



**WORKING PAPER**

**TWELFTH AIR NAVIGATION CONFERENCE**

**Montréal, 19 to 30 November 2012**

**Agenda Item 4: Optimum capacity and efficiency – through global collaborative ATM  
4.2: Dynamic management of special use airspace**

**OCEANIC POSITIONING AND TRACKING, AND FLIGHT DATA TRIGGERED TRANSMISSION**

(Presented by the Presidency of the European Union on behalf of the European Union and its Member States<sup>1</sup>; by the other Member States of the European Civil Aviation Conference<sup>2</sup>; and by the Member States of EUROCONTROL)

**SUMMARY**

This paper proposes that actions be taken at global level to improve the position tracking in oceanic and low density remote areas, and to enable the transmission of flight data triggered by safety significant events. This will improve safety in these areas and, at the last, facilitate the efficient work of the accident investigation bodies.

**Action:** The Conference is invited to agree to the recommendation in paragraph 3.

**1. INTRODUCTION**

1.1 This paper proposes to take actions at global level to improve the position tracking in oceanic and low density remote areas, and to enable the transmission of flight data triggered by safety significant events. This will improve safety in these areas and, at the last, facilitate the efficient work of the accident investigation bodies.

1.2 Since June 2009, as a consequence of the tragic loss in the Atlantic Ocean of Air France Flight 447, and the difficulties experienced recovering the flight data recorders, and having in mind other difficult sea recovery operations, significant efforts have been made in Europe to find solutions, in the shortest possible time, to improve the knowledge of the position of flights on oceanic and remote low density airspace, and to enable the transmission triggered by safety significant events of flight data to ground.

1.3 The different activities done during 2010 and 2012 have resulted in several different means to aim at a common objective in terms of knowledge of the position of and aircraft over oceanic and remote areas. This objective can be formulated as follows:

*“All aeroplanes on long range flights over oceanic or remote areas should have on-board means enabling its position to be established with an accuracy of **4NM** in case of accident.”*

<sup>1</sup> Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and United Kingdom. All these 27 States are also Members of ECAC.

<sup>2</sup> Albania, Armenia, Azerbaijan, Bosnia and Herzegovina, Croatia, Georgia, Iceland, Moldova, Monaco, Montenegro, Norway, San Marino, Serbia, Switzerland, The former Yugoslav Republic of Macedonia, Turkey and Ukraine.

## 2. THE INITIATIVES ON OCEANIC POSITIONING AND TRACKING, AND FLIGHT DATA TRIGGERED TRANSMISSION

2.1 Among the different means to aim at the objective, several can be mentioned.

2.2 The Flight Recorder Panel (FLIRECP) proposed the following progressive requirements for large aeroplanes performing long-range over-water flights or performing flights over designated land area:

- a) all aeroplanes of a MCTOM of over 27 000 kg for which the application for type certification is submitted to a Contracting State on or after 1 January 2018, shall have a means to establish the position of an accident within 6NM;
- b) all aeroplanes of a MCTOM of over 5 700 kg and less than 27 000 kg for which the application for type certification is submitted to a Contracting State on or after 1 January 2018, should have a means to establish the position of an accident within 6NM; and
- c) all aeroplanes of a MCTOM of over 27 000 kg for which the individual certificate of airworthiness is first issued on or after 1 January 2020, shall have a means to establish the position of an accident within 6 NM.

2.2.1 Means of compliance with these requirements could be:

- a) ELT integrated in a deployable recorder or automatically activated in flight;
- b) regular transmission of position; and
- c) triggered transmission of flight data.

2.2.2 It is considered that any transmission of position through various systems, like Satcom (satellite communication) or HF data link, could be also acceptable means of compliance. To be effective, a regular transmission should be made every minute in order to comply with the proposed 6 NM requirement.

2.3 The French BEA (Safety Investigation Authority) created two international working groups to analyze this topic. The “Flight Data Recovery” group looked into new technology to safeguard flight data and/or to facilitate the localization and recovery of on-board recorders. The “Triggered Transmission of Flight Data” group analyzed the concept of triggering the transmission of flight data which consists of:

- a) detecting, using flight parameters, whether an emergency situation is upcoming. If so,
- b) transmitting data automatically from the aircraft until either the emergency situation ends, or the aircraft impacts the surface.

2.3.1 Based on the results of the analysis, it was concluded that it is technically feasible and realistic, to reduce the search area location radius of 4 NM for 2020 by:

- a) triggering transmission of appropriate data prior to impact, and/or
- b) automatically activating next generation ELTs prior to impact, and/or
- c) increasing the frequency of position reports to less than 1 minute.

2.3.2 In both cases, the working groups performed cost benefit analysis using a table of underwater searches and the cost of each potential solution. The operational benefits of each potential solution were also

evaluated. The reports can be consulted on the BEA website<sup>3</sup>. The ICAO FLIRECP proposals were based on the conclusion of these working groups.

