Australian Government
Civil Aviation Safety Authority

Airworthiness Bulletin

AWB 34-017 Issue 2 – 19 November 2021

Testing of ADS-B installations

An Airworthiness Bulletin is an advisory document that alerts, educates and makes recommendations about airworthiness matters. Recommendations in this bulletin are not mandatory.

1. Effectivity

Any aircraft fitted with ADS-B.

2. Purpose

To provide guidance when testing ADS-B installations. ADS-B supports pilots to directly see nearby aircraft on a cockpit screen therefore improving safety and efficiency. To achieve this, it is necessary for aircraft to transmit their position, altitude, and other flight data, for other aircraft to use. ATC can also use the transmitted information.

3. Background

ADS-B messages are transmitted on the same frequency as the ATC transponder, using the transponder transmitter and antenna. A Mode S transponder, with ADS-B capability, is able to receive position and integrity data from a GNSS. For further information on approved ADS-B equipment see FAA AC 20-172B or EASA CS-ACNS (or later versions as published).

Mode S transponders are different to older Mode A/C 'classic' transponders because they:

- allow ATC radar to track aircraft that are very close to one another
- include the aircraft callsign (Flight ID) in the transponder's replies, so that ATC can identify the aircraft without four-digit codes
- reply to radar interrogation when the aircraft is on the ground (helps keep aircraft safe on the surface at busy airports)
- work better with multilateration technology
- allow ATC radar to get error-free information about aircraft identity and altitude.
- "Classic" transponders have no parity or error checking, but Mode S transponders do

When purchasing transponders, aircraft owners and operators should exercise caution. Not all Mode S transponders have the capability to support ADS-B. Any Mode S transponder purchased for use in Australia should be capable of receiving data from a GNSS and transmitting ADS-B messages.

There is no legal requirement to interconnect transponders in VFR aircraft with GNSS equipment. However, when replacing a transponder in a VFR aircraft, it is easy and inexpensive to do so; thereby gaining safety and operational benefits of ADS-B, if the aircraft already has a suitable GNSS. For further information refer to [EASA CS-ACNS](#)or the relevant TSO for the GNSS equipment (which will refer to a specific MOPS).

Automatic Dependent Surveillance Broadcast (ADS-B) is also dependent on other aircraft being equipped with reliable and accurate altitude and position reporting equipment and transponder systems.

Air Services Australia has released some general guidance for installers when validating ADS-B installations with a transponder ramp test set. For further information refer to http://www.airservicesaustralia.com/wp-content/uploads/Guidance-for-ADS-B-installation-checks.pdf.

Prior to carrying out testing, it is important when validating an ADS-B installation to know what standard the transponder is:

- RTCA/DO-260 (TSO-166),
- RTCA/DO-260A (TSO-166, TSO-166A)
- RTCA/DO-260B (TSO-166B).

The equipment standard is used when checking the integrity of an ADS-B system. ADS-B integrity is checked by examining the type code Navigation Uncertainty Category (NUC) in DO-260 equipment or Navigation Integrity Category (NIC) in DO-260A/B equipment. Just because a good NUC/NIC value is transmitted, does not mean that the system is acceptable. The GNSS and transponder must work properly together. The NUC/NIC value transmitted by the aircraft must be truthful and it would be dangerous for the transponder to transmit a fixed “good” integrity value because it would then not be advising the receiver/user of the radius of containment value (Rc).

