



Australian Government
Civil Aviation Safety Authority

I, PETER WILLIAM BOYD, Executive Manager, Standards Development and Future Technologies Division, a delegate of CASA, make this instrument under paragraph 21.601 (2) (a) of the *Civil Aviation Safety Regulations 1998*.

Peter Boyd
Executive Manager
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11 December 2009

Australian Technical Standard Order C1005a

- 1 Name of instrument**
This instrument is the Australian Technical Standard Order C1005a.
- 2 Commencement**
This instrument commences on the day after it is registered.
- 3 Australian Technical Standard Order C1005a**
Schedule 1 makes *Australian Technical Standard Order C1005a*.

Schedule 1

ATSO-C1005a

Australian Technical Standard Order

AIRBORNE STAND-ALONE EXTENDED SQUITTER AUTOMATIC DEPENDENT SURVEILLANCE – BROADCAST (ADS-B) TRANSMIT ONLY EQUIPMENT

- 1. PURPOSE.** This Australian Technical Standard Order (ATSO) prescribes the minimum performance standards (MPS) which airborne stand-alone equipment with Extended Squitter ADS-B transmit only equipment must meet in order to obtain an ATSO authorisation or letter of design approval and so be identified with the applicable ATSO marking.
- 2. APPLICABILITY.** This ATSO supersedes and replaces ATSO-C1005 and is effective for new applications submitted after the effective date of this ATSO.
- 3. REQUIREMENTS.** New models of airborne stand-alone Extended Squitter ADS-B transmit only equipment that are to be so identified and that are manufactured on or after the effective date of this ATSO must meet the MPS specified in this paragraph and Appendix 1.

a. **Functionality.** The standards of this ATSO apply to equipment intended to serve as ADS-B transmit only equipment that transmits ADS-B messages to support surveillance applications both in air traffic management systems and in other aircraft equipped to receive ADS-B messages.

b. **Failure Condition Classification.**

(1) An un-announced failure resulting in loss of the ADS-B transmit function is classified as Minor, and

(2) An un-announced failure resulting in broadcast of incorrect ADS-B messages is classified as Major.

The applicant must ensure the system has a design assurance level commensurate with the failure condition classification.

Note: For a definition of failure condition categories refer to United States Federal Aviation Administration (FAA) Advisory Circular (AC), System Design and Analysis AC 25.1309-1A, Equipment, Systems and Installations in Part 23 Airplanes AC 23.1309-1D or European Aviation Safety Authority (EASA) System Design and Analysis Acceptable Means of Compliance (AMC) 25.1309 or later amendments.

c. **Environmental Qualification.** The equipment shall be subject to the test conditions specified in RTCA Inc. Document No. RTCA/DO-160F, "*Environmental Conditions and Test Procedures for Airborne Equipment*", dated 6 December 2007, or the most current version.

d. **Software Qualification.** Software must be developed in accordance with RTCA Inc. Document No. RTCA/DO-178B, "*Software Considerations in Airborne Systems and Equipment Certification*", dated 1 December 1992, or the most current version. Software implementing the functions defined in this ATSO must be developed to Level C as defined in RTCA/DO-178B.

e. **Electronic Hardware Qualification.** If the article includes a complex custom micro-coded component, develop the component to the guidance in RTCA/DO-254, "*Design Assurance Guidance for Airborne Electronic Hardware*" dated 19 April 2000 or the most current version. The hardware design assurance level should be consistent with the failure condition classification determined in accordance with paragraph 3.b of this ATSO.

f. **Fire Protection.** All materials used shall be self-extinguishing except for small parts (such as knobs, fasteners, seals, grommets and small electrical parts) that would not contribute significantly to the propagation of a fire.

g. **Deviations.** The Civil Aviation Safety Authority (CASA) has provisions for using alternative or equivalent means of compliance to the criteria set forth in the MPS of this ATSO. Applicants invoking these provisions shall demonstrate that an equivalent level of safety is maintained and shall apply for a deviation per the Civil Aviation Safety Regulation (CASR) 21.609.

