Department of Transportation
Federal Aviation Administration
Aircraft Certification Service
Washington, DC

TSO-C166c

Effective
Date: *{mm/dd/yy}*

Technical Standard Order

Subject: Extended Squitter Automatic Dependent Surveillance - Broadcast (ADS-B) and Traffic Information Service - Broadcast (TIS-B) Equipment Operating on the Radio Frequency of 1090 Megahertz (MHz)

1. PURPOSE. This technical standard order (TSO) is for manufacturers applying for a TSO authorization (TSOA) or letter of TSO design approval (LODA). In it, we (the Federal Aviation Administration, (FAA)) tell you what minimum performance standards (MPS) your 1090 MHz ADS-B and TIS-B equipment must meet for approval and identification with the applicable TSO marking.

2. APPLICABILITY. This TSO affects new applications submitted after its effective date.

a. TSO-C166b will also remain effective until 18 months after the effective date of an amendment to Title 14, Code of Regulations (14 CFR) 91.225 and 91.227 to allow installation and use of ADS-B Out equipment manufactured under this TSO for compliance with those rules. After that date, we will no longer accept applications for TSO-C166b.

b. 1090 MHz ADS-B and TIS-B equipment approved under a previous TSOA may still be manufactured under the provisions of its original approval.

> **Note:** 1090 MHz ADS-B and TIS-B equipment produced to TSO versions before TSO-C166b does not comply with the operating rule requirements of §§ 91.225 and 91.227.

3. REQUIREMENTS. New models of 1090 MHz ADS-B and TIS-B equipment identified and manufactured on or after the effective date of this TSO must meet the requirements in RTCA/DO-260C / EUROCAE ED-102B, *Minimum Operational Performance Standards for 1090 MHz Extended Squitter Automatic Dependent Surveillance-Broadcast (ADS-B) and Traffic Information Services-Broadcast (TIS-B)*, Sections 2.1 and 2.2, issued in December 2020, as modified by Change 1, issued in January 2022.

a. Functionality.

(1) This TSO's standards apply to equipment intended to transmit and receive broadcast messages about an aircraft's position (latitude, longitude, and altitude), velocity, integrity, and other parameters. Similarly-equipped operators will share these messages with one another and with ground-based facilities such as air traffic services. These message parameters form the basis for various ADS-B, ADS-B Rebroadcast Service (ADS-R), and TIS-B reports. The 1090 MHz ADS-B and TIS-B equipment may also support additional features as shown in RTCA/DO-260C / EUROCAE ED-102B Section 1.3.6**.**

(2) This TSO supports two major classes of 1090 MHz ADS-B equipment. Class A equipment consists of transmit and receive subsystems. Class B equipment contains a transmit subsystem only.

(a) Class A equipment includes Classes A1, A1S, A2 and A3 as defined in RTCA/DO-260C / EUROCAE ED-102B. We require 1090 MHz airborne Class A equipment to receive ADS-B, ADS-R, and TIS-B messages; deliver ADS-B, ADS-R, and TIS-B reports; and transmit ADS-B messages. Class A equipment can also be defined as transmit only or receive only. Follow guidance in RTCA/DO-260C / EUROCAE ED-102B Section 2.1.12.1 for transmit only or Section 2.1.12.2 for receive only equipment.

(b) Class B equipment includes Classes B1 and B1S as defined in RTCA/DO-260C / EUROCAE ED-102B. Class B equipment is only required to transmit ADS-B messages.

(3) This TSO addresses only broadcasting messages from transmit subsystems and assembling reports in receiver subsystems. It does not address applications that use the information in reports. TSO-C195b and later revisions, *Avionics Supporting Automatic Dependent Surveillance – Broadcast (ADS-B) Aircraft Surveillance Applications (ASA)*, provide standards for ADS-B aircraft surveillance applications.

(4) Do not add ADS-B message elements outside of the message requirements outlined in Section 2 of RTCA/DO-260C / EUROCAE ED-102B or populate message fields reserved for future use.

b. Failure Condition Classifications.

(1) Unannunciated failure of the function defined in paragraph **3.a** of this TSO resulting in incorrect reports to onboard applications or broadcast of incorrect ADS-B messages is a *major* failure condition.

(2) Loss of the function defined in paragraph **3.a** of this TSO is a *minor* failure condition.

(3) Design the system to at least these failure condition classifications.

Note: The major failure condition for transmission of incorrect ADS-B messages is based on use of the data by other aircraft or Air Traffic Control for separation services.

c. Functional Qualification. Demonstrate the required functional performance under the test conditions specified in RTCA/DO-260C / EUROCAE ED-102B, Section 2.4, as modified by Change 1 and by appendix B of this TSO.

d. Environmental Qualification. Demonstrate the required performance under the test conditions specified in RTCA/DO-260C / EUROCAE ED-102B, Section 2.3 using standard environmental conditions and test procedures appropriate for airborne equipment. You may use a different standard environmental condition and test procedure than RTCA/DO-160G / EUROCAE ED-14G, *Environmental Conditions and Test Procedures for Airborne Equipment*, issued in December 2010 / May 2011 respectively, provided the standard is appropriate for 1090 MHz ADS-B and TIS-B equipment.

Note: The use of RTCA/DO-160D / EUROCAE ED-14D (with Changes 1 and 2 only, without Change 3 incorporated) or earlier versions is generally not considered appropriate and will require substantiation via the deviation process as discussed in paragraph **3.g** of this TSO.

e. Software Qualification. If the article includes software, develop the software according to RTCA/DO-178C / EUROCAE ED-12C, *Software Considerations in Airborne Systems and Equipment Certification*, issued in December 2011 / January 2012 respectively, including referenced supplements as applicable, to at least the software design assurance level consistent with the failure condition classification defined in paragraph **3.b** of this TSO.

f. Electronic Hardware Qualification. If the article includes complex custom airborne electronic hardware, then develop the component according to RTCA/DO-254 / EUROCAE ED-80, *Design Assurance Guidance for Airborne Electronic Hardware*, issued in April 2000, to at least the design assurance level consistent with the failure condition classification defined in paragraph **3.b** of this TSO. For custom airborne electronic hardware determined to be simple, RTCA/DO-254 / EUROCAE ED-80, Section 1.6 applies.

g. Deviations. We have provisions for using alternate or equivalent means of compliance with the criteria in the MPS of this TSO. If you invoke these provisions, you must show that your equipment maintains an equivalent level of safety. Apply for a deviation pursuant to 14 CFR 21.618.

4. MARKING.

a. Mark at least one major component permanently and legibly with all of the information in 14 CFR 45.15(b). The marking must include the serial number. Include equipment class and article name, unless the classes and article name are identified in the installation instructions or by software.

b. If the article includes software and/or airborne electronic hardware, then the article part numbering scheme must identify the software and airborne electronic hardware configuration. The part numbering scheme can use separate, unique part numbers for software, hardware, and airborne electronic hardware.

c. You may use electronic part marking to identify software or airborne electronic hardware components by embedding the identification within the hardware component itself (using software) rather than marking it on the equipment nameplate. If electronic marking is used, it must be readily accessible without the use of special tools or equipment.

d. Transmitting and receiving components must be permanently and legibly marked. The following table explains how to mark components. Find the equipment class in RTCA/DO-260C / EUROCAE ED-102B, Section 2.1.11 and the receiving equipment type in Section 2.2.6.

If component can:	*Mark it with:*	*Sample marking pattern:*
Transmit and receive	Equipment class it supports, and Receiving equipment type	Class A1/Type 1
Transmit, but not receive	Equipment class it supports	Class B1 or Class A3 - Transmit Only
Receive, but not transmit	Equipment class it supports, and Receiving equipment type	Class A2/Type 2 - Receive Only

e. If the equipment supports optional additional features identified in RTCA/DO-260C / EUROCAE ED-102B, Section 1.3.6, the equipment must be marked with the ID Code(s) for all supported additional features in accordance with RTCA/DO-260C / EUROCAE ED-102B, Section 1.3.6, Table 1-1.

f. As a courtesy to operators and repair stations, and with the permission of RTCA, Inc., we have included a copy of RTCA/DO-260C / EUROCAE ED-102B, Sections 1.3.6, 2.1.11, and 2.2.6 in appendix A to this TSO.

5. APPLICATION DATA REQUIREMENTS. You must give the FAA Aircraft Certification Office (ACO) manager responsible for your facility a statement of conformance, as specified in 14 CFR 21.603(a)(1) and one copy each of the following technical data to support your design and production approval. LODA applicants must submit the same data (excluding paragraph **5.g**) through their civil aviation authority.

a. Manuals containing the following:

(1) Operating instructions and article limitations sufficient to describe the equipment's operational capability.

(2) Detailed description of any deviations.

(3) Installation procedures and limitations sufficient to ensure that the 1090 MHz ADS-B and TIS-B equipment, when installed according to the installation or operational procedures, still meets this TSO's requirements. Limitations must identify any unique aspects of the installation. The limitations must also include a note with the following statement: "This article meets the minimum requirements of TSO-C166c. Installation of this article requires separate approval." The installation manual must also identify information security review and mitigation strategies for any interface by which the equipment makes use of a non-trusted connectivity where the installation could potentially have aircraft information security vulnerabilities, as described in RTCA/DO-260C / ED-102C, Section 1.10. RTCA/DO-326A / ED-202A, *Airworthiness Security Process Specification,* issued in August 2014 / June 2014 respectively, and RTCA/DO-356A / ED-203A, *Airworthiness Security Methods and Considerations*, issued in June 2018 provide guidance for analyzing the threat of intentional unauthorized electronic interaction.

(4) For each unique configuration of software and airborne electronic hardware, reference the following:

(a) Software part number, including revision and design assurance level;

(b) Airborne electronic hardware part number including revision and design assurance level; and

(c) Functional description.

(5) A summary of the test conditions used for environmental qualifications for each component of the article. For example, a form as described in RTCA/DO-160G / EUROCAE ED-14G, Appendix A.

(6) Schematic drawings, wiring diagrams, and any other documentation necessary for installation of the 1090 MHz ADS-B and TIS-B equipment.

(7) By-part-number list of replaceable components that makes up the 1090 MHz ADS-B and TIS-B equipment. Include vendor part number cross-references, when applicable.

b. Instructions covering periodic maintenance, calibration, and repair, to ensure that the 1090 MHz ADS-B and TIS-B equipment continues to meet the TSO approved design. Include recommended inspection intervals and service life, as appropriate.

c. If the article includes software: a plan for software aspects of certification (PSAC), software configuration index, and a software accomplishment summary.

d. If the article includes simple or complex custom airborne electronic hardware: a plan for hardware aspects of certification (PHAC), a hardware verification plan, top-level drawing, and hardware accomplishment summary (or similar document, as applicable).

e. A drawing depicting how the article will be marked with the information required by paragraph **4** of this TSO.

f. Identify functionality or performance contained in the article not evaluated under paragraph **3** of this TSO (defined as non-TSO functions). Non-TSO functions can be accepted in parallel with the TSOA. For those non-TSO functions to be accepted, you must declare these functions and include the following information with your TSO application:

(1) Description of the non-TSO function(s), such as performance specifications, failure condition classifications, software, hardware, and environmental qualification levels. Include a statement confirming that the non-TSO function(s) do not interfere with the article's compliance with the requirements of paragraph **3** of this TSO.

(2) Installation procedures and limitations sufficient to ensure that the non-TSO function(s) meets the declared functions and performance specification(s) described in paragraph **5.f.(1)** of this TSO.

(3) Instructions for continued performance applicable to the non-TSO function(s) described in paragraph **5.f.(1)** of this TSO**.**

(4) Interface requirements and applicable installation test procedures to ensure compliance with the non-TSO function(s) performance data defined in paragraph **5.f.(1)** of this TSO**.**

(5) Test plans, analysis, and results, as appropriate, to verify that the performance of the hosting TSO article is not affected by the non-TSO function(s).

(6) Test plans and analysis, as appropriate, to verify that the function and performance of the non-TSO function(s) are as described in paragraph **5.f.(1)** of this TSO**.**

g. The quality manual required by 14 CFR 21.608, including functional test specifications. The quality system must ensure that you will detect any change to the approved design that could adversely affect compliance with the TSO MPS and reject the article accordingly. Applicants who currently hold TSOAs must submit revisions to the existing quality manual as necessary (not required for LODA applicants).

h. A description of your organization as required by 14 CFR 21.605.

i. Material and process specifications list.

j. A list of all drawings and processes (including revision level) that define the article's design.

k. Manufacturer's TSO qualification report showing results of testing accomplished according to paragraph **3.c** of this TSO.

