



*International Civil Aviation Organization*

**FIFTEENTH MEETING OF THE ADS-B STUDY AND IMPLEMENTATION  
TASK FORCE (ADS-B SITF/15)**

Bangkok, Thailand, 18 - 20 April 2016

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**Agenda Item 4: Review States' activities and interregional issues on implementation of  
ADS-B and multilateralism**

**BOEING 787 ADS-B DEFICIENCY UPDATE**

(Presented by Australia with contribution from Boeing)

**SUMMARY**

This paper provides an update on the ADS-B problem experienced with Boeing 787 aircraft and detail of rectification plans.

**1. Introduction**

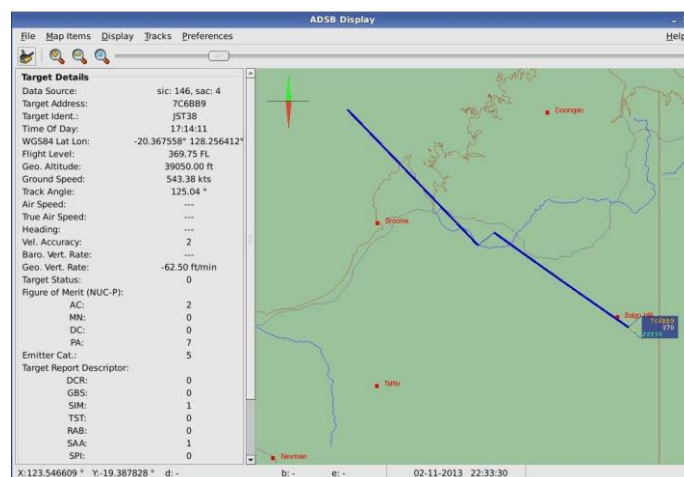
1.1 This paper describes the current status of the ADS-B deficiency that afflicts Boeing 787 aircraft with DO-260A ADS-B, and the plans for rectification of the operational fleet.

1.2 This paper is a status update that follows from the paper presented at the ADS-B SITF/14 in Christchurch, New Zealand (April 2015) as IP04 and at ADS-B Implementing Working Group (SEA/BOB ADS-B WG/11 (Nov 2015) as WP/09.

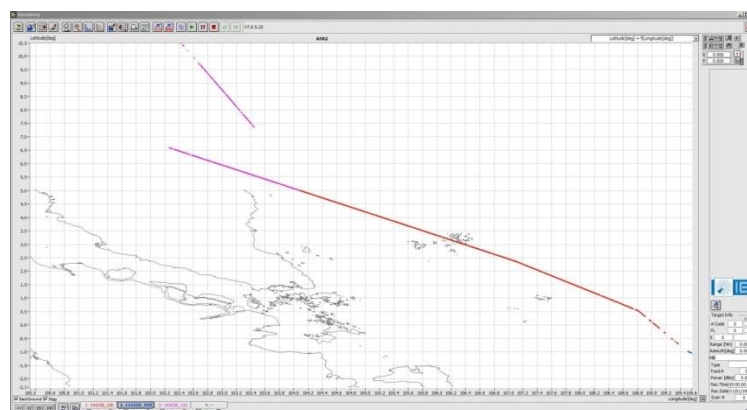
**2. History**

2.1 On 29<sup>th</sup> October 2014, an Australian registered B787 aircraft was observed by ATC to be transmitting inaccurate ADS-B positional data whilst declaring the data as high integrity.

2.2 In this case, following a heading change at a planned waypoint, the reported ADS-B data appeared to be extrapolated in a straight line with constant velocity along the previous heading until it auto-corrected. The correction was observed as a "jump" shown below. The aircraft is flying from the north-west towards the south-east.



2.3 Airservices subsequently became aware of similar incidents, both for this particular aircraft, and for other B787 aircraft operating internationally including Singapore, USA, Canada and Europe. Data was collected from a number of Asia Pacific ANSPs supporting the investigation. Another correction was observed as a “jump” shown below. The aircraft is flying from the south-east towards the north-west.



Trajectory provided by CAAS Singapore

2.4 With data from the above incidents, Boeing was notified and investigations undertaken. Boeing identified that the root cause was associated with the Surveillance processor within the B787 Integrated Surveillance System (ISS) which computes and assembles the ADS-B message, relating to the way in which latitude and longitude data were packaged for delivery to the transponder function. The B787 uses an onboard data network to deliver packetized data inputs from other airplane sensors. When the latitude and longitude information was split across different data packets, the transponder function did not process the position data, and instead commenced extrapolating the position at constant heading and velocity – until the position data was again contained within a single message packet. Geometric level was similarly affected and did not update during these periods of extrapolation.

