



Safety Information Bulletin

Airworthiness – Operations – ATM/ANS

SIB No.: 2011-15R3

Issued: 08 May 2025

Subject: **ADS-B Out, Mode S and Mode C Transponder Systems: Ground Testing**

Revision:

This SIB revises EASA SIB 2011-15R2 dated 19 July 2013.

Ref. Publications:

Commission Implementing Regulation (EU) [2023/1770](#) dated 12 September 2023.

Applicability:

Owners and operators of aircraft having Secondary Surveillance Radar (SSR) Mode S transponder, Automatic Dependent Surveillance-Broadcast Out (ADS-B Out) transmitter or SSR Mode C transponder systems installed.

Design Approval Holders of aircraft equipped with a transponder.

Mode S transponder systems, ADS-B Out transmitter systems and Mode C transponder systems are known to be installed on, but not limited to, aircraft certificated under EASA CS 22, 23, 25, 27, 29, 31HB, VLA, VLR or LSA; or equivalent Federal Aviation Requirements or Joint Aviation Requirements.

Description:

Accurate and reliable surveillance information (including altitude reporting) and aircraft and/or flight data, transmitted by ADS-B Out, Mode S and Mode C transponder systems when the aircraft is in flight and on the ground, are crucial for the safe and smooth operation of today's air traffic management environment.

This SIB is revised to clarify the test requirement, correct some references, remove the recommendation for a 24-month recurrence of the test, except for transponders with analogue altitude encoder, extend the applicability to Light Sport Aircraft (LSA) and to add reference to ADS-B Out. It also includes recommendations previously provided through EASA SIB 2011-13 and 2011-14 (withdrawn).

At this time, the safety concern described in this SIB is not considered to be an unsafe condition that would warrant Airworthiness Directive (AD) action under Commission Regulation (EU) [748/2012](#), Part 21.A.3B. or Safety Directive (SD) under Commission Regulation (EU) [965/2012](#), Annex II, ARO.GEN.135 or Commission Implementing Regulation (EU) [2017/373](#), Annex II, ATM/ANS.AR.A.025.

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Recommendation(s):**Aircraft Operators:**

After becoming aware, or after receiving notification, from e.g. Air Traffic Control (ATC), EUROCONTROL (performing the network monitoring), EASA, or a competent authority of an ADS-B Out, Mode S or Mode C transponder system defect, EASA recommends that the affected transponder is not used until a test addressing at least the considerations listed in Appendix 2 of this SIB is performed and the defect corrected.

In order to allow the notifying authority to track the resolution of such issues, it is highly recommended that operators/owners promptly inform the notifying authority of any rectification action.

To ensure acceptable transponder system performance, EASA recommends that the correct operation of installed Mode C, Mode S or ADS-B Out transponder systems using an analogue altitude encoder (e.g., a Gilham code encoder) is verified periodically (at least, once every 24 months), using appropriate calibrated ramp testing equipment in accordance with the applicable maintenance manual procedures and the guidance in Appendix 3 of this SIB.

Note 1: Care should be taken, not to disturb the operation of ATC or other aircraft when performing any transponder or Airborne Collision Avoidance System (ACAS) related tests. Guidance for the ground testing of transponders can be found in Appendix 1 of this SIB.

Note 2: In case the ramp test equipment indicates an error with the transmission of the data as specified above, or indicates any other type of failure (e.g. out of frequency, power etc), the affected transponder must be rectified in accordance with applicable approved procedures.

Design Approval Holders:

Design Approval Holders of aircraft equipped with a transponder should ensure that the aircraft maintenance documentation includes a test that is at least consistent with Appendix 2 of this SIB.

Contact(s):

For further information contact the EASA Safety Information Section, Certification Directorate.

E-mail: ADs@easa.europa.eu.