6. MANUFACTURER DATA REQUIREMENTS. Besides the data given directly to the responsible ACO, have the following technical data available for review by the responsible ACO:

Note: The following data for a LODA applicant may be made available for review through its CAA. Refer to the applicable bilateral agreement for specific details regarding access to this data.

a. Functional qualification specifications for qualifying each production article to ensure compliance with this TSO.

b. Article calibration procedures.

c. Schematic drawings.

d. Wiring diagrams.

e. Material and process specifications.

f. The results of the environmental qualification tests conducted according to paragraph **3.d** of this TSO.

g. If the article includes software, the appropriate documentation defined in RTCA/DO-178C / EUROCAE ED-12, including all data supporting the applicable objectives in Annex A, *Process Objectives and Outputs by Software Level.*

h. If the article includes complex custom airborne electronic hardware, the appropriate hardware life-cycle data in combination with design assurance level, as defined in RTCA/DO-254 / EUROCAE ED-80, Appendix A, Table A-1. For simple custom airborne electronic hardware, the following data are required: test cases or procedures, test results, test coverage analysis, tool assessment and qualification data, and configuration management records, including problem reports.

i. If the article contains non-TSO function(s), you must also make items **6.a** through **6.h** of this TSO available as they pertain to the non-TSO function(s).

7. FURNISHED DATA REQUIREMENTS.

a. When furnishing one or more articles manufactured under this TSO to one entity (such as an operator or repair station), provide one copy or on-line access to the data in paragraphs **5.a** and **5.b** of this TSO. Add any other data needed for the proper installation, certification, use or continued compliance with the TSO of the 1090 MHz ADS-B and TIS-B equipment.

b. If the article contains declared non-TSO function(s), include one copy of the data in paragraphs **5.f.(1)** through **5.f.(4)** of this TSO**.**

c. If the article contains software, include one copy of the Open Problem Report (OPR) summary.

8. HOW TO GET REFERENCED DOCUMENTS.

a. Standards documents referred in this TSO can be purchased from respective organizations.

(1) Order RTCA documents from RTCA, Inc., 1150 18th Street NW, Suite 910, Washington, DC 20036. Telephone: (202) 833-9339; fax: (202) 833-9434. You can also order copies online at www.rtca.org.

(2) EUROCAE documents from European Organisation for Civil Aviation Equipment, 9-23 rue Paul Lafargue, ‘‘Le Triangle’’ building, 93200 Saint-Denis, France. Telephone: +33-1-49-46-19-65. You can also order online at www.eurocae.net.

b. Order copies of 14 CFR parts 21, 45, and 91 from the Superintendent of Documents, Government Publishing Office, PO Box 979050, St. Louis, MO 63197-9000. Telephone: (202) 512-1800, fax: (202) 512-2104. You can also order copies online at www.gpo.gov, or find an electronic version at the FAA’s online Dynamic Regulatory System (DRS), https://drs.faa.gov.

c. You can find a current list of TSOs and advisory circulars at https://drs.faa.gov. You will also find the TSO Index of Articles at the same site.

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Appendix A. 1090 MHz ADS-B and TIS-B Equipment Marking Scheme

Purpose. This appendix contains relevant portions of RTCA/DO-260C / EUROCAE ED-102B regarding labeling schemes as a courtesy to operators and repair stations.

Table 1 – Excerpts from RTCA/DO-260C / EUROCAE ED-102B (Reprinted with the permission of RTCA, Inc. and EUROCAE)

1.3.6 Optional Additional Features

Some ADS-B systems may support additional features:

- **Interrogation/Reply Monitor (IRM) Capability** – ADS-B equipment implementing IRM adhere to the requirements contained in §2.2.3.2.7.4.4 and §2.2.3.2.7.4.5.
- **Phase Overlay** – ADS-B equipment implementing phase modulation adhere to the requirements in §2.2.3.5 and §2.2.4.3.4.8 for Class A equipment.
- **Advanced Range Class A3 Receiver** – ADS-B receivers implementing advanced reception range adhere to the requirements provided in §2.2.4.4.4.
- **High Velocity and/or Altitude Operation** – ADS-B equipment implementing support for high velocity and/or high altitude operations adhere to the requirements in §2.2.3.2.7.5.
- **Unmanned/Remotely-Piloted Aircraft Systems (UAS/RPAS)** – ADS-B equipment implementing support for unmanned or remotely piloted aircraft operations will adhere to the requirements in §2.2.3.2.8.1.3.
- **ADS-B Wx AIREP Support** – ADS-B equipment implementing support for broadcast of ADS-B Wx AIREP data adhere to the requirements in §2.2.3.2.7.6 and §2.2.3.2.7.8.1.4 – §2.2.3.2.7.8.1.7.
- **ADS-B Wx PIREP Support** – ADS-B equipment implementing support for broadcast of ADS-B Wx PIREP data adhere to the requirements in §2.2.3.2.8.2.

These additional features and corresponding identification codes (may be used by certification authorities for equipment marking purposes) are summarized in Table 1-1.

<u>Table 1-1:</u> ADS-B Optional Additional Features

Additional Features	ID Code
Interrogation/Reply Monitor	m
Phase Overlay	o
Advanced Reception Range	r
High Velocity and/or Altitude Operation	v
Unmanned/Remotely-Piloted Aircraft Systems	u
ADS-B Wx AIREPs	w
ADS-B Wx PIREPs	p

2.1.11 Equipage Class Definitions

ADS-B equipage is categorized according to the classes listed in Table 2-1. These equipage classes were originally defined by the initial ADS-B MASPS, RTCA DO-242, and are the basis for these MOPS equipage classes. ADS B equipage classes are defined in terms of the levels of operational capabilities. The classifications include airborne and ground participants, and include those that are fully interactive and those that only transmit.

2.1.11.1 Interactive Aircraft/Vehicle ADS-B Subsystems (Class A)

These subsystems accept own-platform source data, exchange appropriate ADS-B Messages with other interactive ADS-B System participants, and assemble ADS-B Reports supporting own-platform applications. Such interactive aircraft subsystems, termed Class A subsystems, are further defined by equipage classification according to the provided user capability.

The following describes the Class A subsystems that have been defined in Table 2-1:

<u>Class A0:</u> Supports minimum interactive capability for ADS-B based applications requiring ranges up to 10 NM. Broadcast ADS-B Messages are based upon own-platform source data. ADS-B Messages received from other aircraft support generation of ADS-B Reports that are used by on-board applications (e.g., CDTI for aiding visual acquisition of other-aircraft tracks by the own-aircraft's air crew). This equipage class supports State Vector and Mode Status reports. It may also support interactive ground vehicle needs on the airport surface.

<u>Class A1:</u> Supports all class A0 functionality and ADS-B based applications requiring ranges up to 20 NM. Class A1 is intended for operation in IFR designated airspace. "A1" equipment has been further divided into two classes, based on antenna diversity. For A1 installations using a single antenna, the "A1 Single" class is created, and abbreviated throughout this document as "A1S." A1 installations with diversity antennas are abbreviated throughout this document as "A1." The only equipment difference between classes A1 and A1S is antenna diversity.

<u>Class A2:</u> Supports all class A1 functionality and ADS-B based applications requiring ranges up to 40 NM. Supports State Vector, Mode Status, and Target State and Status reports. Supports antenna diversity.

<u>Class A3:</u> Supports all class A2 functionality and ADS-B based applications requiring ranges up to 90 NM.

2.1.11.2 Broadcast-Only Subsystems (Class B)

Some ADS-B system participants may not need to be provided information from other participants but do need to broadcast their state vector and associated data. Class B ADS-B subsystems meet the needs of these participants. Class B subsystems are defined as follows (Table 2-1):

<u>Class B0:</u> Aircraft broadcast-only subsystem. Class B0 subsystems require transmit powers and information capabilities equivalent to those of class A0.

<u>Class B1:</u> Aircraft broadcast-only subsystem. Class B1 subsystems require transmit powers and information capabilities equivalent to those of class A1. "B1" equipment has been further divided into two classes, based on antenna diversity. For B1 installations using a single antenna, the "B1 Single" class is created, and abbreviated throughout this document as "B1S." B1 installations with diversity antennas are abbreviated throughout this document as "B1." The only equipment difference between classes B1 and B1S is antenna diversity.

<u>Class B2:</u> Ground vehicle broadcast-only subsystem. Surface vehicles qualifying for ADS B equipage are limited to those that operate within the surface movement area.

<u>Class B3:</u> Fixed obstacle broadcast-only subsystem. Obstacle coordinates may be obtained from available survey data. Collocation of the transmitting antenna with the obstacle is not required as long as broadcast coverage requirements are met. Fixed obstacle qualifying for ADS B are structures and obstructions identified by ATS authorities as a safety hazard.

Table 2-1: Subsystem Classes and Their Features

Class	Subsystem	Description	Features
Interactive Aircraft/Vehicle Participant Systems (Class A)			
A0	Minimum Interactive Aircraft/Vehicle	Supports basic enhanced visual acquisition (see Note 1)	Lower transmit power and less sensitive receive than Class A1 permitted.
A1S/A1	Basic Interactive Aircraft	A0 plus standard range	Standard transmit power and receive.
A2	Enhanced Interactive Aircraft	A1 plus improved reception range and Target State and Status Messages	Standard transmit power and longer range reception. Interface with avionics source required.
A3 (see Note 2)	Extended Interactive Aircraft	A2 plus long range	Higher transmit power and more sensitive receive. Interface with avionics source required.
Broadcast-Only Participant Systems (Class B)			
B0	Aircraft Broadcast Only	Supports A0 applications for other participants	Lower transmit power than Class B1 permitted.
B1S/B1	Aircraft Broadcast Only	Supports A1 applications for other participants	Standard transmit power.
B2	Ground Vehicle Broadcast Only	Supports airport surface situational awareness	Surface only.
B3	Fixed Obstacle	Supports visual acquisition	Fixed coordinates. No position input required. Collocation with obstacle not required with appropriate broadcast coverage.

Notes:

1. *Basic enhanced visual acquisition includes the EVAcq and AIRB applications defined in the MOPS for the Aircraft Surveillance Applications (ASA) System, RTCA DO-317/ EUROCAE ED-194.*
2. *There are additional optional "Advanced Range Equipage Class A3 Receiver" requirements that may also be implemented (see §2.2.4.4.4).*

2.2.6 ADS-B Receiving Device Message Processor Characteristics

To provide maximum flexibility in user application implementation of ADS-B information, ADS-B Receiving Devices are categorized into two major functional types, which are … specified in the following subparagraphs.

a. The ADS-B Message processing function begins with the ADS-B Message Reception Function receiving the transmitted message and then performing the necessary processing to deliver “Message Data” to the Report Assembly Function.

b. **TYPE 1** – TYPE 1 ADS-B Report Assembly subsystems are those that receive ADS-B Messages and produce application-specific subsets of ADS-B reports. As such, the Type 1 ADS-B Report Assembly subsystems may be customized to the particular applications using ADS-B reports. In addition, Type 1 ADS-B Report Assembly subsystems may be controlled by an external entity to produce installation-defined subsets of the reports that those subsystems are capable of producing.

c. **TYPE 2** – TYPE 2 ADS-B Report Assembly subsystems are those that receive ADS-B Messages and are capable of producing complete ADS-B reports in accordance with the applicable ADS-B equipment class requirements. Type 2 Report Assembly subsystems may be controlled by an external entity to produce installation-defined subsets of the reports that those subsystems are capable of producing.

Appendix B. FAA Modifications to RTCA/DO-260C / EUROCAE ED-102B

Purpose. This appendix lists FAA modifications to RTCA/DO-260C / EUROCAE ED-102B. Text added to modify RTCA/DO-260C / EUROCAE ED-102B is underlined and highlighted. Text to be removed is struck through. Due to the extensive modifications, Section 2.4.5.2.12 is included as a complete change. Excerpts from RTCA/DO-260C / EUROCAE ED-102B are reprinted with the permission of RTCA, Inc and EUROCAE.

2.4.3.2.7.6.4.4 Verification of "Wind Speed" Subfield in ADS-B Wx Weather State Messages (§2.2.3.2.7.6.4.4)

This test procedure is used to verify that the ADS-B Transmitting Subsystem correctly encodes the "Wind Speed" subfield in the Weather State Message as a dynamic value from a variable data input.

