



INTERNATIONAL CIVIL AVIATION ORGANIZATION
Western and Central African Office
Workshop on the Interconnection of Aeronautical Surveillance Systems
(Dakar, 14 – 16 April 2014)

Agenda Item 8: Future development on aeronautical surveillance systems interconnection

*Review of the Recommendations of ICAO 12th Air Navigation Conference
pertaining to Aeronautical Surveillance*

(Presented by the Secretariat)

Summary

This Working Paper presents review of the recommendations of the ICAO 12th Air Navigation Conference pertaining to Aeronautical Surveillance Systems.

Action by the meeting is at Paragraph 3.

Reference

- Report of ICAO 12th Air Navigation conference
- Draft Global Air Navigation Plan (GANP, Doc. 9750)

Related ICAO Strategic Objectives: A: Safety; B: Air Navigation Capacity and Efficiency

Related ASBU Bloc 0 Modules, Performance Improvement Area:

PIA 2 - Globally Interoperable Systems and Data: B0 FICE

PIA 3 - Optimum Capacity and Flexible Flights: B0 ACAS; B0 ASEP; B0 ASUR; B0 OPFL; B0 SNET

PIA4 - Efficient Flight Path: B0 TBO

1. INTRODUCTION

- 1.1 The ICAO 12th Air Navigation Conference was held from 19 to 30 November 2012 in the ICAO Headquarters, Montreal, Canada and its outcome adopted by the 38 Assembly of ICAO held in Montreal from 24 September 4 October to 2013 (Resolution A38-2 refers).
- 1.2 The Conference aim was to enable contracting States to agree to a new way of global planning, developing standards, and identifying and implementing operational improvements.
- 1.3 Fifty-six (56) Recommendations developed by the Conference were reviewed by the Air Navigation Commission (ANC) on 28 January 2013 in its 192nd session, 5th Meeting. Air Navigation Commission's recommendations on the AN-Conf/12 report were presented to the Council in its 198th Session on 8 Feb 2013.

2. DISCUSSION

2.1 The Conference addressed a range of technology issues and enablers that will support the future aviation systems and agreed that available and emerging technologies and a supporting regulatory framework, including ICAO Standards, Recommended Practices, Procedures and guidance material would be necessary to support their successful implementation.

2.2 In order to achieve operational improvements the Conference noted that there was a need to ensure that the minimum set of global CNS systems required to meet aviation's safety and capacity requirements was clearly identified; that where necessary duplication exists, reasoned justification is provided; and that, when new systems and technologies are introduced, implementation strategies clearly define sunset clauses to phase out older systems where this is feasible.

2.3 Therefore it appeared that technology roadmaps and regional planning, supported by performance measurement metrics would be necessary to measure progress and the effectiveness of implementation. This CNS infrastructure will comprise set of key enablers for the implementation of the modules of the the ICAO Aviation System Block Upgrades (ASBUs).

2.4 In this regard, the Conference confirmed that Surveillance systems are fundamental components of any ATM system and will be required to support both current services and the more demanding future. This will meet ICAO vision of an integrated, harmonized and globally interoperable air traffic management (ATM) system defined in the ICAO *Global Air Traffic Management Operational Concept* (Doc 9854) aiming to bringing substantial safety and capacity benefits.

2.5 Based on the assessment of the performance of the independent surveillance systems (PSR, SSR, MLAT) with regard to the status of maturity of the dependant surveillance systems (ADS-C, ADS-B), the Conference reached the conclusion that a wide range of drivers are contributing to the manner in which the surveillance infrastructure would need to operate in the future and those specific to the surveillance environment include amongst others:

- a) Increasing traffic densities;*
- b) New construction techniques for aircraft and all new types of aircraft (VLJs and UAS) may place new requirements both for ground surveillance (integration of UAS in non-segregated airspace) and for airborne surveillance (support to “detect and avoid”);*
- c) Increasing use of secondary and tertiary airports;*
- d) New operational improvements stemming from initiatives (SESAR, CARATS, NextGen, etc.);*
- e) Obsolescence of old/existing technology and the availability of new technologies and techniques offering superior performance at reduced cost;*
- f) Introduction of spectrum charging schemes; and*
- g) RF congestion – the frequency spectrum (1030/1090 MHz) allocated to aeronautical safety and regularity of flight is, in certain airspace, already heavily congested by non-optimized civil and military systems.*

2.6 Taking into consideration the evolving technologies the Conference noted that the evolving surveillance in 2030 will probably be achieved using the techniques currently available, based on cooperative surveillance systems using 1030/1090 MHz RF bands (SSR Mode S, WAM and ADS-B) complemented, where necessary, with some form of independent non-cooperative means of detection such as conventional PSR or MSPSR. The important trends of the next twenty years will be that:

- a) Different techniques will be mixed in order to obtain the best cost benefit depending on local constraints; and*
- b) The airborne part of the surveillance system will become more important in the total surveillance system and should be globally interoperable in order to support the various surveillance techniques which will be used.*

2.7 The surveillance techniques established over recent years will thus form the foundations for ASBU Blocks 1, 2 and 3, could meet all the demands placed upon it, and support the demanding separation minima required to achieve those foreseen operational requirements. However, the timely provision of changes should be carefully managed to minimize the burden on aircraft operators and maintain interoperability with military and State authorities.