2.4 In April 2011, the wreckage of AF447 was localized and a few days later the flight recorders were recovered. An extensive analysis of the FDR (Flight Data Recorder) and CVR (Cockpit Voice Recorder) was conducted. The computations detailed in the report of the Triggered Transmission of Flight Data WG were also later on applied to the AF447 data. From this analysis it appears that in the case of AF447, if a vertical deviation of 300 feet had been used as a trigger to start a regular transmission every minute:

- a) the distance between the last position reported and the position of impact would have been 0.49 NM. The second draft version of the ICAO Global Operational Data Link Document (GOLD) document includes procedures for the establishment of deviation event contracts which will alert air traffic services (ATS) personnel as soon as an aircraft deviates from its planned route or level. Once such an alert has been received, the reporting rate will be increased to 64 seconds in an attempt to reduce the search area to an acceptable level; and
- b) a single position transmission at the time of the trigger would have been sent 257 seconds prior to the impact and would not have improved the localization computed by BEA in the first days after the accident. Nevertheless, this transmission would have triggered the alert and may have reduced the delay to find the first floating parts.

2.5 The SESAR Joint Undertaking launched OPTIMI (Oceanic Position Tracking Improvement and Monitoring Initiative) as a collaborative project with air navigation service providers, airlines, manufacturers, SATCOM providers and other entities involved in the aviation sector at the European Atlantic airspace.

2.5.1 The initiative showed<sup>4</sup> an optimum frequency of positioning reporting, balancing both the costs of SAR operations derived from the search area, and the operating cost of reporting, of one positioning reporting each 15 min. From this, and without prejudice to the use of the ADS-C emergency mode, a recommended short term solution was proposed:

- a) use of FANS 1/A based ADS-C periodic position reports with a 15 minutes period.
- b) use of FANS 1/A based ADS-C deviation alert on the following events:
  - 1) lateral deviation of 5 NM from the nominal route;
  - 2) vertical deviation of 300 ft above or below the nominal altitude
  - 3) altitude change/descent rate of 5 000 ft/min; and
  - 4) waypoint change.

2.5.2 Although OPTIMI was not initially conceived for operational safety reasons, an analysis of safety data showed also that additional safety benefits are anticipated in terms of reducing losses of separation. Besides the solution described above, OPTIMI came with some recommendations for the future work of ICAO:

- a) Oceanic Area Control Centres (OACCS) and SAR facilities should jointly review their protocols of notification and intervention in case of emergency to align them with the

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<sup>3</sup> <http://www.bea.aero/en/enquetes/flight.af.447/flight.data.recovery.working.group.final.report.pdf> and <http://www.bea.aero/en/enquetes/flight.af.447/triggered.transmission.of.flight.data.pdf>

<sup>4</sup> OPTIMI /Lot1/WA1-1 - Analysis of the Baseline; OPTIMI/Lot1/WA2-1 - Implementation Feasibility Analysis of the OPTIMI Flight Tracking Service; OPTIMI/Lot5/WP1.2 - Cost Benefit Assessment; OPTIMI/Lot5/WA1-1 - Safety Assessment; OPTIMI/Lot 5/WP2: Regulatory Review; OPTIMI/Lot5/WP3- OPTIMI Recommendation

dispositions of ICAO Annex 12 Search and Rescue and ICAO Doc 9731 International Aeronautical and Maritime Search and Rescue Manual;

- b) The triggering criteria, the most relevant parameters to be downloaded, and the speed of data transmission should be determined;
- c) The establishment of a data repository for downloaded data storage and management either based on central repository configuration or on a configuration of sequential repositories, with due regard to data protection, should be studied; and
- d) further standardization of phraseology for CPDLC messages should be achieved.

2.6 During the Sixteenth Meeting of the CAR/SAM Regional Planning and Implementation Group (GREPECAS/16) in April 2011, a paper<sup>5</sup> was presented, describing the interest of Brazil's and the SESAR Joint Undertaking to expand the Oceanic Position Tracking Improvement and Monitoring functionalities, defined for the Atlantic airspace in the NAT, EUR and AFI regions, to the CAR and SAM Atlantic airspace, through the sharing of technical and operational information on OPTIMI, promoting jointly global interoperability to enable a wide deployment of this functionality. The paper identified also some potential improvement areas connected to the initiative.

### 3. ACTION BY THE CONFERENCE

3.1 Considering the already existing need to improve the search and rescue of survivors, and the localization of wreckage in the undesirable event of future accidents, the Conference is invited to:

- a) note the information contained in this paper;
- b) adopt the following recommendation:

**Recommendation 5/x - Positioning and tracking over oceanic and remote areas, and flight data triggered transmission**

That ICAO:

- a) evaluate, as a matter of urgency, the necessary changes in the field of transmission of flight data, based on the contents of this working paper
- b) develop amendments to the appropriate Annexes to the Convention.

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<sup>5</sup> Agenda Item 3: Performance framework for Regional Air Navigation Planning and Implementation: OPTIMI (Oceanic Position Tracking Improvement and Monitoring)