



International Civil Aviation Organization

**THE NINTH MEETING OF AUTOMATIC
DEPENDENT SURVEILLANCE – BROADCAST
(ADS-B) STUDY AND IMPLEMENTATION
TASK FORCE (ADS-B SITF/9)**



Jakarta, Indonesia, 18 -19 August 2010

Agenda Item 7: Development of Asia/Pacific Regional ADS-B implementation plan

- Develop a sample document for the regional harmonized requirements for ADS-B OUT avionics equipage.

**AUSTRALIAN RULE FOR AIRCRAFT ADS-B AVIONICS – AS REVISED
DECEMBER 2009**

(Presented by Australia)

SUMMARY

The purpose of this IP is to inform the ADS-B SITF/9 Meeting that the Civil Aviation Safety Authority (CASA) issued legislative amendments in December 2009 which revised the specification of technical standards for aircraft ADS-B equipment configurations.

1. INTRODUCTION

1.1 In December 2009, the Civil Aviation Safety Authority (CASA) amended its existing Civil Aviation Orders relevant to aircraft ADS-B equipment requirements. A primary consideration of the amendment was to take account of the information presented at the ADS-B SITF/8 Meeting held in Hanoi in May 2009 and the Final Report of that meeting as endorsed by APANPIRG/20 in September 2009. The scope of the amendments also took account of international developments in ADS-B standards since the time of the initial promulgation of the rules in 2006.

1.2 The main issue taken into consideration was the Selective Availability Aware (SA Aware) capability of the GNSS equipment. That topic was discussed in some depth at the ADS-B SITF/8 Meeting. The SA Aware feature has been shown to provide increased availability of the aircraft position integrity containment radius HPL (Horizontal Protection Limit) of the GNSS derived aircraft position that is transmitted by ADS-B.

1.3 The previous Australian rule required SA Aware to be incorporated in the GNSS system of an aircraft after June 2012. Most airline aircraft, other than some of those manufactured in the last 4-5 years, do not have that feature, meaning that they would need a retrofit modification of the GNSS receivers. The amendment now permits aircraft manufactured before 28 June 2012 to retain existing GNSS equipment not having SA Aware. The result is significant cost savings in not replacing existing equipment. However, aircraft newly manufactured after 28 June 2012 will be required to be fitted with GNSS equipment having SA Aware. The GNSS integrity features of Fault Detection and Exclusion (FDE) and the output of Horizontal Protection Level (HPL) are retained for all aircraft, for safety assurance.

1.4 The revised rules are applicable to Australian aircraft and foreign aircraft operating in Australia. Existing airline aircraft having FDE and HPL technology in their GNSS systems are not affected. This includes most existing airline aircraft used on international services.

1.5 The pre-existing date of 12 December 2013 after which all aircraft operating in airspace at and above FL290 in Australia must have ADS-B OUT equipment is not affected by the amendments.

2. EXPLANATION

2.1 In addition to the information presented at the ADS-B SITF/8 Meeting, CASA has taken account of information from a number of sources (airline aircraft manufacturers, airlines, IATA) concerning:

- a) the possible retention of certain airline aircraft types that were previously planned to be retired by airlines prior to mid-2012, coupled with delays in delivery of new technology aircraft;
- b) the situation regarding the availability and timing of retrofit kits from aircraft manufacturers to equip current airline aircraft with certified GNSS and ADS-B equipment installations meeting the previous Australian standards;
- c) the amount of time necessary for airlines to install the retrofit kits to their aircraft (mainly B747-400; A-330; B767; B737-400, etc.) during major maintenance; and
- d) the advent of a new standard for GNSS equipment (TSO-C196) issued by the FAA, and the relevant CASA Australian Technical Standards (ATSOs 1004 and 1005) have been brought up to date. These have been included in the amendment.

2.2 As the change to allow SA Aware has an affect on air traffic surveillance by ATC, the proposal was co-ordinated with Airservices Australia. Safety outcomes will not be affected as Airservices Australia is planning to make changes to the current integrity level thresholds of aircraft ADS-B transmissions for display on ATC screens, following consideration of that matter by the ICAO SASP.

2.3 The revision will not impose any additional requirements on aircraft operators. For many existing aircraft, there will be significant cost savings in that operators will not have to modify GNSS installations with expensive retrofit modifications (that are not available and would have had to be produced and certified by aircraft manufacturers.)