4. **MARKING.** Articles manufactured under this ATSO must be marked in accordance with CASR 21.607(1)(c). The following additional markings shall be applied:

a. **Environment.** The environmental categories over which it has been designed to operate, as set forth in Appendix A of RTCA/DO-160F, must be permanently and legibly marked on the equipment. Where an environmental test procedure is not applicable and the test is not conducted, an "X" should be placed in the space assigned for that category.

b. **Class.** The class that the equipment meets must be permanently and legibly marked on the equipment. Equipment that meets the requirements of more than one class need only be marked with the class that contains the more severe requirements.

c. **Identification.** Each separate component of equipment (antenna, transmitter, etc.) must be permanently and legibly marked with at least the name of the manufacturer, the ATSO number and the environmental categories over which it is designed to operate.

5. **DATA REQUIREMENTS.**

a. **Application Data.** In addition to the data requirements of CASR 21.605(2) the manufacturer must provide the CASA with one copy of the following technical data:

(1) Manufacturer's operating instructions and equipment limitations. The descriptions of the limitations shall be sufficient to describe the operational capability of the equipment. In particular, operational or installation limitations resulting from specific deviations granted must be described in detail.

(2) Installation procedures and limitations. The descriptions of the limitations shall be sufficient to ensure that the transponder, when installed according to the installation procedures, continues to meet the requirements of this ATSO. The limitations shall identify any unique aspects of the installation. Finally, the limitations shall also include a note with the following statement:

The conditions and tests required for ATSO approval of this article are minimum performance standards. It is the responsibility of the person installing this article either on or within a specific type or class of aircraft to determine that the aircraft installation conditions are within the ATSO standards. ATSO articles must have separate approval for installation in an aircraft.

(3) Schematic drawings, as applicable to the installation procedures.

(4) Wiring diagrams, as applicable to the installation procedures.

(5) Equipment specifications.

(6) List of the components, by part number, that make up the system complying with the standards prescribed in this ATSO. Manufacturers should include vendor part number cross-references when applicable.

(7) Instructions, in the form of an Installation Manual (IM) and/or a Component Maintenance Manual (CMM) containing information on the periodic maintenance, calibration and repair for the continued airworthiness of installed equipment, including recommended inspection intervals and service life. Details of deviations granted, as noted in paragraph 5.a.(1) of this ATSO, may also be described in the IM and/or CMM.

(8) Material and process specifications list.

(9) The quality control system description required by CASR 21.605(2)(c) and CASR 21.143 including functional test specifications to be used to test each production article to ensure compliance with this ATSO.

(10) Manufacturer's ATSO qualification test report(s).

(11) Nameplate drawing providing the information required by paragraph 4 (Markings) of this ATSO.

(12) A list of all drawings and processes, including revision level, necessary to define the article's design. In the case of a minor change, any revisions to the drawing list need only be made available upon request.

(13) An environmental qualifications form as described in RTCA/DO-160F for each component of the system.

(14) Computer Software. If the article includes a digital computer, the software must be developed in accordance with RTCA/DO-178B. In accordance with RTCA/DO-178B, the applicant must submit a Plan for Software Aspects of Certification (PSAC), software configuration index and software accomplishment summary for review and approval.

(15) If the article includes a complex custom micro-coded component a Plan for Hardware Aspects of Certification (PHAC), a hardware verification plan, top level drawing and hardware accomplishment summary as defined in RTCA/DO-254 must be submitted for review and approval.

Note: The CASA recommends that the PSAC and PHAC be submitted as early as possible in the certification process. This will allow for early discussion and agreement between the applicant and the CASA on the design assurance level or levels, the verification approach and the documentation to be prepared and submitted.

b. Manufacturer's Data. In addition to the data to be directly furnished to the CASA, each manufacturer must have the following technical data available for review by the CASA:

(1) The functional qualification specifications to be used to qualify each production article to ensure compliance with this ATSO.

(2) Equipment calibration procedures.

(3) Corrective maintenance procedures within 12 months after ATSO authorisation.

(4) Schematic drawings.

(5) Wiring diagrams.

(6) Material and process specifications.

(7) The results of the environmental qualification tests conducted in accordance with RTCA/DO-160F.