Table 2-240: "Wind Speed" Subfield Encoding Test Values

Coding		**Meaning**
(Binary)	(Decimal)	
~~0000 0000~~	~~0~~	~~NO or INVALID data~~
0000 0001	1	0 ≤ Wind Speed [kts] < 1
0000 0010	2	1 ≤ Wind Speed [kts] < 2
0000 0100	4	3 ≤ Wind Speed [kts] < 4
0000 1000	8	7 ≤ Wind Speed [kts] < 8
0001 0000	16	15 ≤ Wind Speed [kts] < 16
0010 0000	32	31 ≤ Wind Speed [kts] < 32
0100 0000	64	63 ≤ Wind Speed [kts] < 64
1000 0000	128	127 ≤ Wind Speed [kts] < 128
1111 1110	254	253 ≤ Wind Speed [kts] < 254
1111 1111	255	254 ≤ Wind Speed [kts]

Measurement Procedure:

Step 1: Conduct variable data input tests

a. Configure the ADS-B system as for installed operation

b. Power on the ADS-B system and perform start-up procedures (§2.2.3.3.2.1)

c. Operate the ADS-B system so as to broadcast Airborne Position Messages (§2.2.3.3.2.2).

d. Provide variable input data to the ADS-B Transmitting Subsystem at the nominal update rate for the "Wind Speed" and "Wind Direction" subfields.

e. For each "Wind Speed" decimal value in Table 2-240, verify that the system generates Weather State Messages with the "Wind Speed" subfield in each such message set equal to the binary coding value corresponding to the decimal value tested.

f. Provide an updated "Wind Speed" subfield value to the ADS-B Transmitting Subsystem input interface. Verify that the "Wind Speed" subfield for subsequent Weather State Messages is set to the updated value within 100 milliseconds of the data being made available to the input interface.

2.4.3.2.7.6.4.5 Verification of "Wind Direction" Subfield in ADS-B Wx Weather State Messages (§2.2.3.2.7.6.4.5)

This test procedure is used to verify that the ADS-B Transmitting Subsystem correctly encodes the "Wind Direction" subfield in the Weather State Message as a dynamic value from a variable data input.

Table 2-241: "Wind Direction" Subfield Encoding

Coding		Meaning
(Binary)	(Decimal)	
~~00 0000 0000~~	~~0~~	~~NO or INVALID data~~
00 0000 0001	1	0.000 ≤ Wind Direction [degrees] < 0.352
00 0000 0010	2	0.352 ≤ Wind Direction [degrees] < 0.704
00 0000 0100	4	1.056 ≤ Wind Direction [degrees] < 1.408
00 0000 1000	8	2.463 ≤ Wind Direction [degrees] < 2.815
00 0001 0000	16	5.279 ≤ Wind Direction [degrees] < 5.630
00 0010 0000	32	10.909 ≤ Wind Direction [degrees] < 11.261
00 0100 0000	64	22.170 ≤ Wind Direction [degrees] < 22.522
00 1000 0000	128	44.692 ≤ Wind Direction [degrees] < 45.044
01 0000 0000	256	89.736 ≤ Wind Direction [degrees] < 90.088
10 0000 0000	512	179.824 ≤ Wind Direction [degrees] < 180.176
11 1111 1110	1022	359.296 ≤ Wind Direction [degrees] < 359.648
11 1111 1111	1023	359.648 ≤ Wind Direction [degrees] < 360.000

Measurement Procedure:

Step 1: Conduct variable data input tests

a. Configure the ADS-B system as for installed operation

b. Power on the ADS-B system and perform start-up procedures (§2.2.3.3.2.1)

c. Operate the ADS-B system so as to broadcast Airborne Position Messages (§2.2.3.3.2.2).

d. Provide variable input data to the ADS-B Transmitting Subsystem at the nominal update rate for the "Wind Speed" and "Wind Direction" subfields.

e. For each "Wind Direction" decimal value in Table 2-241, verify that the system generates Weather State Messages with the "Wind Direction" subfield in each such message set equal to the binary coding value corresponding to the decimal value tested.

f. Provide an updated "Wind Direction" subfield value to the ADS-B Transmitting Subsystem input interface. Verify that the "Wind Direction" subfield for subsequent Weather State Messages is set to the updated value within 100 milliseconds of the data being made available to the input interface.

2.4.3.2.7.6.4.6 Verification of "Air Temperature Type" Subfield in ADS-B Wx Weather State Messages (§2.2.3.2.7.6.4.6)

This test procedure is used to verify that the ADS-B Transmitting Subsystem correctly encodes the "Air Temperature Type" subfield in the Weather State Message, as either a preconfigured, static value or as a dynamic value based on variable data input(s). It also verifies the encoding of "Air Temperature Type" in the Alternate Weather State Message.

Note: This test procedure assumes "Air Temperature Type" may be preconfigured, provided explicitly, or may be determined from the provision of Total Air Temperature data or Static Air Temperature data. If one or more method is not supported, the test steps associated with that method may be omitted.

Measurement Procedure:

Step 1: Conduct preconfigured data tests

a. Configure the ADS-B system as for installed operation, preconfiguring the Weather State Message, "Air Temperature Type" subfield with decimal value "0" (binary 0) in Table 2-90, as appropriate per §2.2.3.2.7.6.4.6.

b. Power on the ADS-B system and perform start-up procedures (§2.2.3.3.2.1).

c. Operate the ADS-B system so as to broadcast Airborne Position Messages (§2.2.3.3.2.2).

d. Provide variable input data to the ADS-B Transmitting Subsystem at the nominal update rate for the "Wind Speed" and "Wind Direction" subfields.

e. Verify that the ADS-B Transmitting Subsystem transmits Weather State Messages with the "Air Temperature Type" subfield set to the preconfigured value.

f. Perform Steps 1.a through 1.e, substituting the untested "Air Temperature Type" decimal value "1" (binary 1) in Table 2-90 for the "0" in Step 1.a

g. Perform Steps 1.a through 1.c

h. Provide variable input data to the ADS-B Transmitting Subsystem at the nominal update rate for the "Roll Angle" subfield.

i. Verify that the ADS-B Transmitting Subsystem transmits Alternate Weather State Messages with the "Air Temperature Type" subfield set to the preconfigured value.

j. Perform Steps 1.a through 1.c and 1.h, substituting the untested "Air Temperature Type" decimal value "1" (binary 1) in Table 2-90 for the "0" in Step 1.a.

k. Verify that the ADS-B Transmitting Subsystem transmits Alternate Weather State Messages with the "Air Temperature Type" subfield set to the preconfigured value.

Step 2: Conduct variable data input tests for dynamic, explicitly provided Air Temperature Type variable input

a. Perform Steps 1.b through 1.d

b. Provide variable input data to the ADS-B Transmitting Subsystem at the nominal update rate for the "Air Temperature Type" subfield in the form of "Air Temperature Type" data set to decimal "0" (binary 0)

c. Verify that the ADS-B Transmitting Subsystem transmits Weather State Messages with the “Air Temperature Type” subfield in each such message set to decimal “0” (binary 0).

d. Provide variable input data to the ADS-B Transmitting Subsystem at the nominal update rate for the “Air Temperature Type” subfield in the form of “Air Temperature Type” data set to decimal “1” (binary 1)

e. Verify that the ADS-B Transmitting Subsystem transmits Weather State Messages with the “Air Temperature Type” subfield in each such message set to decimal “1” (binary 1).

f. Provide an updated “Air Temperature Type” subfield value to the ADS-B Transmitting Subsystem input interface. Verify that the “Air Temperature Type” subfield for subsequent Weather State Messages is set to the updated value within 100 milliseconds of the data being made available to the input interface.

g. Perform Steps 1.b and 1.c and 1.h

h. Provide variable input data to the ADS-B Transmitting Subsystem at the nominal update rate for the “Air Temperature Type” subfield in the form of “Air Temperature Type” data set to decimal “0” (binary 0)

i. Verify that the ADS-B Transmitting Subsystem transmits Alternate Weather State Messages with the “Air Temperature Type” subfield in each such message set to decimal “0” (binary 0).

j. Provide variable input data to the ADS-B Transmitting Subsystem at the nominal update rate for the “Air Temperature Type” subfield in the form of “Air Temperature Type” data set to decimal “1” (binary 1)

k. Verify that the ADS-B Transmitting Subsystem transmits Alternate Weather State Messages with the “Air Temperature Type” subfield in each such message set to decimal “1” (binary 1).

l. Provide an updated “Air Temperature Type” subfield value to the ADS-B Transmitting Subsystem input interface. Verify that the “Air Temperature Type” subfield for subsequent Alternate Weather State Messages is set to the updated value within 100 milliseconds of the data being made available to the input interface.

Step 3: Conduct variable data input tests for determining Air Temperature Type from variable input of Total Air Temperature data

a. Perform Steps 1.b through 1.d

b. Provide variable input data to the ADS-B Transmitting Subsystem at the nominal update rate for the “Air Temperature” subfield in the form of “Total Air Temperature” data only.

c. Verify that the ADS-B Transmitting Subsystem transmits Weather State Messages with the “Air Temperature Type” subfield in each such message set to decimal “0” (binary 0).

d. Provide an updated “Air Temperature” subfield value to the ADS-B Transmitting Subsystem input interface in the form of Static Air Temperature. Verify that the “Air Temperature Type” subfield for subsequent Weather State Messages is set to decimal “1” (binary 1) within 100 milliseconds of the data being made available to the input interface.

e. Perform Steps 1.b and 1.c

f. Provide variable input data to the ADS-B Transmitting Subsystem at the nominal update rate for the “Air Temperature” subfield in the form of “Total Air Temperature” data only.

g. Verify that the ADS-B Transmitting Subsystem transmits Alternate Weather State Messages with the “Air Temperature Type” subfield in each such message set to decimal “0” (binary 0).

h. Provide an updated “Air Temperature” subfield value to the ADS-B Transmitting Subsystem input interface in the form of Static Air Temperature. Verify that the “Air Temperature Type” subfield for subsequent Alternate Weather State Messages is set to decimal “1” (binary 1) within 100 milliseconds of the data being made available to the input interface.

Step 4: Conduct variable data input tests for determining Air Temperature Type from variable input of Static Air Temperature data

a. Perform Steps 1.b through 1.d

b. Provide variable input data to the ADS-B Transmitting Subsystem at the nominal update rate for the “Air Temperature” subfield in the form of “Static Air Temperature” data only

c. Verify that the ADS-B Transmitting Subsystem transmits Weather State Messages with the “Air Temperature Type” subfield in each such message set to decimal “1” (binary 1).

d. Discontinue the input of Static Air Temperature. Provide an updated “Air Temperature” subfield value to the ADS-B Transmitting Subsystem input interface in the form of Total Air Temperature. Verify that the “Air Temperature Type” subfield for subsequent Weather State Messages is set to decimal “0” (binary 0) within 100 milliseconds of the data being made available to the input interface.

e. Perform Steps 1.b and 1.c

f. Provide variable input data to the ADS-B Transmitting Subsystem at the nominal update rate for the “Air Temperature” subfield in the form of “Static Air Temperature” data only.

g. Verify that the ADS-B Transmitting Subsystem transmits Alternate Weather State Messages with the “Air Temperature Type” subfield in each such message set to decimal “1” (binary 1).

h. Discontinue the input of Static Air Temperature. Provide an updated “Air Temperature” subfield value to the ADS-B Transmitting Subsystem input interface in the form of Total Air Temperature. Verify that for Alternate Weather State messages sent within 2.0 seconds after discontinuing the input of Static Air Temperature, the “Air Temperature Type” subfield is set to decimal “1” (binary 1), and that for Alternate Weather State messages sent more than 2.0 seconds after discontinuing the input of Static Air Temperature, the “Air Temperature Type” subfield ~~for subsequent Alternate Weather State Messages~~ is set to decimal “0” (binary 0) ~~within 100 milliseconds of the data being made available to the input interface~~.

Step 5: Conduct variable data input tests for determining Air Temperature Type from variable input of both Total Air Temperature data and Static Air Temperature data

a. Perform Steps 1.b through 1.d

b. Provide variable input data to the ADS-B Transmitting Subsystem at the nominal update rate for the "Air Temperature" subfield in the form of both "Total Air Temperature" data, and "Static Air Temperature".

c. Verify that the ADS-B Transmitting Subsystem transmits Weather State Messages with the "Air Temperature Type" subfield in each such message set to decimal "1" (binary 1).

d. Perform Steps 1.b and 1.c

e. Provide variable input data to the ADS-B Transmitting Subsystem at the nominal update rate for the "Air Temperature" subfield in the form of both "Total Air Temperature" data and "Static Air Temperature" data.

f. Verify that the ADS-B Transmitting Subsystem transmits Alternate Weather State Messages with the "Air Temperature Type" subfield in each such message set to decimal "1" (binary 1).

2.4.3.2.7.6.4.8 Verification of "Airspeed Type" Subfield in ADS-B Wx Weather State Messages (§2.2.3.2.7.6.4.8)

This test procedure is used to verify that the ADS-B Transmitting Subsystem correctly encodes the "Airspeed Type" subfield in the Weather State Message, as either a preconfigured, static value or as a dynamic value based on variable data input(s). It also verifies the encoding of "Airspeed Type" in the Alternate Weather State Message.

