	**Line 2**: Available communication means: A – VHF; B – UHF; C – None.
Line 3: Available equipment: A – Water; B – Food; C – Life jacket; D –Distress rocket; F – None.	**Line 4**: Number of persons in distress: A – 1; B – 2; C – 3-5; D – 5-10 E – more than 10
Line 5: Number of patients/injured persons: A – 1; B – 2; C – 3 to 5 D – more than 5	**Line 6:** Available method of pick-up site marking: A – Panel; B – Pyrotechnic signal; C – Smoke signal; D – None;

Free text messaging

8.18 The free text messaging offers a greater flexibility in the information collection but requires additional complexity in the beacon with the addition of a more complex Human Machine Interface (HMI) text interface. Upon receipt of a free text two-way RLM text question, the beacon displays the question on the HMI, the user edits his answer in a text box, and then validates his entry. The beacon then encodes the response in the appropriate rotating field of the alert message.

8.19 An interesting feature that is under consideration as part of the H2020 study for the Two Way Communication Service regards the HMI that could be developed. Alternatively to or complementing the interface embedded in the beacon, a mobile device (tablet, smartphone, smartwatch) could remotely connect to the beacon (for example via Bluetooth) for easier interaction.

8.20 This solution could potentially help in situations were the user is out of reach of the beacon and whereby he would have the possibility to engage in TWC messaging via this remote interface.

8.21 In addition this remote connectivity to a beacon (via tablet, smartphone, smartwatch) could implement the functionality to remotely activate the beacon. The user in distress could therefore be able to activate a beacon (which would be in listening mode) even when out of reach for example via his/her smartwatch.

Security aspects

8.22 In the preliminary definition of the two way communications over Galileo RLS the safety and security considerations have been taken into account. As regards the beacon, it is important the GNSS receiver integrates a protection against spoofing and jamming. In addition, the Navigation Message Authentication (NMA) mechanism of the Galileo system will be applied also to the RLM. This would provide an additional integrity scheme to the system improving the robustness of the service.

Action requested of the Sub-Committee

9 The Sub-Committee is invited to:

a. Take note of the information on the on-going development of the two-ways communication service that is under consideration for potential implementation in the Galileo System in conjunction with the Cospas-Sarsat system and comment as appropriate.

b. Take note of the intention of the European Commission to perform a demonstration and to refine the users' requirements through SAR services involvement.

c. Provide comments and suggestions as appropriate to Cospas-Sarsat on the implementation of this concept in second generation beacons.

d. Confirm its interest in the continued investigation into the potential development of the two- way communication service and advise the Maritime Safety Committee accordingly.