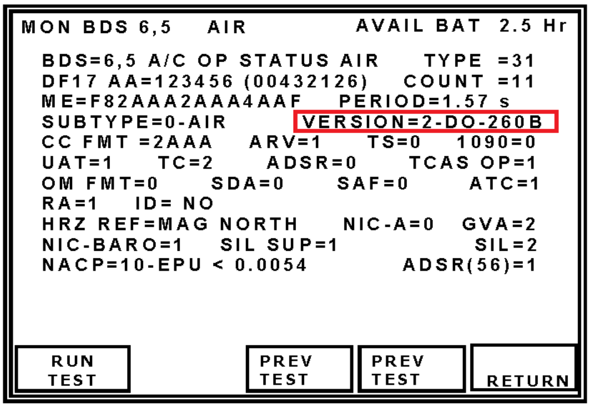

Figure 1 - DO-260 version number

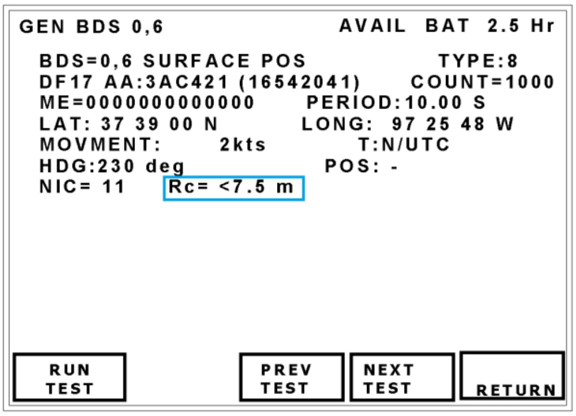

Figure 2 - Radius of Containment value

4. Recommendations

Some important points to observe, when carrying out validation checks on ADS-B equipment:

- The FAA has a SAFO 17002 which provides instance where testing transponders on the ground on one aircraft has resulted in ACAS RA on approach to another aircraft.
- Wiring and soldering issues have been known to cause issues with false 24 bit aircraft addresses
- Depending on the contour of the fuselage RF signals can leak through the gap in the testing coupler. RF absorbent material prevent signal leakage which can get picked up by other aircraft or ATC. Blankets with nickel and/or copper type fabric can provide up to 80+dB of shielding effectiveness