2.4 The links below are to the relevant Civil Aviation Orders (CAOs) on CASA's website. These legal instruments have similar text; they are applicable to all Australian aircraft (CAO 20.18), to foreign aircraft when operating in Australian territory under an Air Operator's Certificate (CAOs 82.1, 82.3 and 82.5), and to foreign aircraft engaged in private operations in Australian territory (CASA legislative instrument 521/09):

CAO 20.18 Amendment Order (No 3) 2009 (Aircraft Equipment - basic operational requirements): See section 9B and Appendix XI

http://casa.gov.au/wcmswr/_assets/main/download/orders/cao20/2018.pdf

CAO 82.1 Amendment Order (No 2) 2009 (Conditions on Air Operator's Certificates authorising charter operations and aerial work operations): See paragraph 5.8 and Appendices 3 and 4

http://casa.gov.au/wcmswr/_assets/main/download/orders/cao82/8201.pdf

CAO 82.3 Amendment Order (No 3) 2009 (Conditions on Air Operator's Certificates authorising regular public transport operations in other than high capacity aircraft). See paragraph 10.8 and Appendices 6 and 7.

http://casa.gov.au/wcmswr/_assets/main/download/orders/cao82/8203.pdf

CAO 82.5 Amendment Order (No 3) 2009 (Conditions on Air Operator's Certificates authorising regular public transport operations in high capacity aircraft). See paragraph 10.8 and Appendices 4 and 5.

http://casa.gov.au/wcmswr/_assets/main/download/orders/cao82/8205.pdf

CASA Miscellaneous Instrument 521/09 - Direction - Use of ADS-B in foreign aircraft engaged in private operations in Australian territory.

http://casa.gov.au/wcmswr/_assets/main/rules/miscinst/2009/casa521.pdf

3. RECOMMENDED ACTION

3.1 A copy of the ADS-B rule as applicable to foreign airline aircraft (CAO 82.5) is attached for the information of ADS-B SITF.

3.2 Australia is confident that the revisions are in keeping with all APANPIRG Conclusions and guidelines, and in particular with Conclusion 20/55 concerning forward fitment requirements for SA Aware and FDE functionality of GNSS equipment.

3.3 The ADS-B SITF/9 Meeting is invited to note the revised Australian standards for ADS-B avionics.

Extract from Civil Aviation Order 82.5

Australian ADS-B rule applicable to foreign airline aircraft operating in Australia - Extract from Civil Aviation Order 82.5

Paragraph 10.8

- 10.8 The operator of a foreign registered aircraft must ensure that it complies with the requirements (*Directions*) in Appendix 4. The definitions in Appendix 4 also apply for Appendix 5.

Appendix 4

Directions relating to carriage and use of automatic dependent surveillance – broadcast equipment

- 1 In this Appendix:

ADS-B means automatic dependent surveillance – broadcast.

ADS-B test flight means a flight to prove ADS-B transmitting equipment that is newly installed on the aircraft undertaking the flight.

aircraft means a foreign aircraft.

aircraft address means a unique combination of 24 bits assigned to an aircraft by, or under the authority of, an NAA for the purpose of air to ground communications, navigation and surveillance.

approved equipment configuration means an equipment configuration that:

- (a) meets the conditions for approval set out in Appendix 5; or
- (b) is approved in writing by CASA.

Note Equipment configurations approved by CASA are published in Appendix D of Advisory Circular 21-45.

ATSO means Australian Technical Standard Order of CASA.

EASA means the European Aviation Safety Agency.

EASA AMC 20-24 means EASA document AMC 20-24 titled *Certification Considerations for Enhanced ATS in Non-Radar Areas using ADS-B Surveillance (ADS-B-NRA) via 1090 MHz Extended Squitter*, dated 2 May 2008.

ETSO means European Technical Standard Order of the EASA.

FAA means the Federal Aviation Administration of the United States.

FDE means Fault Detection and Exclusion, a feature of a GNSS receiver that excludes faulty satellites from position computation.

FL 290 means flight level 290.

Note Flight level 290 is defined in subregulation 2 (1) of CAR 1988.

GNSS means the Global Navigation Satellite System installed in an aircraft to continually compute the position of the aircraft by use of the GPS.

GPS means the Global Positioning System.