Note: *This test procedure assumes "Airspeed Type" may be preconfigured, provided explicitly, or may be determined from the provision of Indicated Airspeed data or True Airspeed data. If one or more method is not available, the test steps associated with that method may be omitted.*

Measurement Procedure:

Step 1: Conduct preconfigured data tests

a. Configure the ADS-B system as for installed operation, preconfiguring the Weather State Message, "Airspeed Type" subfield with decimal value "0" (binary 0) in Table 2-92, as appropriate per §2.2.3.2.7.6.4.8.

b. Power on the ADS-B system and perform start-up procedures (§2.2.3.3.2.1).

c. Operate the ADS-B system so as to broadcast Airborne Position Messages (§2.2.3.3.2.2).

d. Provide variable input data to the ADS-B Transmitting Subsystem at the nominal update rate for the "Wind Speed" and "Wind Direction" subfields.

e. Verify that the ADS-B Transmitting Subsystem transmits Weather State Messages with the "Airspeed Type" subfield set to the preconfigured value.

f. Perform Steps 1.a through 1.e, substituting the untested "Airspeed Type" decimal value "1" (binary 1) in Table 2-92 for the "0" in Step 1.a.

g. Perform Steps 1.a through 1.c

h. Provide variable input data to the ADS-B Transmitting Subsystem at the nominal update rate for the “Roll Angle” subfield.

i. Verify that the ADS-B Transmitting Subsystem transmits Alternate Weather State Messages with the “Airspeed Type” subfield set to the preconfigured value.

j. Perform Steps 1.a through 1.c and 1.h, substituting the untested “Airspeed Type” decimal value “1” (binary 1) in Table 2-92 for the “0” in Step 1.a.

k. Verify that the ADS-B Transmitting Subsystem transmits Alternate Weather State Messages with the “Airspeed Type” subfield set to the preconfigured value.

Step 2: Conduct variable data input tests for dynamic, explicitly provided Airspeed Type variable input

a. Perform Steps 1.b through 1.d

b. Provide variable input data to the ADS-B Transmitting Subsystem at the nominal update rate for the “Airspeed Type” subfield in the form of “Airspeed Type” data set to decimal “0” (binary 0)

c. Verify that the ADS-B Transmitting Subsystem transmits Weather State Messages with the “Airspeed Type” subfield in each such message set to decimal “0” (binary 0).

d. Provide variable input data to the ADS-B Transmitting Subsystem at the nominal update rate for the “Airspeed Type” subfield in the form of “Airspeed Type” data set to decimal “1” (binary 1)

e. Verify that the ADS-B Transmitting Subsystem transmits Weather State Messages with the “Airspeed Type” subfield in each such message set to decimal “1” (binary 1).

f. Provide an updated “Airspeed Type” subfield value to the ADS-B Transmitting Subsystem input interface. Verify that the “Airspeed Type” subfield for subsequent Weather State Messages is set to the updated value within 100 milliseconds of the data being made available to the input interface.

g. Perform Steps 1.b and 1.c and 1.h

h. Provide variable input data to the ADS-B Transmitting Subsystem at the nominal update rate for the “Airspeed Type” subfield in the form of “Airspeed Type” data set to decimal “0” (binary 0)

i. Verify that the ADS-B Transmitting Subsystem transmits Alternate Weather State Messages with the “Airspeed Type” subfield in each such message set to decimal “0” (binary 0).

j. Provide variable input data to the ADS-B Transmitting Subsystem at the nominal update rate for the “Airspeed Type” subfield in the form of “Airspeed Type” data set to decimal “1” (binary 1)

k. Verify that the ADS-B Transmitting Subsystem transmits Alternate Weather State Messages with the “Airspeed Type” subfield in each such message set to decimal “1” (binary 1).

l. Provide an updated “Airspeed Type” subfield value to the ADS-B Transmitting Subsystem input interface. Verify that the “Airspeed Type” subfield for subsequent Alternate Weather State Messages is set to the updated value within 100 milliseconds of the data being made available to the input interface.

Step 3: Conduct variable data input tests for determining Airspeed Type from variable input of Indicated Airspeed data

a. Perform Steps 1.b through 1.d

b. Provide variable input data to the ADS-B Transmitting Subsystem at the nominal update rate for the "Airspeed" subfield in the form of "Indicated Airspeed" data only.

c. Verify that the ADS-B Transmitting Subsystem transmits Weather State Messages with the "Airspeed Type" subfield in each such message set to decimal "0" (binary 0).

d. Provide an updated "Airspeed" subfield value to the ADS-B Transmitting Subsystem input interface in the form of True Airspeed. Verify that the "Airspeed Type" subfield for subsequent Weather State Messages is set to decimal "1" (binary 1) within 100 milliseconds of the data being made available to the input interface.

e. Perform Steps 1.b and 1.c

f. Provide variable input data to the ADS-B Transmitting Subsystem at the nominal update rate for the "Airspeed" subfield in the form of "Indicated Airspeed" data only.

g. Verify that the ADS-B Transmitting Subsystem transmits Alternate Weather State Messages with the "Airspeed Type" subfield in each such message set to decimal "0" (binary 0).

h. Ensure that the "Air Temperature Type" subfield is set to "Static Air Temperature". Provide an updated "Airspeed" subfield value to the ADS-B Transmitting Subsystem input interface in the form of True Airspeed. Verify that the "Airspeed Type" subfield for subsequent Alternate Weather State Messages is set to decimal "1" (binary 1) within 100 milliseconds of the data being made available to the input interface.

Step 4: Conduct variable data input tests for determining Airspeed Type from variable input of True Airspeed data

a. Perform Steps 1.b through 1.d

b. Provide variable input data to the ADS-B Transmitting Subsystem at the nominal update rate for the "Airspeed" subfield in the form of "True Airspeed" data only.

c. Verify that the ADS-B Transmitting Subsystem transmits Weather State Messages with the "Airspeed Type" subfield in each such message set to decimal "1" (binary 1).

d. Discontinue the input of True Airspeed. Provide an updated "Airspeed" subfield value to the ADS-B Transmitting Subsystem input interface in the form of Indicated Airspeed. Verify that for Weather State messages sent within 2.0 seconds after discontinuing the input of True Airspeed, the "Airspeed Type" subfield for subsequent Weather State Messages is set to decimal "1" (binary 1), and that for Weather State messages sent more than 2.0 seconds after discontinuing the input of True Airspeed, the

"Airspeed Type" subfield ~~for subsequent Weather State Messages~~ is set to decimal "0" (binary 0) ~~within 100 milliseconds of the data being made available to the input interface~~.

e. Perform Steps 1.b and 1.c

f. Provide variable input data to the ADS-B Transmitting Subsystem at the nominal update rate for the "Airspeed" subfield in the form of "True Airspeed" data only.

g. Verify that the ADS-B Transmitting Subsystem transmits Alternate Weather State Messages with the "Airspeed Type" subfield in each such message set to decimal "1" (binary 1).

h. Discontinue the input of True Airspeed. Provide an updated "Airspeed" subfield value to the ADS-B Transmitting Subsystem input interface in the form of Indicated Airspeed. Verify that for Weather State messages sent within 2.0 seconds after discontinuing the input of True Airspeed, the "Airspeed Type" subfield for subsequent Weather State Messages is set to decimal "1" (binary 1), and that for Weather State messages sent more than 2.0 seconds after discontinuing the input of True Airspeed, the "Airspeed Type" subfield ~~for subsequent Alternate Weather State Messages~~ is set to decimal "0" (binary 0) ~~within 100 milliseconds of the data being made available to the input interface~~.

Step 5: Conduct variable data input tests for determining Airspeed Type from variable input of both Indicated Airspeed data and True Airspeed data

a. Perform Steps 1.b through 1.d

b. Provide variable input data to the ADS-B Transmitting Subsystem at the nominal update rate for the "Airspeed" subfield in the form of both "Indicated Airspeed" data and "True Airspeed" data.

c. Verify that the ADS-B Transmitting Subsystem transmits Weather State Messages with the "Airspeed Type" subfield in each such message set to decimal "1" (binary 1).

d. Perform Steps 1.b and 1.c

e. Ensure that the "Air Temperature Type" subfield is set to "Static Air Temperature". Provide variable input data to the ADS-B Transmitting Subsystem at the nominal update rate for the "Airspeed" subfield in the form of both "Indicated Airspeed" data and "True Airspeed" data.

f. Verify that the ADS-B Transmitting Subsystem transmits Alternate Weather State Messages with the "Airspeed Type" subfield in each such message set to decimal "1" (binary 1).

g. Ensure that the "Air Temperature Type" subfield is set to "Total Air Temperature". Provide variable input data to the ADS-B Transmitting Subsystem at the nominal update rate for the "Airspeed" subfield in the form of both "Indicated Airspeed" data and "True Airspeed" data.

h. Verify that the ADS-B Transmitting Subsystem transmits Alternate Weather State Messages with the "Airspeed Type" subfield in each such message set to decimal "0" (binary 0).

2.4.3.2.7.8.1.6 Verification of "Peak EDR Offset" Subfield in Emergency / Priority Status Messages (§2.2.3.2.7.8.1.6)

Purpose/Introduction:

If supporting the ADS-B Wx AIREP option, this test procedure is used to verify that the ADS-B Transmitting Subsystem correctly encodes the "Peak EDR Offset" subfield in the Emergency / Priority Status Message as a dynamic value from a variable data input. The test procedures in §2.4.3.3.2.6.3 verify that encodings other than "NO or INVALID Data" occur only when Airborne Position Messages are being broadcast. If ADS-B Wx AIREPs are not supported, this test verifies that the "Peak EDR Offset" subfield is set to ALL ZEROs.

Measurement Procedure:

If NOT implementing ADS-B Wx AIREP:

Configure the ADS-B Transmitting Subsystem to transmit Airborne Position Messages. Set the ADS-B Transmitting Subsystem to Airborne status. Produce valid Airborne Position Messages at the nominal rate with valid position and altitude data. Verify that the ADS-B Transmitting Subsystem begins to transmit Extended Squitter Aircraft Status Messages at the nominal rate with the TYPE Subfield set to 28 (binary 1 1100) and the Subtype Subfield set to ONE (binary 001). Verify that the "Peak EDR Offset" subfield ("ME" bits 40 – 42; Message bits 72 – 74) is set to ALL ZEROs.

If implementing ADS-B Wx AIREP:

Conduct variable data input tests

a. Configure the ADS-B system as for installed operation

b. Power on the ADS-B system and perform start-up procedures (§2.2.3.3.2.1)

c. Operate the ADS-B system so as to broadcast Airborne Position Messages (§2.2.3.3.2.2).

d. Provide variable input data to the ADS-B Transmitting Subsystem at the nominal update rate for the "Peak EDR Offset" subfield.

e. For each valid "Peak EDR Offset" decimal value in Table 2-102, verify that the system generates Emergency / Priority Status Messages with the "Peak EDR Offset" subfield in each such message set equal to the binary coding value corresponding to the decimal value tested.

~~f. For variable input values greater than the "Peak EDR Offset" subfield range maximum in Table 2-102, verify that the system generates Emergency / Priority Status Messages with the "Peak EDR Offset" subfield coding in each such message is set to decimal "7" (binary 111).~~

g. Provide an updated "Peak EDR Offset" subfield value to the ADS-B Transmitting Subsystem input interface. Verify that the "Peak EDR Offset" subfield for subsequent Emergency/Priority Status Messages is set to the updated value within 100 milliseconds of the data being made available to the input interface.

2.4.3.3.2.3 Verification of ADS-B Surface Position Message Broadcast Rate (§2.2.3.3.2.3)

Purpose/Introduction:

This test verifies the Surface Position broadcast rates. Broadcast rates for 1090 MHz Extended Squitter ADS-B Messages are summarized in Table 2-128.

Equipment Required:

Provide a method of loading valid data for broadcasting ADS-B Messages into the ADS-B equipment under test. Provide a method of monitoring the transmitted ADS-B Messages and measuring the rate at which they are output.

Measurement Procedure:

Step 1: Broadcast Rate (§2.2.3.3.2.3.a, b and c)

Ensure that the equipment is set to the "On-Ground" condition and that the appropriate valid ADS-B Surface Position data are available such that the position data is initiated and changes such that the position reflects an increased displacement from the initial position of 1 meter each second.

After 15 seconds, verify that the ADS-B Surface Position Messages are broadcast at random intervals that are uniformly distributed over the range of 0.4 to 0.6 seconds using a time quantization no greater than 15 milliseconds as specified in §2.2.3.3.2.3.b.