2.5 The solution being implemented by Boeing is to install a single software update which also provides the new DO260B Surveillance processor capability for the B787. The DO260B software is proven to be not subject to the root cause defect (even though it had been developed prior to the issue being fully understood by Boeing). The new DO260B capability satisfies the airspace mandates in Europe and the United States in 2020.

2.6 Since the initial reports, Airservices Australia has observed one recurrence of the issue in operations, and is unaware of the issue having been reported via other ANSPs. It might be noted however that the incorrect extrapolation could occur randomly in “straight and level flight” or during taxi operations but not be detected by operational ATC, due to the large scale of most ATC displays where ADS-B surveillance is dominant.

### 3. Current status

3.1 Boeing and Rockwell Collins have finalized development of the DO-260B upgrade for the B787 fleet. As well as correcting the extrapolation issue, and supporting DO-260B, the upgrade will provide other reliability benefits for the avionics. The 787 Type Certification has been amended to include the software upgrade. The upgraded ADS-B Out function is compliant with FAA AC 20-165A, EASA CS-ACNS Subpart D (Surveillance) and TSO-C166b.

3.2 Boeing has issued a Fleet Team Digest article (787-FTD-34-15001) which was recently revised to include the following information:

#### **Final Action**

Incorporation of Service Bulletin (SB) B787-81205-SB340005-00 will correct this issue. The DO-260B compliant software installed by SB 34-0005 will process the position data correctly, even if it is contained in multiple messages. This processing difference was already included as part of original SB 34-0005 package, prior to the identification of the erroneous position report problem.

Operators should be careful not to confuse Service Bulletin (SB) B787-81205-SB340005-00 with (SB) B787-81205-SB340025-00 which upgrades the Integrated Surveillance System (ISS) hardware to support ADS-B IN capability.

Operator must notify Air Services Australia (Milns, Alex <Alex.Milns@airservicesaustralia.com> and Dunstone, Greg <Greg.Dunstone@airservicesaustralia.com>) and Nav Canada (Masse, Raymond <MasseR@navcanada.ca> and Lemire, Jacques <LemireJ@navcanada.ca>) upon accomplishment of the service bulletin.

*Note: If ANSPs other than Australia and Canada have implemented blacklist action in response to this issue, they should contact Boeing to ensure they are notified of fleet upgrade action.*

3.3 Australia has been in regular contact with B787 operators since the Service Bulletin was released in December 2015. As at the date of this meeting, the following operators are confirmed to have upgraded their B787 fleet and corrected the defect:

- Air New Zealand
- Scoot
- Royal Brunei
- Etihad
- Qatar
- Jetstar
- Xiamen Airlines
- Vietnam Airlines
- China Southern

The following operators previously indicated a fleet completion date of 31 March, but Australia has not yet received confirmation that the upgrades have been applied:

- United
- Air India

Other airlines operating B787 that Australia has contacted (and their planned upgrade completion dates):

- American Airlines – 30 April 2016 with some upgrades underway.
- Thai Airways – 31 May 2016
- LAN Airlines – 11 July 2016 with upgraded aircraft detected in Australia
- All Nippon Airways – August 2016 with upgraded aircraft detected in Australia

Boeing is also encouraging operators to accomplish the upgrade as soon as possible.

3.4 Boeing has advised that “The SB is an onboard software load. No wiring or hardware changes are required. The SB estimates a total of approximately 6 hours to complete (access, software load, and test) but operators are reporting actual time to update both Left and Right units of about 1 hour. To be able to incorporate SB 787-34-0005 (ADS-B) software, operators must be at a particular Displays and Crew Alerting (DCA) and Communication Management Function (CMF) Block Point (See Fleet Team Digest 787-FTD-34-15001 for details).

3.5 Boeing has confirmed that this is a cost free SB and updates the aircraft to the DO260B ADS-B standard.

3.6 Some operators have indicated that they need to wait for new hardware associated with an ADS-B IN Service Bulletin B787-81205-SB340025. Boeing has advised that Service Bulletin B787-81205-SB340005-00 can be applied to the B787 before Service Bulletin B787-81205-SB340025 hardware requirements and hence there is no need to wait for any hardware availability before correction of the critical issue. Service Bulletin B787-81205-SB340005-00 must be applied to install the new software after installation of the new hardware.

3.7 Australia will progressively remove B787 aircraft from A-SMGCS “ADS-B blacklist” when information is received that aircraft have been upgraded. It should be noted that this A-SMGCS blacklist is essentially a system protection, and does not affect ATC services to these aircraft.

#### **4. Action by the meeting**

4.1 The meeting is invited to

- a) note the actions undertaken by Boeing and Rockwell Collins to solve the problem;
- b) note that some airlines have been able to promptly apply the Service Bulletin;
- c) note that the avionics software upgrades will still take some months to be deployed across the remaining B787 fleet; and
- d) discuss any relevant matters as appropriate.

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