HPL means the Horizontal Protection Level of the GNSS position of an aircraft as an output of the GNSS receiver or system.

NAA has the same meaning as in regulation 1.4 of the *Civil Aviation Safety Regulations 1998*.

Note “NAA, for a country other than Australia, means:

- (a) the national airworthiness authority of the country; or
- (b) EASA, in relation to any function or task that EASA carries out on behalf of the country.”

NIC means Navigation Integrity Category as specified in paragraph 2.2.3.2.7.2.6 of RTCA/DO-260A.

NUCp means Navigation Uncertainty Category — Position as specified in paragraph 2.2.8.1.5 of RTCA/DO-260.

RTCA/DO-229D means document RTCA/DO-229D titled *Minimum Operational Performance Standards for Global Positioning System/Wide Area Augmentation System Airborne Equipment*, dated 13 December 2006, of the RTCA Inc. of Washington D.C. USA (**RTCA Inc.**).

RTCA/DO-260 means RTCA Inc. document RTCA/DO-260 titled *Minimum Operational Performance Standards for 1090 MHz Automatic Dependent Surveillance – Broadcast*, dated 13 September 2000.

RTCA/DO-260A means RTCA Inc. document RTCA/DO-260A titled *Minimum Operational Performance Standards for 1090 MHz Automatic Dependent Surveillance – Broadcast (ADS-B) and Traffic Information Services – Broadcast (TIS-B)*, dated 10 April 2003.

SA means Selective Availability, and is a function of the GPS that has the effect of degrading the accuracy of the computed GPS position of a GNSS-equipped aircraft.

TSO means Technical Standard Order of the FAA.

Note NAA is defined in regulation 1.4 of the *Civil Aviation Safety Regulations 1998*.

- 2 If an aircraft carries ADS-B transmitting equipment for operational use in Australian territory, the equipment must comply with an approved equipment configuration.
- 3 If an aircraft carries serviceable ADS-B transmitting equipment for operational use in Australian territory, the equipment must transmit:
 - (a) a flight identification that corresponds exactly to the aircraft identification mentioned on the flight notification filed with, or relayed to air traffic control (**ATC**) for the flight; or
 - (b) another flight identification directed or approved by ATC.
- 4 If an aircraft carries serviceable ADS-B transmitting equipment that complies with an approved equipment configuration, the equipment must be operated continuously during the flight in all airspace at all altitudes unless the pilot is directed or approved otherwise by ATC.
- 5 If an aircraft carries ADS-B transmitting equipment which does not comply with an approved equipment configuration, the aircraft must not fly in Australian territory unless the equipment is:
 - (a) deactivated; or
 - (b) set to transmit only a value of zero for the NUCp or NIC.

Note It is considered equivalent to deactivation if NUCp or NIC is set to continually transmit only a value of zero.

- 6 However, the equipment need not be deactivated as mentioned in clause 5 if the aircraft is undertaking an ADS-B test flight in VMC in airspace below FL 290.
- 7 On and after 12 December 2013, if an aircraft operates at or above FL 290, it must carry serviceable ADS-B transmitting equipment that complies with an approved equipment configuration.

Note On and after 12 December 2013, an aircraft must carry and continuously operate compliant ADS-B transmitting equipment in accordance with clause 7.

Apart from this, there is no obligation to carry compliant ADS-B transmitting equipment.

However, including the effect of clause 4 above, if compliant ADS-B transmitting equipment is in fact carried, whether voluntarily or in accordance with the obligation under clause 7, it must be operated continuously in all airspace, at all altitudes.

- 8 Clause 7 does not apply to an aircraft if the aircraft owner, operator or pilot has written authorisation from CASA for the operation of the aircraft without the equipment.

Appendix 5

Paragraph 10.8 and definition of *approved equipment configuration*
in clause 1 of Appendix 4

Part A

Approved equipment configuration

- 1 An equipment configuration is approved if it complies with the standards specified in Part B or Part C of this Appendix.