Provide position and movement data to the ADS-B equipment such that the position is stationary. Note the initial time that the position data is no longer changing. After 15 minutes and 10 seconds from the start of the input of stationary position data, verify that the ADS-B Surface Position Messages are broadcast at random intervals that are uniformly distributed over the range of 4.8 to 5.2 seconds using a time quantization no greater than 15 milliseconds as specified in §2.2.3.3.2.3.c.

Provide position data such that the position is moving 10 meters per minute and note the time the input changes from stationary to moving. After 61 seconds from the change from stationary position to moving, verify that the ADS-B Surface Position Messages are broadcast at random intervals that are uniformly distributed over the range of 0.4 to 0.6 seconds.

Step 2: Initiation, Timeout, and Termination (§2.2.3.3.2.1.2, §2.2.3.3.2.11.b, §2.2.3.3.2.12.b)

Ensure that the equipment is set to the "On -Ground" condition. Input Movement and Heading / Ground Track, but do not input position. Verify that Surface Position Messages are not broadcast.

Cease input of Movement and Heading / Ground Track. Input position with a simulated movement at a rate high enough to result in a "High" broadcast rate. Verify that Surface Position messages are initiated.

Input all data for the Surface Position Messages. Stop the input of position data, but continue with data sufficient to populate the Movement and Heading / Ground Track subfields.

Verify that the Surface Position Messages broadcast within 2.6 seconds after stopping the data input have all data bits set to the last reported valid value. Verify that Surface Position Messages broadcast more than 2.6 seconds after stopping the data input have all data bits set to ZERO. Verify that the ADS-B Surface Position Messages cease to be broadcast 60 seconds from stopping the position input.

Note: The 60 second termination does not apply to Non-Transponder Devices.

Resume input of position data and stop the input of Movement data. Verify that the Surface Position Messages broadcast within 2.6 seconds after stopping the data input have the Movement subfield set to the last reported valid value. Verify that Surface Position Messages broadcast more than 2.6 seconds after stopping the data input have the Movement subfield set to ZERO with all other subfields correctly populated.

Resume input of Movement data and stop the input of Heading / Ground Track data. Verify that the Surface Position Messages broadcast within 2.6 seconds after stopping the data input have the Heading / Ground Track subfield set to the last reported valid value. Verify that Surface Position Messages broadcast more than 2.6 seconds after stopping the data input have the Heading / Ground Track subfield set to ZERO with all other subfields correctly populated.

Note: It is acceptable to validate the data in the subsequent Surface Position Message received after the indicated time has elapsed.

~~Step 3: Switching between High Rate and Low Rate (§2.2.3.3.2.3.a)~~

~~Ensure that the equipment is set to the "On-Ground" condition and that the appropriate valid ADS-B Surface Position data are provided such that the position is changing at a rate of 10.1 meters in any 15 minute interval. After the initial data input, verify that the ADS-B Surface Position Messages are broadcast at a low rate. 15 minutes and 10 seconds after the start of the data input, verify that the ADS-B Surface Position Messages are the high rate.~~

~~Input new ADS-B Surface Position data with the position data changing at a rate of 9.9 meters in any 15 minute interval. Verify that high rate broadcasts are maintained for at least 14 minutes and 50 seconds. 15 minutes and 10 seconds after the inputting of the new data, verify that the ADS-B Surface Position Messages are broadcast at the low rate.~~

~~*Note: It is acceptable to validate the data in the subsequent Surface Position Message received after the indicated time has elapsed.*~~

2.4.3.3.2.4 Verification of ADS-B Aircraft Identification and Category Message Broadcast Rate (§2.2.3.3.2.4)

Purpose/Introduction:

This test verifies the Aircraft Identification and Category broadcast rates. Broadcast rates for 1090 MHz Extended Squitter ADS-B Messages are summarized in Table 2-128.

Equipment Required:

Provide a method of loading valid data for ADS-B broadcast messages into the ADS-B equipment under test. Provide a method of monitoring the transmitted ADS-B Messages and measuring the rate at which they are output.

Measurement Procedure:

Step 1: Broadcast Rate (§2.2.3.3.2.4)

Ensure that the equipment is set to the "Airborne" condition and that the appropriate valid Aircraft Identification and Category data are available. Verify that the Aircraft Identification and Category Messages are broadcast at random intervals that are uniformly distributed over the range of 4.8 to 5.2 seconds using a time quantization no greater than 15 milliseconds as specified in §2.2.3.3.2.4.a.

Ensure that the equipment is set to the "On-Ground" condition, the appropriate valid ADS-B Surface Position data are provided such that the position is stationary, the Surface Position Message is transmitting at the "Low" rate, and the appropriate valid ADS-B Aircraft Identification and Category data are available. Verify that the ADS-B Aircraft Identification and Category Messages are broadcast at random intervals that are uniformly distributed over the range of 9.8 to 10.2 seconds using a time quantization no greater than 15 milliseconds as specified in §2.2.3.3.2.4.b.

Discontinue input of position data and wait 60 seconds. Verify that the ADS-B Aircraft Identification and Category Messages are broadcast at intervals that are uniformly distributed over the range of 4.8 to 5.2 seconds using a time quantization no greater than 15 milliseconds as specified in §2.2.3.3.2.4.c.

Resume input of ~~Input new~~ ADS-B Surface Position data such that the position is changing at a rate of 5 m/s. Two (2) seconds after inputting the new data, verify that the ADS-B Aircraft Identification and Category Messages are broadcast at random intervals that are uniformly distributed over the range of 4.8 to 5.2 seconds using a time quantization no greater than 15 milliseconds as specified in §2.2.3.3.2.4.a.

Note: It is acceptable to validate the data in the subsequent Aircraft Identification and Category Message received after the indicated time has elapsed.

Step 2: Initiation, Timeout, and Termination (§2.2.3.3.2.1.2, §2.2.3.3.2.11.d, §2.2.3.3.2.12.c)

Reset the ADS-B device. Input only ADS-B Emitter Category data. Verify that the Aircraft Identification and Category Messages are initiated.

Stop the input of data. At least 60 seconds later, verify that the Aircraft Identification and Category Messages continue to be broadcast with the same data that existed prior to stopping the data input.

Reset the ADS-B system. Input only Aircraft Identification data. Verify that the Aircraft Identification and Category Messages are initiated.

Stop the input of data. At least 60 seconds later, verify that the Aircraft Identification and Category Messages continue to be broadcast with the same data that existed prior to stopping the data input.

2.4.3.3.2.6.1 Verification of ADS-B Target State and Status Message Broadcast Rates (§2.2.3.3.2.6.1)

Purpose/Introduction:

This test verifies the Target State and Status broadcast rates. Broadcast rates for 1090 MHz Extended Squitter ADS-B Messages are summarized in Table 2-128.

Equipment Required:

Provide a Method of loading valid data for ADS-B broadcast messages into the ADS-B equipment under test. Provide a method of monitoring the transmitted ADS-B Messages and measuring the rate at which they are output.

Measurement Procedure:

Step 1: Broadcast Rate (§2.2.3.3.2.6.1)

Ensure that the equipment is set to the “Airborne” condition and that the appropriate valid Target State and Status data are available. Verify that the Target State and Status Messages are broadcast at random intervals that are uniformly distributed over the range of 1.2 to 1.3 seconds using a time quantization no greater than 15 milliseconds as specified in §2.2.3.3.2.6.1.

Step 2: Initiation, Timeout, and Termination (§2.2.3.3.2.1.2, §2.2.3.3.2.11.e, §2.2.3.3.2.12.e)

Provide the ADS-B Transmitting Subsystem with valid data necessary for the generation of Target State and Status Messages and Surface Position Messages. Ensure that the equipment is set to the “On-Ground” condition. Verify that Target State and Status Messages are not broadcast.

Discontinue the input of Selected Altitude, Selected Heading, and BPS data. Ensure that the equipment is set to the “Airborne” condition. Generate Airborne Position messages. Verify that Target State and Status Messages are not broadcast.

Input valid Selected Altitude data. Verify that Target State and Status Messages are initiated.

Discontinue input of Selected Altitude data. Verify that the Target State and Status Messages cease to be broadcast 2.6 seconds after stopping the data input.

Input valid Selected Heading data. Verify that the Target State and Status Messages are initiated.

Discontinue input of Selected Heading data. Verify that the Target State and Status Messages cease to be broadcast 2.6 seconds after stopping the data input.

Input valid BPS data. Verify that the Target State and Status Messages are initiated. Discontinue input of BPS data. Verify that the Target State and Status Messages cease to be broadcast 2.6 seconds after stopping the data input.

Input valid Target State and Status data, and discontinue Airborne Position Message broadcast (e.g., no position or altitude data provided to the system). Verify that the ADS-B Transmitting Subsystem is not broadcasting any ADS-B Target State and Status Messages.

Input valid Target State and Status data and Airborne Position data. Discontinue input of Selected Altitude. Verify that the Target State and Status Messages broadcast within ~~2.0~~ 2.6 seconds after stopping the data input have the Selected Altitude subfield set to the last reported valid value. Verify that Target State and Status Messages broadcast more than ~~2.0~~ 2.6 seconds after stopping the data input have the Selected Altitude subfield set to ALL ZEROs with all other subfields correctly populated.

Resume input of Selected Altitude and discontinue input of Selected Heading. Verify that the Target State and Status Messages broadcast within ~~2.0~~ 2.6 seconds after stopping the data input have the Selected Heading subfield set to the last reported valid value. Verify that Target State and Status Messages broadcast more than ~~2.0~~ 2.6 seconds after stopping the data input have the Selected Heading subfield set to ALL ZEROs with all other subfields correctly populated.

Resume input of Selected Heading and discontinue input of BPS. Verify that the Target State and Status Messages broadcast within ~~2.0~~ 2.6 seconds after stopping the data input have the BPS subfield set to the last reported valid value. Verify that Target State and Status Messages broadcast more than ~~2.0~~ 2.6 seconds after stopping the data input have the BPS subfield set to ALL ZEROs with all other subfields correctly populated.

Note: *It is acceptable to validate the data in the subsequent Target State and Status Message received after the indicated time has elapsed.*

2.4.3.3.2.6.3 Verification of ADS-B Emergency/Priority Status Message Broadcast Rate (§2.2.3.3.2.6.3)

Purpose/Introduction:

This test verifies the Emergency/Priority Status Message broadcast rates. Broadcast rates for 1090 MHz Extended Squitter ADS-B Messages are summarized in Table 2-128.

Equipment Required:

Provide a method of loading valid data for ADS-B broadcast messages into the ADS-B equipment under test. Provide a method of monitoring the transmitted ADS-B Messages and measuring the rate at which they are output.

Measurement Procedure:

Step 1: Broadcast Rate (§2.2.3.3.2.6.3)

Ensure that appropriate valid Emergency/Priority Status Message data are available. Verify that the Emergency/Priority Status Messages are broadcast at random intervals that are uniformly distributed over the range of 4.8 to 5.2 seconds using a time quantization no greater than 15 milliseconds as specified in §2.2.3.3.2.6.3.b.

Input a Mode A Code of 1000. Verify that the Emergency/Priority Status Messages are broadcast at random intervals that are uniformly distributed over the range of 0.7 to 0.9 seconds using a time quantization no greater than 15 milliseconds seconds as specified in §2.2.3.3.2.6.3.a. Verify that the Emergency/Priority Status Messages return to the nominal rate 24 ±1 seconds after changing the data.

Input a Mode A Code of 7400. Verify that the Emergency/Priority Status Messages are broadcast at random intervals that are uniformly distributed over the range of 0.7 to 0.9 seconds using a time quantization no greater than 15 milliseconds seconds as specified in §2.2.3.3.2.6.3.a. At least 60 seconds after changing the Mode A Code, verify that the Emergency/Priority Status Messages remain at the higher rate.

Input a Mode A Code of 1000. After the Emergency/Priority Status Message reverts to the low broadcast rate, input a Mode A Code of 7500. At least 60 seconds after changing the Mode A Code to 7500, verify that the Emergency/Priority Status Messages are broadcast at the higher rate.

Input a Mode A Code of 1000. After the Emergency/Priority Status Message reverts to the low broadcast rate, input a Mode A Code of 7600. At least 60 seconds after changing the Mode A Code to 7600, verify that the Emergency/Priority Status Messages are broadcast at the higher rate.

Input a Mode A Code of 1000. After the Emergency/Priority Status Message reverts to the low broadcast rate, input a Mode A Code of 7700. At least 60 seconds after changing the Mode A Code to 7700, verify that the Emergency/Priority Status Messages are broadcast at the higher rate.

Input a Mode A Code of 1000. After the Emergency/Priority Status Message reverts to the low broadcast rate, input an Emergency/Priority Status of decimal 6. At least 60 seconds after changing the Emergency/Priority Status, verify that the Emergency/Priority Status Messages are broadcast at the higher rate.

