



International Civil Aviation Organization

**SIXTEENTH MEETING OF THE
COMMUNICATIONS/NAVIGATION/SURVEILLANCE AND
METEOROLOGY SUB-GROUP (CNS/MET SG/16) OF APANPIRG**

Bangkok, Thailand, 23 – 27 July 2012

Agenda Item 5: Navigation
...
5) other radio navigation issues

Agenda Item 6: Surveillance
...
3) discuss other surveillance related issues

**REGULATORY AVIONICS MANDATES APPLICABLE TO AUSTRALIAN AIRCRAFT IN
SUPPORT OF THE FUTURE AIR TRAFFIC MANAGEMENT SYSTEM**

(Presented by Australia)

SUMMARY

This paper details the regulatory requirements (mandates) being established by the Civil Aviation Safety Authority Australia for aircraft CNS avionics in support of the future ATM system being implemented by the Australian ANSP, Airservices Australia.

This paper relates to –

Strategic Objectives:

A:Safety – Enhance global civil aviation safety

Global Plan Initiatives:

- GPI-5 RNAV and RNP (Performance-based navigation)
- GPI-7 Dynamic and flexible ATS route management
- GPI-9 Situational awareness
- GPI-12 Functional integration of ground systems with airborne systems
- GPI-15 Match IMC and VMC operating capacity
- GPI-21 Navigation systems
- GPI-22 Communication infrastructure

1. INTRODUCTION

1.1 In January 2012, the Civil Aviation Safety Authority (CASA) Australia issued a Notice of Proposed Rule Making (NPRM) for the fitment of aircraft avionics to support the airborne segment of the future Air Traffic Management System that is currently being rolled out by Airservices Australia (Airservices).

Agenda Items 5 & 6

23/07/12

1.2 The objective of the rulemaking is to improve the safety and efficiency of Air Traffic Management (ATM) and for aircraft-to-aircraft conflict alerting and collision avoidance. This is to be achieved by implementation of modern navigation and surveillance infrastructure utilising inter-operable satellite, aircraft and ground based electronic systems which comply with the relevant ICAO standards.

1.3 This paper itemises the proposed aircraft avionics mandates and the associated compliance timelines. The mandates are applicable to Australian registered aircraft, not foreign registered aircraft operating to Australia. The relevant CASA NPRM is No. 1105AS which can be viewed on the CASA internet website at the following link:

http://www.casa.gov.au/scripts/nc.dll?WCMS:STANDARD::pc=PC_100829

1.4 The proposed mandates described in section 2.3 below for ADS-B are additional to the existing mandate for aircraft ADS-B equipment for flight in the upper airspace (at/above Flight Level 290) which has a date of effect on 12 December 2013. That mandate is applicable to Australian aircraft and also to foreign registered aircraft operating into Australia as a condition placed on the relevant AOC of the foreign operator.

2. DISCUSSION - AIRCRAFT MANDATES TO SUPPORT THE FUTURE ATM SYSTEM – Applicable to Australian registered aircraft

2.1 Equipment mandates for GNSS Navigation under the IFR (SATNAV)

2.1.1. **Mandate 1** – Existing aircraft (defined as those placed on the Australian Aircraft Register before 6 February 2014) must be equipped for GNSS navigation for flight under the Instrument Flight Rules (IFR) on/after 4 February 2016.

2.1.2 **Mandate 2** – New aircraft (defined as those first placed on the Australian Aircraft Register on/after 6 February 2014), must be equipped for GNSS navigation under the IFR on/after 6 February 2014 in accordance with the standards meeting TSO-C145 or -C146 or -C196 or be otherwise approved by CASA as a Required Navigation Performance (RNP) capable aircraft.

2.2 Equipment mandates for fitment of Mode S transponders (with ADS-B OUT capability)

2.2.1 **Mandate 3** – Aircraft first placed on the Australian Civil Aircraft Register on/after 6 February 2014 must be Mode S transponder equipped for flight in airspace classifications A, B, C or E or for flight above 10000FT in Class G airspace. (Exemptions apply in Class E and Class G only to aircraft that do not have an engine or do not have sufficient engine-driven electrical power generation capacity to power a Mode S transponder.)

2.2.2 **Mandate 4** – Aircraft operating at Melbourne, Sydney, Brisbane and Perth Airports must be Mode S transponder equipped on and after 4 February 2016. This requirement is to support interoperability with the Advanced Surface Movement Guidance and Control System (A-SMGCS) that has been installed by Airservices Australia for surveillance of the manoeuvring area by ATC at these aerodromes. It also supports the WAM based Parallel Runway Monitoring (PRM) system at Sydney Airport.

2.2.3 **Mandate 5** - transponder retrofits: On and after 6 February 2014, for any new transponder retrofit installation undertaken in an aircraft, it is mandatory to install a Mode S transponder with ADS-B capability, not a Mode A/C transponder, although the associated GNSS unit to provide position source input is not necessarily required to be installed at that time of retrofit.

2.3 Further mandates for ADS-B OUT equipment

2.3.1 **Mandate 6** – Existing aircraft (defined as those placed on the Australian Civil Aircraft Register before 6 February 2014) undertaking any flight under the IFR must be equipped to transmit ADS-B on and after 2 February 2017.

2.3.2 **Mandate 7** – New aircraft (defined as those first placed on the Australian Civil Aircraft Register on/after 6 February 2014) undertaking any flight under the IFR must be equipped to transmit ADS-B on/after 6 February 2014.

2.3.3 **Mandate 8** – Any aircraft undertaking any flight under the IFR in airspace classes A, B, C or E within an area 500NM from the north of Perth Airport to 500NM East of Perth Airport must be equipped to transmit ADS-B on/after 4 February 2016. This requirement is to ease airspace congestion created by the Fly In/Fly Out of mining workers that has been generated by the industrial resources mining activity in Western Australia.