Part B

ADS-B transmitting equipment — standard for approval

- 2 ADS-B transmitting equipment must be of a type that:
 - (a) is authorised by:
 - (i) the FAA in accordance with TSO-C166 as in force on 20 September 2004, or a later version as in force from time to time; or
 - (ii) CASA, in writing, in accordance with:
 - (A) ATSO-C1004a as in force on 16 December 2009, or a later version as in force from time to time; or
 - (B) ATSO-C1005a as in force on 16 December 2009, or a later version as in force from time to time; or
 - (b) meets the following requirements:
 - (i) the type must be accepted by CASA as meeting the specifications in RTCA/DO-260 dated 13 September 2000, or a later version as in force from time to time;
 - (ii) the type must utilise HPL at all times HPL is available; or
 - (c) is otherwise authorised, in writing, by CASA for the purposes of subsection 9B of Civil Aviation Order 20.18 as being equivalent to one of the foregoing types.

GNSS position source equipment — standard for aircraft manufactured on or after 28 June 2012

- 3 For an aircraft manufactured on or after 28 June 2012, the geographical position transmitted by the ADS-B transmitting equipment must be determined by:
 - (a) a GNSS receiver of a type that is authorised by the FAA in accordance with TSO-C145a or TSO-C146a as in force on 19 September 2002, or a later version as in force from time to time; or
 - (b) a GNSS receiver of a type that is authorised by the FAA in accordance with TSO-C196 as in force on 9 September 2009, or a later version as in force from time to time; or
 - (c) a GNSS receiver or system which meets the following requirements:
 - (i) is certified by an NAA for use in flight under the I.F.R.;
 - (ii) has included in its specification and operation the following:
 - (A) FDE, computed in accordance with the definition at paragraph 1.7.3 of RTCA/DO-229D;
 - (B) the output function HPL, computed in accordance with the definition at paragraph 1.7.2 of RTCA/DO-229D;

(C) functionality that, for the purpose of HPL computation, accounts for the absence of the SA of the GPS in accordance with paragraph 1.8.1.1 of RTCA/DO-229D; or

(d) another equivalent system authorised in writing by CASA.

Note The following GNSS receivers meet the requirements of clause 3, namely, those certified to TSO-C145a or TSO-C146a, or later versions, or those manufactured to comply with TSO-C196.

GNSS position source equipment — standard for aircraft manufactured before 28 June 2012

- 4 For an aircraft manufactured before 28 June 2012, the geographical position transmitted by the ADS-B transmitting equipment must be determined by:
- (a) a GNSS receiver or system that complies with the requirements of clause 3, other than sub-subparagraph 3 (c) (ii) (C) which is optional; or
 - (b) an equivalent GNSS receiver or system that has been approved in writing by CASA.

Note The following GNSS receivers meet the requirements of clause 4, namely, those certified to TSO-C145a or TSO-C146a, or later versions, or those manufactured to comply with TSO-C196. Some later versions of GNSS receivers certified to TSO-C129 may also meet the requirements, i.e. those having FDE and HPL features incorporated.

Altitude source equipment — standard

- 5 The pressure altitude transmitted by the ADS-B transmitting equipment must be determined by:
- (a) a barometric encoder of a type that is authorised by:
 - (i) the FAA in accordance with TSO-C88a as in force on 18 August 1983, or a later version as in force from time to time; or
 - (ii) EASA in accordance with ETSO-C88a as in force on 24 October 2003, or a later version as in force from time to time; or
 - (b) another equivalent system authorised in writing by CASA.

Aircraft address — standard

- 6 Unless otherwise approved in writing by CASA, the ADS-B transmitting equipment must:
- (a) transmit the current aircraft address; and
 - (b) allow the pilot to activate and deactivate transmission during flight.

Note The requirement in paragraph 6 (b) is met if the ADS-B transmitting equipment has a cockpit control that enables the pilot to turn the ADS-B transmissions on and off.

Part C

Alternative approved equipment configuration — standard for aircraft manufactured on or after 28 June 2012

- 7 For an aircraft manufactured on or after 28 June 2012, an equipment configuration is approved if:
- (a) it has been certified by EASA as meeting the standards of EASA AMC 20-24; and
 - (b) the aircraft flight manual attests to the certification; and
 - (c) the GNSS receiver or system complies with the requirements of clause 3 in Part B.

Alternative approved equipment configuration — standard for aircraft manufactured before 28 June 2012

- 8 For an aircraft manufactured before 28 June 2012, an equipment configuration is approved if:
 - (a) it has been certified by EASA as meeting the standards of EASA AMC 20-24;
and
 - (b) the aircraft flight manual attests to the certification; and
 - (c) the GNSS receiver or system complies with the requirements of clause 4 in Part B.