<u>Step 2:</u> <u>Initiation, Timeout, and Termination (§2.2.3.3.2.1.2, §2.2.3.3.2.11.i, §2.2.3.3.2.12.g)</u>

Provide the ADS-B Transmitting Subsystem with only Emergency/Priority Status data. Verify that the Emergency/Priority Status Message is initiated.

Discontinue input of Emergency/Priority Status data. At least 60 seconds later, verify that the Emergency/Priority Status Messages continue to be broadcast.

Reset the ADS-B Transmitting Subsystem. Provide the ADS-B Transmitting Subsystem with only Mode A Code data. Verify that the Emergency/Priority Status Message is initiated.

Reset the ADS-B Transmitting Subsystem. Provide the ADS-B Transmitting Subsystem with Mode A Code data and with Manned/Unmanned Operation data setting the subfield to ONE (binary 1). Verify that the Emergency/Priority Status Message is initiated.

Discontinue input of Mode A Code and Manned/Unmanned Operation data. At least 60 seconds later, verify that the Emergency/Priority Status Messages continue to be broadcast with the same Mode A Code data as was previously input and with the Manned/Unmanned Operation subfield set to ONE (binary 1).

If implementing support for the optional ADS-B Wx AIREP Messages, the following additional tests apply:

Reset the ADS-B Transmitting Subsystem. Operate the ADS-B system so as to broadcast Surface Position Messages (§2.2.3.3.2.2). Provide the ADS-B Transmitting Subsystem, additionally, with Mean EDR data only. Verify that the Emergency/Priority Status Message is not initiated. Provide the ADS-B Transmitting Subsystem with Mode A Code data in addition to Mean EDR data. Verify that the Emergency/Priority Status Message is initiated and that the Mean EDR subfield is set to ALL ZEROs in the Emergency/Priority Status Messages generated.

Reset the ADS-B Transmitting Subsystem. Operate the ADS-B system so as to broadcast Airborne Position Messages. Provide the ADS-B Transmitting Subsystem, additionally, with Mean EDR data only. Verify that the Emergency/Priority Status Message is initiated.

Discontinue input of Mean EDR data. Verify that the Emergency/Priority Status Messages broadcast within 15 seconds after stopping the data input have the Mean EDR subfield set to the last reported valid value and that any Emergency/Priority Status Messages broadcast more than 15 seconds after stopping the data input have the Mean EDR subfield set to ALL ZEROs. At least 60 seconds later, verify that the Emergency/Priority Status Messages continue to be broadcast.

Reset the ADS-B Transmitting Subsystem. Operate the ADS-B system so as to broadcast Surface Position Messages. Provide the ADS-B Transmitting Subsystem, additionally, with Peak EDR data only. Verify that the Emergency/Priority Status Message is not initiated. Provide the ADS-B Transmitting Subsystem with Mode A Code data in addition to Peak EDR data. Verify that the Emergency/Priority Status Message is initiated and that the Peak EDR subfield is set to ALL ZEROs in the Emergency/Priority Status Messages generated.

Reset the ADS-B Transmitting Subsystem. Operate the ADS-B system so as to broadcast Airborne Position Messages. Provide the ADS-B Transmitting Subsystem, additionally, with Peak EDR data only. Verify that the Emergency/Priority Status Message is initiated.

Discontinue input of Peak EDR data. Verify that the Emergency/Priority Status Messages broadcast within 15 seconds after stopping the data input have the Peak EDR subfield set to the last reported valid value and that any Emergency/Priority Status Messages broadcast more than 15 seconds after stopping the data input have the Peak EDR and Peak EDR Offset subfields set to ALL ZEROs. At least 60 seconds later, verify that the Emergency/Priority Status Messages continue to be broadcast.

Reset the ADS-B Transmitting Subsystem. Operate the ADS-B system so as to broadcast Surface Position Messages. Provide the ADS-B Transmitting Subsystem, additionally, with Peak EDR Offset data only. Verify that the Emergency/Priority Status Message is not initiated. Provide the ADS-B Transmitting Subsystem with Mode A Code data in addition to Peak EDR Offset data. Verify that the Emergency/Priority Status Message is initiated and that the Peak EDR Offset subfields are set to ALL ZEROs in the Emergency/Priority Status Messages generated.

Reset the ADS-B Transmitting Subsystem. Operate the ADS-B system so as to broadcast Airborne Position Messages. Provide the ADS-B Transmitting Subsystem, additionally, with Peak EDR Offset data only. Verify that the Emergency/Priority Status Message is not initiated. Provide the ADS-B Transmitting Subsystem with Peak EDR data in addition to Peak EDR Offset data. Verify that the Emergency/Priority Status Message is initiated.

Discontinue the input of Peak EDR Offset data. Verify that the Emergency/Priority Status Messages broadcast within 15 seconds after stopping the data input have the Peak EDR Offset subfield set to the last reported valid value and that any Emergency/Priority Status Messages broadcast more than 15 seconds after stopping the data input have the Peak EDR Offset subfield set to ALL ZEROs. At least 60 seconds later, verify that the Emergency/Priority Status Messages continue to be broadcast.

Reset the ADS-B Transmitting Subsystem. Operate the ADS-B system so as to broadcast Surface Position Messages. Provide the ADS-B Transmitting Subsystem, additionally, with Water Vapor data only. Verify that the Emergency/Priority Status Message is not initiated. Provide the ADS-B Transmitting Subsystem with Mode A Code data in addition to Water Vapor data. Verify that the Emergency/Priority Status Message is initiated and that the Water Vapor subfield is set to ALL ZEROs in the Emergency/Priority Status Messages generated.

Reset the ADS-B Transmitting Subsystem. Operate the ADS-B system so as to broadcast Airborne Position Messages. Provide the ADS-B Transmitting Subsystem, additionally, with Water Vapor data only. Verify that the Emergency/Priority Status Message is initiated.

Discontinue input of Water Vapor data. Verify that the Emergency/Priority Status Messages broadcast within 6 seconds after stopping the data input have the Water Vapor subfield set to the last reported valid value and that any Emergency/Priority Status Messages broadcast more than 6 seconds after stopping the data input have the Water Vapor subfield set to ALL ZEROs. At least 60 seconds later, verify that the Emergency/Priority Status Messages continue to be broadcast.

Note: It is acceptable to validate the data in the subsequent Emergency/Priority Status Message received after the indicated time has elapsed.

2.4.5.2.4 Verification of Airborne Velocity Message – Subtype=1 Latency (§2.2.5.2.4, §2.2.3.2.6.1)

Purpose/Introduction:

This test verifies the latency of the Airborne Velocity Message – Subtype=1. ~~The following test procedures are used to test Airborne Velocity Messages – Subtype=1 transmitted by Airborne ADS-B Transmitting Subsystems when the transmitting device is installed in an environment having NON-supersonic airspeed capabilities. These test procedures verify that any changes in the data used to structure the subfields of the Airborne Velocity Message - Subtype=1 are reflected in the affected subfield of the next scheduled Airborne~~

~~Velocity Message - Subtype=1 provided that the change occurs at least 100 milliseconds prior to the next scheduled Airborne Velocity Message - Subtype=1 transmission.~~

Measurement Procedure:

Step 1: Airborne Velocity Message - Subtype=1 – "TYPE" Subfield (§2.2.3.2.6.1.1 and §2.2.5.2.4)

Configure the ADS-B Transmitting Subsystem to transmit Airborne Velocity Messages – Subtype=1 by providing subsonic velocity information at the nominal update rate. Provide the data externally at the interface to the ADS-B system. Set the ADS-B Transmitting Subsystem to Airborne status. Provide valid non-zero subsonic velocity data to the ADS-B System. Continue transmitting Airborne Velocity Messages - Subtype=1 at the nominal rate with all parameters unchanged. Verify that the TYPE subfield in the Airborne Velocity Message – Subtype=1 equals 19, which is the only TYPE value assigned to Airborne Velocity Messages.

Step 2: Airborne Velocity Message - Subtype=1 – "Subtype" Subfield (§2.2.3.2.6.1.2 and §2.2.5.2.4)

Continue transmitting Airborne Velocity Messages - Subtype=1 at the nominal rate with all parameters unchanged. Increase the velocity data input to the ADS-B System to a supersonic value so that the change occurs at least 100 milliseconds prior to the next scheduled Airborne Velocity Message transmission. Verify that the "Subtype" subfield value has changed to TWO (2) in the next transmitted Airborne Velocity Message.

Step 3: Airborne Velocity Message - Subtype=1 – "NAC_V" Subfield (§2.2.3.2.6.1.5 and §2.2.5.2.4)

Continue transmitting Airborne Velocity Messages - Subtype=1 at the nominal rate with all parameters unchanged. Verify that the NAC_V value equals Zero (0). Insert changed data to the ADS-B System to cause a change to occur in the NAC_V value and so that the change is detected at least 100 milliseconds prior to the next scheduled Airborne Velocity Message transmission. Verify that the NAC_V subfield value has changed to the correct value in the next transmitted Airborne Velocity Message.

Step 4: Airborne Velocity Message - Subtype=1 – "East/West Direction Bit" Subfield (§2.2.3.2.6.1.6 and §2.2.5.2.4)

Continue transmitting Airborne Velocity Messages - Subtype=1 at the nominal rate with all parameters unchanged. Verify that the East/West Direction Bit equals Zero (0). Insert changed data to the ADS-B System to cause a change to occur in the East/West Direction Bit so that the direction will become "West" and so that the change is detected at least 100 milliseconds prior to the next scheduled Airborne Velocity Message transmission. Verify that the East/West Direction Bit subfield value has changed to ONE (1) in the next transmitted Airborne Velocity Message.

Step 5: Airborne Velocity Message - Subtype=1 – "East/West Velocity" Subfield (§2.2.3.2.6.1.7 and §2.2.5.2.4)

Configure the ADS-B Transmitting Subsystem to transmit Airborne Velocity Messages – Subtype=1 by providing subsonic velocity information at the nominal update rate. Provide the data externally at the interface to the ADS-B system. Set the ADS-B Transmitting Subsystem to Airborne status. Provide valid non zero subsonic East/West Velocity data to the ADS-B System. Continue transmitting Airborne Velocity Messages - Subtype=1 at the nominal rate with all parameters unchanged.

Insert changed data to the ADS-B System to cause a change to occur in the East/West Velocity so that it is detected at least 100 milliseconds prior to the next scheduled Airborne Velocity Message transmission. Verify that the East/West Velocity subfield value has changed in the next transmitted Airborne Velocity Message and that the value in the subfield is correct.

Step 6: Airborne Velocity Message - Subtype=1 – "North/South Direction Bit" Subfield (§2.2.3.2.6.1.8 and §2.2.5.2.4)

Repeat the tests in Step 6 above changing the word "East" to "North" and the word "West" to "South."

Step 7: Airborne Velocity Message - Subtype=1 – "North/South Velocity" Subfield (§2.2.3.2.6.1.9 and §2.2.5.2.4)

Repeat the tests in Step 7 above changing the words "East/West" to "North/South."

Step 8: Airborne Velocity Message - Subtype=1 – "Vertical Rate Source Bit" Subfield (§2.2.3.2.6.1.10 and §2.2.5.2.4)

a. Continue transmitting Airborne Velocity Messages - Subtype=1 at the nominal rate with all parameters unchanged. Verify that the Source Bit for Vertical Rate equals Zero (0), indicating receipt of Vertical Rate information from a Non-Barometric Source. Insert changed data to the ADS-B System to cause a change to occur in the Source Bit for Vertical Rate so that the Vertical Rate information will come from a Barometric Source or Barometric Source blended with another Source~~, and so that the change is detected at least 100 milliseconds prior to the next scheduled Airborne Velocity Message transmission~~. Wait for 2.6 seconds. Verify that the "Source Bit for Vertical Rate" subfield value has changed to ONE (1) in the next transmitted Airborne Velocity Message.

b. Continue transmitting Airborne Velocity Messages – Subtype=1 at the nominal rate with all parameters unchanged and verify that the Source Bit for Vertical Rate contains the value ONE (1). Continue transmitting Airborne Velocity Messages - Subtype=1 at the nominal rate with all parameters unchanged. Insert changed data to the ADS-B System to cause a change to occur in the Source Bit for Vertical Rate so that the Vertical rate information will come from a Non-Barometric Source~~, and so that the change is detected at least 100 milliseconds prior to the next scheduled Airborne Velocity Message transmission~~. Wait for 2.6 seconds. Verify that the "Source Bit for Vertical Rate" subfield value has changed to ZERO (0) in the next transmitted Airborne Velocity Message.