2.4 Equipment mandate for fitment of TCAS II Version 7.1 avionics (ICAO standard)

2.4.1 **Mandate 9** – An aircraft that is a turbine powered aeroplane used in public transport services first placed on the Australian Civil Aircraft Register on/after 1 January 2014 that has a maximum certified take-off weight in excess of 5700 kg or has a certified passenger capacity of more than 19 passengers must be fitted with an approved TCAS II Version 7.1. This mandate is in accordance with the ICAO Annex 10 Volume IV standard for forward fitment in new turbine powered aeroplanes.

2.5 Reasons for the proposed mandates

2.5.1 The following is a brief general summary of the reasons for requiring applicable aircraft to be fitted with the modern navigation and surveillance technology.

2.5.1.1 Requirement for aircraft GNSS navigation for flight under the IFR

2.5.1.1.1 The reason for transitioning to GPS is to provide the enabling technology to support PBN and APV deployment in Australia consistent with ICAO Direction and Resolutions A36/23 and A37/11. It is also consistent with the draft ANC-12 WP6 and ASBUs B0-10 and B0-65.

2.5.1.1.2 The driver for compliance timing is that it obviates the need for the Australian ANSP to replace a large number of its existing ground-based navigations aids (mostly non-directional beacons (NDB) and VHF Omni Radio Range (VOR) equipment installations) which are rapidly approaching or already at end-of-life. Airservices Australia has estimated the cost saving of contraction to a backup navaid network to be about \$120 million. In addition, advanced aircraft navigation applications such as Required Navigation Performance (RNP) navigation, User Preferred Routes, Flexi-Tracks and Area Navigation based Standard Instrument Departures and Standard Terminal Approach Routes are available using the GNSS.

2.5.1.1.3 For the foreseeable future some 215 existing terrestrial navigation aids are to be retained as the contingency means of providing alternative navigation in this decade for aircraft that retain receivers for ground-based navigation aid capability. The remaining (some 200) navaids are mostly at end-of-life, do not have continuing spares support by manufacturers and are difficult and expensive to maintain and cannot be effectively or economically supported.

Agenda Items 5 & 6

23/07/12

2.5.1.1.4 Unless weather is below minima requiring a planned alternate aerodrome, aircraft that are GNSS equipped for primary means navigation with TSO- C145 or –C146 or –C196 or otherwise approved by CASA for RNP will also be able to conduct operations without a requirement for the carriage of fuel for flight to an alternate aerodrome that has a conventional navaid approach. This brings significant operational efficiency benefits.

2.5.1.2 Requirement for Mode S transponders (with ADS-B OUT capability)

2.5.1.2.1 The technical advantages of Mode S in comparison with Mode A/C transponders and ground SSR technology are significant in both safety and efficiency terms.

2.5.1.2.2 Aircraft Mode S transponder targets provide improved resolution, less garbling, less erroneous data, less clutter, and the display of aircraft identification (call-signs) and other flight parameters on ATC screens. This improved operation applies for terminal and en-route SSR radars operating in Mode S, and also at those major airports that have the Advanced Surface Movement Guidance and Control System (A-SMGCS) and Multilateration systems of electronic surveillance based on Mode S and ADS-B technology. Airservices Australia operates the A-SMGCS equipment for tower control at Sydney and Melbourne Airports. Similar systems are also presently being implemented at Brisbane and Perth Airports.

2.5.1.2.3 The advantage in the operation of A-SMGCS and Multilateration systems at aerodromes is as follows: Mode S equipped aircraft transmit a 24 bit aircraft address and a flight identification unique to every aircraft, practically eliminating identification errors by the surveillance system. The Multilateration system has difficulty discriminating Mode A responses because of the non-directional antennae necessary for its operation. Mode S transponders can be interrogated on the aerodrome surface without other aircraft replying and corrupting the received signal. Unlike Mode A/C transponders, Mode S transponders operate on the aerodrome surface without creating ATC screen clutter and erroneous display of aircraft.

2.5.1.2.4 Migration to Mode S transponders to gradually replace Mode A/C transponders will also achieve the transition to ADS-B OUT if the Mode S transponder has ADS-B OUT capability, as required by the relevant mandates in the NPRM. With the addition of compatible GNSS navigation equipment as also required by the mandates in the NPRM, the geographic position source data and its level of integrity assurance is also provided to the Mode S transponder for the transmission of ADS-B position.

2.5.1.3 Requirement for TCAS II Version 7.1 as forward fit in new turbine-powered passenger transport aircraft

2.5.1.3.1 TCAS II Version 7.1 addresses two safety issues that arose following a mid-air collision of two high capacity passenger transport aircraft near Uberlingen, Germany in 2002. Version 7.1 corrects missed and late TCAS resolution reversals and changes the current TCAS II aural Resolution Advisory warning.

2.5.1.3.2 In April 2010, ICAO issued State Letter AN 7/1.1.1.45-10/28 (Adoption of Amendment 85 to Annex 10 to the Convention on International Civil Aviation) for the adoption of an international aviation standard to Annex 10 Volume IV requiring TCAS II Version 7.1 as forward fitment in newly manufactured turbine-powered aircraft with a maximum weight above 5700kg or certified to carry more than 19 passengers from the date of 1 January 2014. Version 7.1 of TCAS II is now the industry standard for turbine-powered passenger transport aeroplanes.

3. ACTION BY THE MEETING

3.1 The Meeting is invited to note Australia's avionics mandates supporting the future ATM system being implemented by the ANSP, Airservices Australia.

Contact:

brian.harris@casa.gov.au