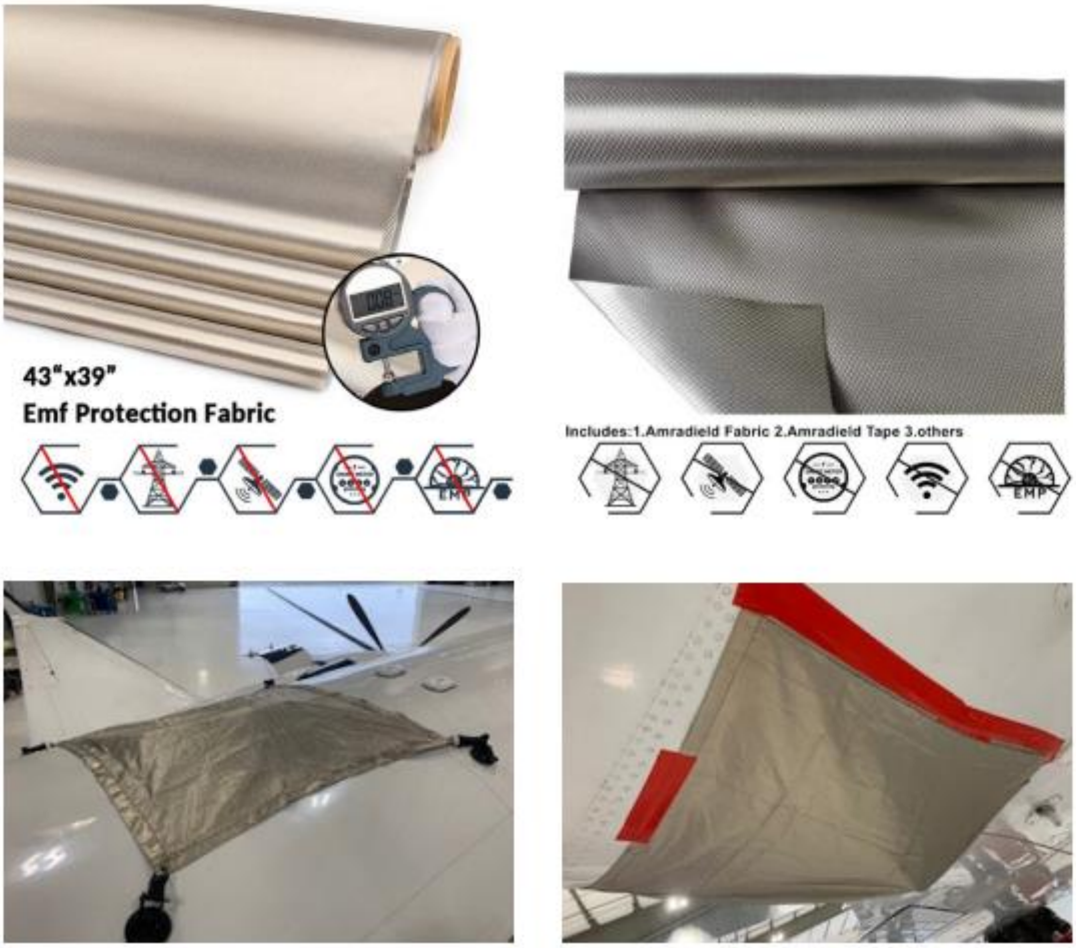

Figure 3 - RF blanket

- Check gasket for antenna coupler and coaxial cables for condition
- The aircraft GNSS needs a clear view of the sky/GNSS constellation to generate a good Horizontal Protection Limits (HPL)/NUC/NIC value. Normally the testing results inside a hangar are not acceptable
- For domestic flight legs do not include VH for the flight ID (this pertains to flight legs using a registration as a callsign. Also, if the flight plan does not include a VH prefix, then the flight ID entry should not include VH).
- Check emitter category set and type are appropriate for the aircraft

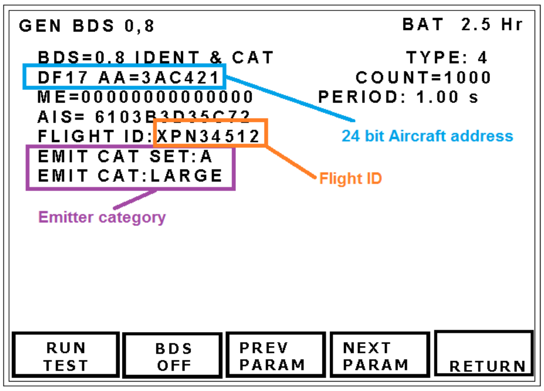

Figure 4 - Aircraft address, flight ID and emitter category

- Check that the NUC/NIC value is not zero. The transmission of a value of zero by an aircraft indicates a navigational uncertainty related to the position of the aircraft or a navigation integrity issue that is too significant to be used by air traffic controllers.
- If you are seeing NUC=4 or 3 or a NIC= 5 or 4, then something is probably wrong because real HPLs do not get this low
- For airborne value squits, the valid range of NUC/NIC is in the range of 9-15
- Check the Source Integrity Level (SIL) has a value 2 or 3 if using a GPS with HPL calculation & FDE (only if the GPS is an approved position source for ADS-B)

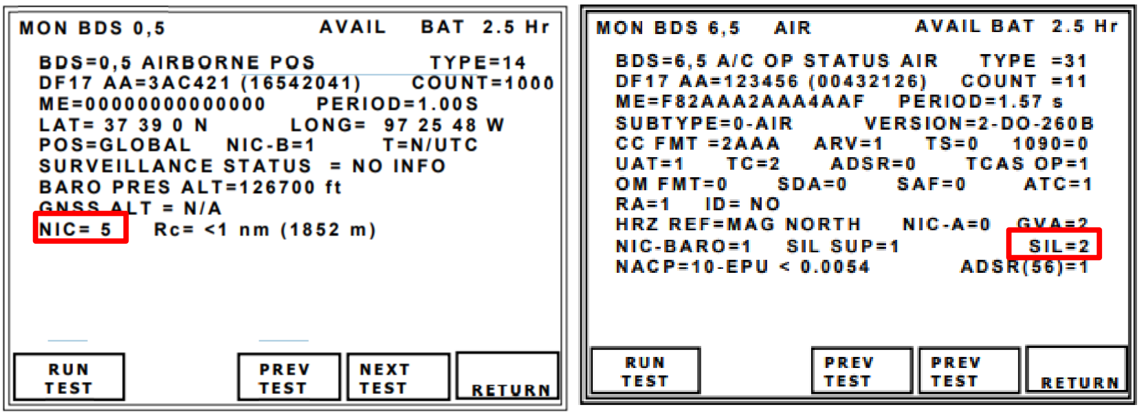

Figure 5 - LH image shows airborne NIC and SIL values are shown in the RH image.

5. Reporting

Report any equipment failures to the original equipment manufacturer and CASA if deemed a major defect.

6. Enquiries

Enquiries with regard to the content of this Airworthiness Bulletin should be made via the direct link email address:

AirworthinessBulletin@casa.gov.au

or in writing, to:

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Civil Aviation Safety Authority
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