Step 9: Airborne Velocity Message - Subtype=1 – "Sign Bit for Vertical Rate" Subfield (§2.2.3.2.6.1.11 and §2.2.5.2.4)

a. Continue transmitting Airborne Velocity Messages - Subtype=1 at the nominal rate with all parameters unchanged. Verify that the "Sign Bit for

Vertical Rate" subfield equals ZERO (0), indicating Vertical Rate information in the UP Direction. Insert changed data to the ADS-B System to cause a change to occur in the "Sign Bit for Vertical Rate" so that the Vertical Direction information will be DOWN, and so that the change is detected at least 100 milliseconds prior to the next scheduled Airborne Velocity Message transmission. Verify that the "Sign Bit for Vertical Rate" subfield value has changed to ONE (1) in the next transmitted Airborne Velocity Message.

b. Continue transmitting Airborne Velocity Messages – Subtype=1 at the nominal rate with all parameters unchanged and verify that the "Sign Bit for Vertical Rate" subfield contains the value of ONE (1). Continue transmitting Airborne Velocity Messages - Subtype=1 at the nominal rate with all parameters unchanged. Insert changed data to the ADS-B System to cause a change to occur in the "Sign Bit for Vertical Rate" so that the Vertical Direction information will be UP, and so that the change is detected at least 100 milliseconds prior to the next scheduled Airborne Velocity Message transmission. Verify that the "Sign Bit for Vertical Rate" subfield value has changed to ZERO (0) in the next transmitted Airborne Velocity Message.

<u>Step 10:</u> <u>Airborne Velocity Message - Subtype=1 – "Vertical Rate" Subfield (§2.2.3.2.6.1.12 and §2.2.5.2.4)</u>

Configure the ADS-B Transmitting Subsystem to transmit Airborne Velocity Messages – Subtype=1 by providing subsonic velocity information at the nominal update rate. Provide the data externally at the interface to the ADS-B system. Set the ADS-B Transmitting Subsystem to Airborne status. Provide valid non zero Vertical Rate data to the ADS-B System. Continue transmitting Airborne Velocity Messages - Subtype=1 at the nominal rate with all parameters unchanged.

Insert changed data to the ADS-B System to cause a change to occur in the Vertical Rate so that it is detected at least 100 milliseconds prior to the next scheduled Airborne Velocity Message transmission. Verify that the Vertical Rate subfield value has changed in the next transmitted Airborne Velocity Message and that the value in the subfield is correct.

<u>Step 11:</u> <u>Airborne Velocity Message - Subtype=1 – "Extended Difference From Barometric Altitude Sign Bit" Subfield (§2.2.3.2.6.1.14 and §2.2.5.2.4)</u>

Configure the ADS-B Transmitting Subsystem to transmit Airborne Velocity Messages - Subtype=1 by providing subsonic velocity information at the nominal update rate, including non-zero Barometric and Geometric Altitude data. Provide the data externally at the interface to the ADS-B system. Ensure that the "Extended Difference From Barometric Altitude Sign Bit" subfield equals ZERO (0), indicating geometric altitude source data is greater than or equal to barometric. Insert changed data to the ADS-B System to cause a change to occur in the "Extended Difference From Barometric Altitude Sign Bit" so that the geometric altitude source data is less than barometric, and so that the change is detected at least 100 milliseconds prior to the next scheduled Airborne Velocity Message transmission. Verify that the "Extended Difference From Barometric Altitude Sign Bit" subfield value has changed to ONE (1) in the next transmitted Airborne Velocity Message.

Step 12: Airborne Velocity Message - Subtype=1 – "Extended Difference From Barometric Altitude" Subfield (§2.2.3.2.6.1.15 and §2.2.5.2.4)

Configure the ADS-B Transmitting Subsystem to transmit Airborne Velocity Messages – Subtype=1 at the nominal rate with all parameters unchanged. Insert data to the ADS-B System to cause a change to occur in the Extended Difference From Barometric Altitude so that it is detected at least 100 milliseconds prior to the next scheduled Airborne Velocity Message transmission. Verify that the Extended Difference From Barometric Altitude subfield value has changed in the next transmitted Airborne Velocity Message and that the value in the subfield is correct.

Step 13: Airborne Velocity Message - Subtype=1 – "NIC Supplement-D" Subfield (§2.2.3.2.6.1.16 and §2.2.5.2.4)

Set the ADS-B Transmitting Subsystem to Airborne Status. Continue transmitting Airborne Velocity Messages – Subtype=1 at the nominal rate. For Type Codes=20 & 22, insert changed data to the ADS-B System to cause a change to occur in the NIC Supplement-D subfield, so that the change is detected at least 100 milliseconds prior to the next scheduled Airborne Velocity Message transmission. Verify that the value in the NIC Supplement-D subfield equals the corresponding value in the NIC Supplement-D column in the applicable row of Table 2-28.

2.4.5.2.12 Verification of Aircraft Operational Status Message Latency (§2.2.3.2.7.2, §2.2.5.2.12)

Purpose/Introduction:

This test verifies the latency of the Aircraft Operational Status Message.

Measurement Procedure:

Step 1: Aircraft Operational Status Message - "TYPE" Subfield (§2.2.3.2.7.2.1 and §2.2.5.2.12)

Configure the ADS-B Transmitting Subsystem to transmit Aircraft Operational Status Messages by providing data at the nominal update rate. Provide the data externally at the interface to the ADS-B system. Set the ADS-B Transmitting Subsystem to Airborne Status. Continue transmitting Aircraft Operational Status Messages at the nominal rate with all parameters unchanged. Verify that the TYPE subfield in the Aircraft Operational Status Message equals 31, which is the only TYPE value assigned to Aircraft Operational Status Messages.

Step 2: Aircraft Operational Status Message - "Subtype" Subfield (§2.2.3.2.7.2.2 and §2.2.5.2.12)

Continue transmitting Aircraft Operational Status Messages at the nominal rate with all parameters unchanged. Verify that the Subtype subfield in the Aircraft Operational Status Messages equals ZERO (0).

Insert data to the ADS-B System to simulate an On-Ground status, so that the change is detected at least 100 milliseconds prior to the next scheduled Aircraft Operational Status Message transmission. Verify that the Subtype subfield is set to ONE (1).

Step 3: Aircraft Operational Status Message - "Capability Class" (CC) Subfield (§2.2.3.2.7.2.3 and §2.2.5.2.12)

a. Capability Class Code for "CA Operational" (§2.2.3.2.7.2.3.2)

Set the ADS-B Transmitting Subsystem to Airborne Status. Continue transmitting Aircraft Operational Status Messages at the nominal rate with CA Operational indicated. Verify that "ME" bit 11 is set to ONE (1). Insert data to the ADS-B System to cause a change to occur in the Capability Class subfield with Collision Avoidance System is NOT operational indicated, and so that the change is detected at least 100 milliseconds prior to the next scheduled Aircraft Operational Status Message transmission. Verify that "ME" bit 11 is set to ZERO (0).

b. Capability Class Code for "1090ES IN" (§2.2.3.2.7.2.3.3)

This test is only applicable to systems setting the 1090ES IN subfield via data received from an external interface.

Set the ADS-B Transmitting Subsystem to Airborne Status. Continue transmitting Aircraft Operational Status Messages at the nominal rate with ADS-R and/or TIS-B 1090ES reception capability indicated. Verify that "ME" bit 12 is set to ONE (1). Insert data to the ADS-B System to cause a change to occur in the Capability Class subfield which indicates that there is no ADS-R and/or TIS-B 1090ES reception capability available, so that the change is detected at least 100 milliseconds prior to the next scheduled Aircraft Operational Status Message transmission. Verify that "ME" bit 12 is set to ZERO (0).

Set the ADS-B Transmitting Subsystem to On-Ground Status. Rerun this procedure and verify that the Subtype is set to ONE (1) and that "ME" bit 12 is set to the appropriate state.

c. Capability Class Code for "UAT IN" (§2.2.3.2.7.2.3.9)

This test is only applicable to systems setting the UAT IN subfield via data received from an external interface.

Set the ADS-B Transmitting Subsystem to Airborne Status. Continue transmitting Aircraft Operational Status Messages at the nominal rate with ADS-R and/or TIS-B UAT reception capability indicated. Verify that "ME" bit 19 is set to ONE (1). Insert data to the ADS-B System to cause a change to occur in the Capability Class subfield which indicates that there is no ADS-R and/or TIS-B UAT reception capability available, so that the change is detected at least 100 milliseconds prior to the next scheduled Aircraft Operational Status Message transmission. Verify that "ME" bit 19 is set to ZERO (0).

Set the ADS-B Transmitting Subsystem to On-Ground Status. Rerun this procedure and verify that the Subtype is set to ONE (1) and that "ME" bit 19 is set to the appropriate state.

d. Capability Class Code for "Transponder Side Indication" (§2.2.3.2.7.2.3.4)

Set the ADS-B Transmitting Subsystem to Airborne Status. Continue transmitting Aircraft Operational Status Messages at the nominal rate with unknown transponder side data. Verify that "ME" bits 15 – 16 are set to ALL

ZEROs (binary 00). Insert data to the ADS-B System to cause a change to occur in the Capability Class subfield with Transponder #1 indicated, so that the change is detected at least 100 milliseconds prior to the next scheduled Aircraft Operational Status Message transmission. Verify that "ME" bits 15 – 16 are set to ONE (binary 01).

e. Capability Class Code for "Tx Power" (§2.2.3.2.7.2.3.6)

Tx Power is a static parameter that is verified in §2.4.3.2.7.2.3.6.

f. Capability Class Code for "B2 Low" (§2.2.3.2.7.2.3.7)

B2 Low is a static parameter that is verified in §2.4.3.2.7.2.3.7.

g. Capability Class Code for "NAC_V" (§2.2.3.2.7.2.3.8)

Set the ADS-B Transmitting Subsystem to On-Ground Status. Continue transmitting Aircraft Operational Status Messages at the nominal rate with unknown horizontal velocity error data. Verify that "ME" bits 17 – 19 are set to ALL ZEROs (binary 000). Insert data to the ADS-B System to cause a change to occur in the Capability Class subfield with a horizontal velocity error < 10 m/s indicated, so that the change is detected at least 100 milliseconds prior to the next scheduled Aircraft Operational Status Message transmission. Verify that "ME" bits 17 – 19 are set to ONE (binary 001).

h. Capability Class Code for "NIC Supplement-C" (§2.2.3.2.7.2.3.10)

Continue transmitting Aircraft Operational Status Messages at the nominal rate with NIC Supplement-C set to ZERO. Verify that "ME" bit 20 is set to ZERO. Insert data to the ADS-B System to cause a change to occur in the Capability Class subfield with NIC Supplement-C set to ONE, so that the change is detected at least 100 milliseconds prior to the next scheduled Aircraft Operational Status Message transmission. Verify that "ME" bit 20 is set to ONE.

i. Capability Class Code for "RCE" (§2.2.3.2.7.2.3.11)

RCE is a static parameter that is verified in §2.4.3.2.7.2.3.11.

j. Capability Class Code for "DAA" (§2.2.3.2.7.2.3.12)

Set the ADS-B Transmitting Subsystem to Airborne Status. Continue transmitting Aircraft Operational Status Messages at the nominal rate with no RWC capability indicated. Verify that "ME" bits 23 – 24 are set to ALL ZEROs (binary 00). Insert data to the ADS-B System to cause a change to occur in the Capability Class subfield to indicate an RWC function capable of receiving TCAS Resolution messages and ADS-B OCMs, so that the change is detected at least 100 milliseconds prior to the next scheduled Aircraft Operational Status Message transmission. Verify that "ME" bits 23 – 24 are set to ONE (binary 01).

Step 4: Aircraft Operational Status Message – Subtype 0/1 - "Operational Mode" (OM) Subfield (§2.2.3.2.7.2.4 and §2.2.5.2.12)

a. Operational Mode Code for "CA Resolution Advisory Active" (§2.2.3.2.7.2.4.2)

Configure the ADS-B Transmitting Subsystem to transmit Aircraft Operational Status Messages by providing data at the nominal update rate.

Provide the data externally at the interface to the ADS-B system. Set the ADS-B Transmitting Subsystem to Airborne Status. Continue transmitting Aircraft Operational Status Messages at the nominal rate with no CA Resolution Advisory Active indicated. Verify that "ME" bit 27 is set to ZERO (0). Insert data to the ADS-B System to cause a change to occur in the Operational Mode subfield with a CA Resolution Advisory Active indicated, so that the change is detected at least 100 milliseconds prior to the next scheduled Aircraft Operational Status Message transmission. Verify that "ME" bit 27 is set to ONE (1).