2.9 The most significant difference between the surveillance infrastructures of the recent past and that which will be established to support ASBU Block 3 is a shift in functionality from the ground-based sensors to a comprehensive suite of avionics supporting a range of demanding surveillance applications.

2.10 The position and other airborne parameters, including short-term intent indication, will be provided by the airborne part of the surveillance system (ADS-B OUT) and will also be directly used by other aircraft (ADS-B IN) to support new surveillance applications. Airborne surveillance applications also represent an important change in perspective from current air traffic control (ATC) practices.

2.11 The Conference indicated that subject to further development, use of ADS-B receivers located on low earth orbit satellites could provide a means for ATM surveillance in all volumes of airspace, initially in regions such as oceanic or remote areas, in which it is currently difficult or even impossible to provide through conventional ground-based systems.

2.12 It was reported by the Conference that the use of satellite receivers for ADS-B surveillance is being evaluated by several manufactures aiming for the near-term implementation. The technology would provide extraordinary cost benefit for all airspace users and this space-based surveillance capability will be evaluated during the Block 0/1 timeframe (2013-2023) for technical feasibility.

2.13 The technical assessment will address the integration with other enabling technologies (communications and navigation) as well as trade-off studies to evaluate technical alternatives. These will be coupled with a regional or State business case to determine whether to proceed with this technology for implementation in the Block 2 timeframe. If the business case and operational needs can be met through such a technique then this has the potential to complement or replace many surveillance services currently achieved using ADS-C.

2.13 It is expected that modern surveillance systems (and the tools they support) provide benefits in terms of safety through the use of airborne information automatically downlinked by surveillance systems amongst which the following advantages:

- a) Clear presentation of callsign and flight level;*
- b) Improved situational awareness;*
- c) Use of certain down linked aircraft parameters (DAPs) and 25 ft altitude reporting to improve radar tracking algorithms;*
- d) Display of vertical stack lists;*
- e) Reduction in radio transmission (controller and pilot);*
- f) Improve management of aircraft in stacks; and*
- g) Reduction in level busts*

2.14 Improved ACAS has the potential to bring additional significant operational and safety benefits to the implementation of ACAS (TCAS version 7.1) by the introduction of two optional functions: auto-pilot/flight director (AP/FD) connection and altitude capture (**AltCapt**). Plans for a new collision avoidance system are also proposed by ASBU to ensure the adaptation to future ATM environments.

2.15 With regard to this evolving situation the 12th Air Navigation Conference formulated seven (07) Recommendations aiming to guide States and Air Navigation Service Providers plan and implement surveillance systems with regards to the requirements of the future ATM.

- **Recommendation 1/4 – Architecture**
- **Recommendation 1/7 – Automatic dependent surveillance — broadcast**
- **Recommendation 1/8 – Rationalization of radio systems**
- **Recommendation 1/9 – Space-based automatic dependent surveillance — broadcast**
- **Recommendation 4/2 – ICAO aviation system block upgrades relating to ground surveillance using automatic dependent surveillance – broadcast/multilateration, air traffic situational awareness, interval management and airborne separation**

Recommendation 4/3 – ICAO aviation system block upgrades relating to airborne collision avoidance systems and ground-based safety nets

Recommendation 4/4 – Positioning and tracking over oceanic and remote areas, and flight data triggered transmission

2.16 The planning, the implementation and the operation of surveillance systems within the AFI airspace should take due consideration of the surveillance Roadmap developed by the 12th Air Navigation Conference and included in the Global Air Navigation Plan.

The planning and implementation of surveillance systems in AFI region in the framework of the provision of ICAO ASBU concept should consider inter alia:

- **Effective operational requirements determined by a detailed assessment of the capacity needs of the regional ATM system**
 - ✓ *Airspace structure, Traffic flow, separation criteria;*
 - ✓ *Air Traffic Service constraints;*
 - ✓ *Fleet equipage and equipage trend;*
- **Availability and sustainability of technologies candidate to provide surveillance function effectiveness**
- **Case to case cost/benefit assessment with regards to safety maintenance criteria;**

3. ACTION TO BE TAKEN BY THE MEETING

The meeting is invited to:

- a) Take note of the information given above;
- b) Recommend Administration/Organizations to align their projects of implementation of surveillance systems with the provision of the GANP developed in accordance with the ICAO Aviation Systems Blocs Upgrades (ASBU) concept