

Australian Technical Standard Order

**Subject: 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 Automatic Dependent Surveillance – Broadcast (ADS-B) transmit only equipment must meet in order to obtain an ATSO authorization or letter of design approval and so be identified with the applicable ATSO marking.
2. **APPLICABILITY.** This ATSO 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 paragraphs 3,4 and 5 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.** Failure of the function defined in paragraph 3a of this ATSO has been determined to be a Major failure condition, and the applicant must ensure the system has a design assurance level commensurate with this 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 23.1309-1C or European Joint Airworthiness Authorities (JAA) Advisory Material Joint (AMJ), System Design and Analysis AMJ 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-160D, "Environmental Conditions and Test Procedures for Airborne Equipment", Change 3, dated 29 July 1997, 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. 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.

f. 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(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-160D, 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. When listed in order of severity of requirements, highest first, the classes are 1A or 1B.

c. Marking. 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(c) 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) 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.
- (6) Instructions, in the form of 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 CMM
- (7) Material and process specifications list.
- (8) The quality control system description required by CASR 21.605(2)(c) and CASR 21.143(a) including functional test specifications to be used to test each production article to ensure compliance with this ATSO.
- (9) Manufacturer's ATSO qualification test report(s).
- (10) Nameplate drawing providing the information required by paragraph 4 (Markings) of this ATSO.
- (11) 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.
- (12) An environmental qualifications form as described in RTCA/DO-160D, or the most current version for each component of the system.
- (13) Computer Software. If the article includes a digital computer, the software must be developed in accordance with RTCA Document DO-178B, "Software Considerations in Airborne Systems and Equipment Certification" dated 1 December 1992. In accordance with RTCA/DO-178B, the applicant must submit a Software Aspects of Certification Plan (PSAC) for review and approval.

Note: The CASA recommends that this plan 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 software 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 authorization.
- (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-160D or the most current version.
- (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 or the most current version.

c. Furnished data.

(1) One copy of the technical data and information specified in paragraph 5 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 appliance accomplishes any additional functions beyond that described in paragraph 3 of this ATSO, then a copy of the data and information specified in paragraphs 5a(11) through (13) must also go to each person receiving for use one or more articles manufactured under this ATSO.

(3) 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. 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., 1140 Connecticut Avenue, NW, Suite 1020, Washington, D.C. 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 are:

<http://av-info.faa.gov/tso/Technical%20Standard%20Order.htm> and http://www.faa.gov/RegulatoryAdvisory/ac_index.htm respectively.

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

This Appendix prescribes the minimum performance standards (MPS) for airborne stand-alone equipment with Extended Squitter Automatic Dependent Surveillance – Broadcast (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, “Minimum Operational Performance Standards For 1090 MHz Automatic Dependent Surveillance – Broadcast (ADS-B)”, dated 10 April 2003 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 D0-260A – 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, on an external connection point, GPS positional and other data in accordance with paragraph 2.1.2.6 of DO-229C using an approved low cost interface such as RS232.

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 DO-260A Subsection 2.2.3.3.2.1. 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.

3. Equipment Classes

a. Equipment marked, in accordance with Section 4 of this document, as Class 1A must meet all performance and environmental standards for equipment intended for installation in aircraft that operate at altitudes exceeding 15,000 feet or must be equipment intended for installation in aircraft that have a normal cruising speed in excess of 175 knots on a standard day.

b. Equipment marked, in accordance with Section 4 of this document, as Class 1B must meet all performance and environmental standards for equipment intended for installation in aircraft that operate at altitudes not exceeding 15,000 feet.

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. Transmission of the Extended Squitter Aircraft Status Message (Type “28”) is optional. 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.

c. Manufacturers may elect to incorporate Global Positioning System (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 must meet the requirements of Specification G1.

(1) Specification G1

The GPS equipment must meet the requirements of Class B equipment defined in RTCA, Inc., Document No. RTCA/DO-229C, or later version, “Minimum Operational Performance Standards For Global Positioning System/Wide Area Augmentation System Airborne Equipment” dated 28 November 2001. The equipment functional classes are defined in Subsection 1.4.1.

The ability to process Wide Area Augmentation System (WAAS) signals is optional. However the GPS equipment must have Fault Detection and Exclusion capability (See Subsection 1.7.3 of RTCA/DO-229C).

Equipment incorporating this option shall be identified with the suffix “G1”, e.g. Class 1A-G1.