(8) If the article includes a digital computer, the appropriate documentation as defined in RTCA/DO-178B or the most current version, including all data supporting the applicable objectives found in Annex A of RTCA/DO-178B, *Process Objectives and Outputs by Software Level*.

(9) If the article includes a complex custom micro-coded component, the appropriate hardware life cycle data in combination with design assurance level as defined in RTCA/DO-254, Appendix A, Table A-1.

c. Furnished data.

(1) One copy of the technical data and information specified in paragraphs 5.a.(1) to (7) of this ATSO and any other data or information necessary for the proper installation, certification and use and/or for continued airworthiness of the equipment, must accompany each article or multiple articles, if furnished to one source, i.e. operator, repair station etc., manufactured under this ATSO.

(2) If the article has an integrated Global Positioning System (GPS) capability then one copy of an Interface Control Document describing the output of GPS positional data, together with authorisation for this document to be released into the public domain is required. This document shall be in sufficient detail to allow the design of equipment to interface and use the GPS positional data and integrity data that is output.

6. AVAILABILITY OF REFERENCED DOCUMENTS.

a. Copies of the CASRs may be obtained from the CASA or from the CASA internet website at <http://www.casa.gov.au>.

b. Copies of RTCA Documents may be purchased from RTCA Inc. 1828 L Street, NW Suite 805, Washington, DC 20036. The RTCA Internet website is <http://www.rtca.org/>.

c. Copies of FAA Technical Standard Orders (TSOs) and Advisory Circulars (AC) may be obtained from the Federal Aviation Administration (FAA). The relevant FAA Internet website for these documents is: <http://rgl.faa.gov/>.

Note: The above links were valid at time of issue but are subject to change without notice.

APPENDIX 1. MINIMUM PERFORMANCE STANDARDS (MPS) FOR AIRBORNE STAND-ALONE EXTENDED SQUITTER AUTOMATIC DEPENDENT SURVEILLANCE – BROADCAST (ADS-B) TRANSMIT ONLY EQUIPMENT

This Appendix details MPS for airborne stand-alone equipment with Extended Squitter ADS-B transmit only capability as specified by the CASA in this ATSO.

1. MINIMUM PERFORMANCE STANDARDS.

Except as amended by this ATSO, all classes of equipment manufactured in accordance with the provisions of this ATSO must meet the requirements of:

a. The sections of RTCA, Inc., Document No. RTCA/DO-260A, Change 2, “*Minimum Operational Performance Standards For 1090 MHz Automatic Dependent Surveillance – Broadcast (ADS-B) and Traffic Information services – Broadcast (TIS-B)*”, dated 13 December 2006 or later approved version, applicable to non-Mode S transponder-based subsystems, Stand-Alone Transmitters, and Broadcast-Only Systems. Broadcast-Only systems are defined as Class B Equipment in RTCA/DO-260A – refer to Table 2-1.

b. Equipment complying with this ATSO is required to transmit the messages listed below.

- (1) Airborne Position,
- (2) Surface Position,
- (3) Aircraft Identification and Type,
- (4) Airborne Velocity, and
- (5) Aircraft Operational Status Message.

Note: Refer to Table 2-2 of RTCA/DO-260A for the full list of ADS-B Messages.

c. The equipment shall provide the capability for the transmission of the Extended Squitter Aircraft Status Message (Type “28”). This Message is used to provide additional information regarding aircraft status. Subtype “1” is used specifically to provide Emergency/Priority Status. Manufacturers may elect to provide a pilot interface for the input of Emergency/Priority Status, which will then provide data for the transmission of the Extended Squitter Aircraft Status Message.

2. EXCEPTIONS.

a. The minimum radio frequency (RF) peak output power for Class B0 and B1 equipment shall be 21.0 dBW (125W).

b. RTCA/DO-260A Appendix A, Subsection A.1.5.4 is not consistent with RTCA/DO-260A Subsection 2.2.3.3.2.1. To ensure consistency Subsection 2.2.3.3.2.1 shall take precedence, i.e. at power-up initialisation the non-Mode S transponder device shall start operation in a mode in which it transmits no messages until sufficient data is available to initiate ADS-B extended squitter transmissions.

c. Compliance with RTCA/DO-260A Paragraph 2.2.3.2.7.3.2, “TEST” Messages with SUBTYPE=7, is not required but may be incorporated as an option.