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Appendix 1

Mode C, Mode S, ADS-B Out capable Transponder Ground Testing General Guidance

- a. When not required, ensure that all transponders are selected to 'OFF' or 'Standby'.
- b. Before starting any test, contact the local Air Traffic Control Unit and notify them of your intention to conduct transponder testing. Notify the Air Traffic Unit of your start time and test duration. Also inform them of the altitude(s) at which you will be testing, your intended Aircraft Identification (Flight Id) and your intended Mode A code. See paragraphs (c) and (d).
Note: Certain altitudes may not be possible due to over-flying aircraft.
- c. Set the Mode A code to 7776 (or other Mode A code agreed with Air Traffic Control Unit).
Note: *The Mode A code 7776 is assigned as a test code by the ORCAM Users Group, specifically for the testing of transponders.*
- d. For Mode S equipped aircraft, set the Aircraft Identification (Flight Id) with the first 8 characters of the company name. This is the name of the company conducting the tests.
- e. For Mode S equipped aircraft, set the on-the-ground status for all Mode S replies, except when an airborne reply is required (e.g. for altitude testing).
- f. Where possible (e.g., GNSS position not needed), perform the testing inside a hangar to take advantage of any shielding properties it may provide.
- g. As a precaution, use antenna transmission covers whether or not testing is performed inside or outside.
- h. <DELETED>.
- i. In between testing, i.e. to transition from one altitude to another, select the transponder to 'standby' mode.
- j. When testing transponder parameters other than 'altitude', set altitude to -1 000 feet (minus 1 000 feet), or over 60 000 feet. This will minimise the possibility of ACAS warning to airfield and overflying aircraft.
- k. When testing is complete, select the transponder(s) to 'OFF' or 'Standby'.

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Appendix 2

Transponder Testing Guidance

The test should contain at least the following objectives (see Note 3):

- a. Reply peak output power from each antenna
- b. Reply frequency from each antenna
- c. Receiver Minimum Triggering Level
- d. Reply rate
- e. Suppression
- f. Reply pulse widths and spacing
- g. Proper reporting of the ground status
- h. When applicable, Mode S Diversity Transmission Channel Isolation
- i. Altitude reporting

The reply peak output power (a.) and receiver Minimum Triggering Level (c.) should be performed on the aircraft without removing the transponder from its rack.

If the maintenance documentation of the aircraft does not cover the objectives above, the operator should refer to the Design Approval Holder.

Note 3: A Ramp test equipment when providing a 'PASS' status is not considered sufficient to meet the intent of this SIB. In most cases, the Ramp test equipment only ensures that the received parameters are valid without checking the value itself. The operator is expected to verify that the received parameters on the Ramp test equipment are consistent with expected values.

Note 4: In the absence of appropriate test in the maintenance documentation provided by the Design Approval Holders, Federal Aviation Administration defines equivalent criteria:

- for points a. to h. above, in [14 CFR Part 43 Appendix F](#).
- for point i. above, in [14 CFR Part 43 Appendix E](#) point (c).

For a. (reply peak power) and c. (Minimum Triggering Level), Part 43 Appendix F defines limits as being measured at the end of the feedline connected to the transponder, while the recommendation of this SIB expects a verification of the transmitted power. The aircraft antenna normally exhibits no appreciable gain or loss to the system, and testing over the air or using an antenna coupler yields results that are similar when tested at the end of the feedline.

This is information only. Recommendations are not mandatory.



Appendix 3

Transponder Testing Guidance When Using Gilham Code for Altitude Input to the Transponder

Note 5: 'Gilham code' is sometimes referred to as 'Grey code'.

The testing for correct functionality should include at least the following items:

- a. Connect an air data test set to the No. 1 and No. 2 (where applicable) Pitot/Static system.
- b. In the aircraft flight deck/cockpit, select the No. 1 Mode 'C' or Mode 'S' transponder (as applicable) and select Air Data source No. 1.
- c. Select the air data test set to the following applicable altitude reporting values up to the certified altitude ceiling of the aircraft:
 - 1 000 feet;
 - 4 100 feet;
 - 15 700 feet; and
 - 31 000 feet.
- d. For each selected altitude, verify that the Mode 'C' or Mode 'S' transponder (as applicable) altitude reporting is within tolerance (± 125 feet), and record the actual reading of the altitude.
- e. In the aircraft flight deck/cockpit, select Air Data source No. 2 (if applicable) and repeat items (c) and (d) above.
- f. In the aircraft flight deck/cockpit, select the No. 2 Mode 'C' or Mode 'S' transponder (if applicable) and select Air Data source No. 1 and repeat items (c) and (d) above.
- g. In the aircraft flight deck/cockpit, select Air Data source No. 2 (if applicable) and repeat items (c) and (d) above.
- h. Where aircraft have the availability of a third Air Data source, that provides altitude data to the transponder system, then repeat items (c) and (d) above, for No. 1 and/or No.2 Mode C or Mode S transponder systems connected to Air Data source No. 3.
- i. For aircraft equipped with Mode S transponders which utilize dual Air Data sources and have ACAS II installed:

Confirm by inspection and reference to aircraft and equipment Maintenance Manuals and Wiring Diagrams that, where dual Air Data sources together with a transponder altitude data comparator are used to detect an altitude source or encoder failure, the comparator function is enabled. Using appropriate test equipment, demonstrate that the comparator detects altitude data differences between the dual encoders of more than 600 feet. If the comparator function is not enabled or is unserviceable, rectify before further flight.

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