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ADS-B 1090ES MOPS Maintenance

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Non-Transponder Based ADS-B Transmitter Power Tests In Response to Action Item 27-04

Martin Gray
Trig Avionics Limited

Summary

This Working Paper proposes a change in the way that transmit power is measured for non-transponder based devices, specifically testing the situation when two squitter transmissions are made in close succession.

1. Introduction

The purpose of this working paper is to propose changes to two test procedures (§2.4.2.2.10.1 and §2.4.2.2.10.2) that verify the RF Peak Output Power of non-transponder based transmitters. The proposed changes will extend the tests to look for the minimum pulse power during the transmission of two closely spaced ADS-B transmissions.

Background

Although an ADS-B system is limited to a maximum of 6.2 transmissions in any second, the required random nature of the system means that transmissions are not equally spaced, and from time to time the transmissions may be very closely spaced. The term concurrent is used in this section to mean very closely spaced.

Transponder based ADS-B transmitters are tested for concurrent transmissions (DO-181D has specific tests for numbers of transmissions in 100ms, 25ms and 1.6ms intervals), but non-transponder based equipment is not tested in this way.

This test is important, as the ADS-B transmitter must be capable of concurrent transmissions.

It is clear that the probability of occurrence of 3 concurrent transmissions is less than that for 2 events. As a rough guide, two transmissions in a 10ms window will occur several times a minute, 3 transmissions in a 10ms window every few hours and 6 transmissions in 10ms every 200 years.

The more concurrent transmissions, the more stress on the power supply, but (a) the harder it is to test and (b) the less the chance of the event.

A pragmatic approach is presented here – the system is tested for two adjacent ADS-B transmissions. This is a balance between a relatively frequent event and an easy event to test.

2. Proposed change

2.4.2.2.10 Verification of RF Peak Output Power (§2.2.2.2.10)

No specific test procedure is required to validate §2.2.2.2.10, which provides only general information.

2.4.2.2.10.1 Verification of Class A0 Equipment RF Peak Output Power (§2.2.2.2.10.1)

Equipment Required:

Provide a method of generating two ADS-B transmissions at the minimum interval determined by the ADS-B system implementation. Provide a Wide Band Dual Channel Oscilloscope (HP 1710B, or equivalent).

Note: The generation of the two closely transmissions may be achieved in a number of possible ways, including: (a) loading the ADS-B system with two ADS-B transmissions that are scheduled for simultaneous transmission (which will result in the second transmission being scheduled for transmission after the first); or (b) configuring/stimulating the system to generate a number of ADS-B transmissions and monitoring the transmissions until random processes schedule two at the minimum spacing.

Measurement Procedure:

Generate two ADS-B transmissions at the minimum separation that the ADS-B equipment implements. Ensure that the expected ADS-B transmissions occur at the minimum expected spacing. Measure the single pulse having the least RF power output in the two transmissions. Determine that the power output meets the requirements of §2.2.2.2.10.1.

2.4.2.2.10.2 Verification of Class B Equipment RF Peak Output Power (§2.2.2.2.10.2)

Equipment Required:

Provide a method of generating two ADS-B transmissions at the minimum interval determined by the ADS-B system implementation. Provide a Wide Band Dual Channel Oscilloscope (HP 1710B, or equivalent).

Note: The generation of the two closely transmissions may be achieved in a number of possible ways, including: (a) loading the ADS-B system with two ADS-B transmissions that are scheduled for simultaneous transmission (which will result in the second transmission being scheduled for transmission after the first); or (b) configuring/stimulating the system to generate a number of ADS-B transmissions and monitoring the transmissions until random processes schedule two at the minimum spacing.

Measurement Procedure:

Generate two ADS-B transmissions at the minimum separation that the ADS-B equipment implements. Ensure that the expected ADS-B transmissions occur at

the minimum expected spacing. Measure the single pulse having the least RF power output in the two transmissions. Determine that the power output meets the requirements of §2.2.2.2.10.2.