3. EQUIPMENT CLASSES.

a. Equipment meeting all the performance and environmental standards for equipment intended for installation in aircraft that operate at altitudes exceeding 15,000 feet, or be equipment intended for installation in aircraft that have a normal cruising speed in excess of 175 knots on a standard day, shall be marked as Class B1 in accordance with Section 4 of this document,

b. Equipment meeting all the performance and environmental standards for equipment intended for installation in aircraft that operate at altitudes not exceeding 15,000 feet shall be marked as Class B0 in accordance with Section 4 of this document.

4. OPTIONS.

One or more of the following options may be incorporated in the equipment identified with this ATSO marking:

a. In lieu of providing a pilot interface for the input of own-vehicle Aircraft Identification, Flight Number, or Aircraft Registration for the ADS-B Aircraft Identification and Type Message, manufacturers may elect to provide the means by which the Aircraft Registration marking may be programmed into the transmitter during installation. In this case the Aircraft Registration shall be broadcast in the Character Subfield of the ADS-B Aircraft Identification and Type Message. Refer to subsections 2.2.3.2.5 and 2.2.5.1.11 of RTCA/DO-260A.

b. Manufacturers may elect to incorporate GPS equipment in the transponder to provide position, velocity, timing and integrity data for the extended squitter ADS-B message. GPS equipment provided for this purpose shall comply with:

(1) The requirements of Class Beta equipment defined in Subsection 1.4.1 of RTCA/DO-229D “*Minimum Operational Performance Standards For Global Positioning System/Wide Area Augmentation System Airborne Equipment*”, dated 28 November 2001 or later version; or

(2) The requirements of RTCA/DO-316 “*Minimum Operational Performance Standards For Global Positioning System/Aircraft based Augmentation System Airborne Equipment*”, dated 14 April 2009 or later version.

Note: The ability to process Wide Area Augmentation System (WAAS) signals is optional.

Equipment incorporating this option shall be identified with the suffix “G1”, e.g. Class B1-G1.

Explanatory Statement

Civil Aviation Act

Civil Aviation Safety Regulations 1998

Australian Technical Standard Order C1005a

Subsection 98 (1) of the Civil Aviation Act 1988 (the *Act*) provides that the Governor-General may make regulations for the purposes of the Act and in the interests of the safety of air navigation.

Regulation 21.601 prescribes the requirements for the issue of an Australian Technical Standard Order (ATSO). CASA has issued an ATSO C1005a which is intended to prescribe the minimum performance standards (MPS) which airborne stand-alone equipment with Extended Squitter Automatic Dependant Surveillance – Broadcast (ADS-B) transmit only capability must meet in order to obtain an ATSO authorisation or letter of design approval.

The ATSO provides prospective manufacturers with a clear description of the particular parameters that were required for proposed Airservices Australia Air Traffic Control system based on ADS-B. These standards are consistent with the international requirements mandated by ICAO.

The original issue of ATSO C1005 was published on 21 December 2004. With the continuing development of the technology, the primary reference material from RTCA Inc. that the ATSO was derived from has been updated or superseded. To ensure consistency and continuing relevance the ATSO needs to be updated to reflect the new requirements that are recognised internationally. If the ATSO is not updated Australian manufacturers are at risk of designing and manufacturing equipment that will not provide the functionality expected by air traffic control and required by Civil Aviation Order 20.18.

Legislative Instruments Act

Under paragraph 98 5) (5AA) of the Act an instrument issued under paragraph 5A of the Act is a legislative instrument if the instrument is expressed to apply in relation to a class of aircraft, persons or aeronautical product. The instrument relates to design standards and is issued under regulation 21.601 of the Civil Aviation Safety Regulations. The ATSO is, therefore, a legislative instrument and it is subject to tabling and disallowance in the Parliament under sections 38 and 42 of the LIA.

Consultation

Draft ATSO C1005a was published for public comment. The six responses received from local and international respondents were considered and incorporated where appropriate.

The ATSO has been made by a delegate of CASA, in accordance with subregulation 11.260 (1) of CASR 1988.

[Australian Technical Standard Order C1005a]