Set the ADS-B Transmitting Subsystem to On-Ground Status. Continue transmitting Aircraft Operational Status Messages at the nominal rate with no CA Resolution Advisory Active indicated. Verify that "ME" bit 27 is set to ZERO (0) when the OM subfield format code is equal to ZERO (binary 00). Insert changed data to the ADS-B System to cause a change to occur in the Operational Mode subfield with a CA Resolution Advisory Active indicated, so that the change is detected at least 100 milliseconds prior to the next scheduled Aircraft Operational Status Message transmission. Verify that "ME" bit 27 is set to ONE (1) when the OM subfield format code is equal to ZERO (binary 00).

b. Operational Mode Code for "IDENT Switch Active" (§2.2.3.2.7.2.4.3)

Set the ADS-B Transmitting Subsystem to Airborne Status. Continue transmitting Aircraft Operational Status Messages at the nominal rate with IDENT switch not active indicated. Verify that "ME" bit 28 is set to ZERO (0). Insert data to the ADS-B System to cause a change to occur in the Operational Mode subfield with IDENT switch active indicated, so that the change is detected at least 100 milliseconds prior to the next scheduled Aircraft Operational Status Message transmission. Verify that "ME" bit 28 is set to ONE (1).

Set the ADS-B Transmitting Subsystem to On-Ground Status. Continue transmitting Aircraft Operational Status Messages at the nominal rate with IDENT switch not active indicated. Verify that "ME" bit 28 is set to ZERO (0) when the OM subfield format code is equal to ZERO (binary 00). Insert data to the ADS-B System to cause a change to occur in the Operational Mode subfield with IDENT switch active indicated, so that the change is detected at least 100 milliseconds prior to the next scheduled Aircraft Operational Status Message transmission. Verify that "ME" bit 28 is set to ONE (1) when the OM subfield format code is equal to ZERO (binary 00).

c. Operational Mode Code for "Single Antenna Flag" (§2.2.3.2.7.2.4.5)

The Single Antenna Flag (SAF) is a static parameter that is configured at the aircraft level to indicate whether the aircraft is equipped with Diversity or Non-Diversity antenna. The stimulus required to specify this will be implementation dependent.

Provide stimulus to indicate that the aircraft has a single antenna and, if required, reset the ADS-B System for this stimulus to take effect. Set the ADS-B Transmitting Subsystem to Airborne Status. Continue transmitting Aircraft Operational Status Messages at the nominal rate. Verify that "ME" bit 30 is set to ONE (1).

Provide stimulus to indicate that the aircraft has multiple antennas and, if required, reset the ADS-B System for this stimulus to take effect. Set the ADS-B Transmitting Subsystem to Airborne Status. Continue transmitting Aircraft Operational Status Messages at the nominal rate. Verify that "ME" bit 30 is set to ZERO (0).

Reset the ADS-B Transmitting Subsystem to On-Ground Status and rerun the above tests and verify "ME" bit 30 is set appropriately.

d. Operational Mode Code for "System Design Assurance" (§2.2.3.2.7.2.4.6)

Continue transmitting Aircraft Operational Status Messages at the nominal rate with unknown SDA data. Verify that the SDA subfield ("ME" bits 31 – 32) equals ZERO (binary 00). Insert data to the ADS-B System to cause a change to occur in the SDA subfield to indicate 1 x 10-3 per flight hour, and so that the change is detected at least 100 milliseconds prior to the next scheduled Aircraft Operational Status Message transmission. Verify that the SDA subfield equals ONE (binary 01).

Set the ADS-B Transmitting Subsystem to On-Ground Status. Rerun this procedure and verify that the Subtype is set to ONE (1) and that "ME" bits 31 – 32 are set to the appropriate values.

e. Operational Mode Code for "GPS Antenna Offset" (§2.2.3.2.7.2.4.7)

Set the ADS-B Transmitting Subsystem to On-Ground Status. Via the appropriate input interface provide the ADS-B Transmitting Subsystem with no GPS Antenna Offset data. Transmit Aircraft Operational Status Messages at the nominal rate. Verify that "ME" bits 33 – 40 (Message bits 65 – 72) are set to All ZEROs in the Surface Aircraft Operational Status Messages when the OM subfield format code is equal to ZERO (binary 00). Change the Lateral and Longitudinal GPS Antenna Offset inputs such that both the Lateral and Longitudinal Offsets are non-zero. Make the change such that it is detected at least 100 milliseconds prior to the next scheduled Surface Aircraft Operational Status Message transmission. Verify that the Lateral and Longitudinal Offsets are properly reported in the next transmitted Surface Aircraft Operational Status Message when the OM subfield format code is equal to ZERO (binary 00).

f. Operational Mode Code for "Mode S Reply Rate Limiting Status" (§2.2.3.2.7.2.4.4)

The Mode S Reply Rate Limiting Status is verified in §2.4.3.2.7.2.4.4.

g. Operational Mode Code for "CCCB" (§2.2.3.2.7.2.4.8, §2.2.3.2.7.2.4.9, §2.2.3.2.7.2.4.10)

Set the ADS-B Transmitting Subsystem to Airborne Status. Continue transmitting Aircraft Operational Status Messages at the nominal rate with CCCB data set to ZERO. Verify that the Sense: Vertical and Horizontal and Aircraft CAS Type/Capability ("ME" bits 33 – 39) are set to ZERO. Insert data to the ADS-B System to cause a change to occur in the CCCB subfield, so that the change is detected at least 100 milliseconds prior to the next scheduled Aircraft Operational Status Message transmission. Verify that the Sense: Vertical and Horizontal and Aircraft CAS Type/Capability are set to the updated values.

h. Operational Mode Code for "RWC Active" (§2.2.3.2.7.2.4.12)

Continue transmitting Aircraft Operational Status Messages at the nominal rate with no active RWC corrective alert. Verify that RWC Active ("ME" bit 40) is set to ZERO. Insert data to the ADS-B System to cause an RWC corrective alert to be active, so that the change is detected at least 100 milliseconds prior to the next scheduled Aircraft Operational Status Message transmission. Verify that RWC Active ("ME" bit 40) is set to ONE.

i. Operational Mode Code for "Transponder Antenna Offset" (§2.2.3.2.7.2.4.13)

Set the ADS-B Transmitting Subsystem to On-Ground Status. Via the appropriate input interface provide the ADS-B Transmitting Subsystem with no Transponder Antenna Offset data. Transmit Aircraft Operational Status Messages at the nominal rate. Verify that "ME" bits 36 – 40 are set to ALL ZEROs in the Surface Aircraft Operational Status Messages when the OM subfield format code is equal to ONE (binary 01). Change the Transponder Antenna Offset input such that it is non-zero. Make the change such that it is detected at least 100 milliseconds prior to the next scheduled Surface Aircraft Operational Status Message transmission. Verify that the Transponder Antenna Offset is properly reported in the next transmitted Surface Aircraft Operational Status Message when the OM subfield format code is equal to ONE (binary 01).

Step 5: Aircraft Operational Status Message – "Aircraft Length and Width Code" Subfield (§2.2.3.2.7.2.11)

Set the ADS-B Transmitting Subsystem to On-Ground Status. Continue transmitting Aircraft Operational Status Messages at the nominal rate with the Minimum Length and Width values from Table 2-71 indicated. Verify that the "ME" bits 21 – 24 are set to ALL ZEROs (binary 0000). Insert changed data to the ADS-B System to cause a change to occur in the Length and Width subfield, and so that the change is detected at least 100 milliseconds prior to the next scheduled Aircraft Operational Status Message transmission. Verify that the binary values in "ME" bits 21 – 24 equals the corresponding binary values in the same row of the table.

Step 6: Aircraft Operational Status Message – Subtype "0/1" – "ADS-B Version Number" Subfield (§2.2.3.2.7.2.5)

The ADS-B Version Number is a static parameter that is verified in §2.4.3.2.7.2.5.

Step 7: Aircraft Operational Status Message – Subtype "0/1" – "NIC Supplement-A" Subfield (§2.2.3.2.7.2.6)

Continue transmitting Aircraft Operational Status Messages at the nominal rate with NIC Supplement-A set to ZERO. Verify that "ME" bit 44 is set to ZERO. Insert data to the ADS-B System to cause a change to occur in the subfield with NIC Supplement-A set to ONE, so that the change is detected at least 100 milliseconds prior to the next scheduled Aircraft Operational Status Message transmission. Verify that "ME" bit 44 is set to ONE.

Set the ADS-B Transmitting Subsystem to On-Ground Status. Repeat this procedure and verify that the Subtype is set to ONE (1) and that "ME" bit 44 is set to the appropriate value.

Step 8: Aircraft Operational Status Message – Subtype "0/1" – "NAC_P" Subfield (§2.2.3.2.7.2.7)

Set the ADS-B Transmitting Subsystem to Airborne Status. Continue transmitting Aircraft Operational Status Messages at the nominal rate with an EPU greater than or equal to 10 NM indicated. Verify that the NAC_P Subfield ("ME" bits 45 – 48) is set to ZERO (binary 0000). Insert data to the ADS-B System to cause a change to occur in the NAC_P subfield, so that the change is detected at least 100 milliseconds prior to the next scheduled Aircraft Operational Status Message transmission. Verify that the binary value in the NAC_P Subfield equals the corresponding binary value in the NAC_P Binary column in the same row of the table.

Set the ADS-B Transmitting Subsystem to On-Ground Status. Repeat this procedure and verify that the Subtype is set to ONE (1) and that "ME" bits 45 – 48 are set to the appropriate values.

Step 9: Aircraft Operational Status Message – Subtype "0/1" – "SIL" Subfield (§2.2.3.2.7.2.9)

Set the ADS-B Transmitting Subsystem to Airborne Status. Continue transmitting Aircraft Operational Status Messages at the nominal rate with unknown SIL Data. Verify that the SIL subfield ("ME" bits 51 – 52) equals ZERO (binary 00). Insert data to the ADS-B System to cause a change to occur in the SIL subfield to indicate 1 x 10-3 per flight hour or per sample, so that the change is detected at least 100 milliseconds prior to the next scheduled Aircraft Operational Status Message transmission. Verify that the SIL subfield equals ONE (binary 01).

Set the ADS-B Transmitting Subsystem to On-Ground Status. Repeat this procedure and verify that the Subtype is set to ONE (1) and that "ME" bits 51 – 52 are set to the appropriate values.

Step 10: Aircraft Operational Status Message – Subtype=1 – "Track Angle/Heading" Subfield (§2.2.3.2.7.2.12)

Set the ADS-B Transmitting Subsystem to On-Ground Status. Continue transmitting Aircraft Operational Status – Subtype=1 Messages at the nominal rate with Track Angle indicated. Verify that "ME" bit 53 is set to ZERO (0). Insert data to the ADS-B System to cause a change to occur in the Track Angle/Heading subfield with Heading indicated and such that the change is detected at least 100 milliseconds prior to the next scheduled Aircraft Operational Status Message transmission. Verify that "ME" bit 53 is set to ONE (1).

Step 11: Aircraft Operational Status Message – Subtype "1" – "HRD" Subfield (§2.2.3.2.7.2.13)

Set the ADS-B Transmitting Subsystem to On-Ground Status. Continue transmitting Aircraft Operational Status – Subtype "1" Messages at the nominal rate with True North indicated. Verify that "ME" bit 54 is set to ZERO (0). Insert data to the ADS-B System to cause a change to occur in the HRD subfield with Magnetic North indicated, such that the change is detected at least 100 milliseconds prior to the next scheduled Aircraft Operational Status Message transmission. Verify that "ME" bit 54 is set to ONE (1).

Step 12: Aircraft Operational Status Message – Subtype=0 – "GVA" Subfield (§2.2.3.2.7.2.8)

Set the ADS-B Transmitting Subsystem to Airborne Status. Continue transmitting Aircraft Operational Status Messages at the nominal rate with an unknown geometric vertical accuracy. Verify that the GVA subfield ("ME" bits 49 – 50) is set to ZERO (binary 00). Insert data to the ADS-B System to cause the GVA to be set to < 150 meters, so that the change is detected at least 100 milliseconds prior to the next scheduled Aircraft Operational Status Message transmission. Verify that the GVA subfield is set to ONE (binary 01).

Step 13: Aircraft Operational Status Message – Subtype "0/1" – "SIL Supplement" Subfield (§2.2.3.2.7.2.14)

Continue transmitting Aircraft Operational Status Messages at the nominal rate with a SIL probability based on a "per hour" probability. Verify that the SIL Supplement subfield ("ME" bit 55) is set to ZERO (0). Insert data to the ADS-B System to cause the SIL probability to be based on a "per sample" probability, so that the change is detected at least 100 milliseconds prior to the next scheduled Aircraft Operational Status Message transmission. Verify that the SIL Supplement subfield is set to ONE (1).

Set the ADS-B Transmitting Subsystem to On-Ground Status. Repeat this procedure and verify that the Subtype is set to ONE (1) and that "ME" bit 55 is set to the appropriate value.