International Civil Aviation Organization

ELEVENTH MEETING OF THE SOUTHEAST ASIA AND BAY OF BENGAL SUB-REGIONAL ADS-B IMPLEMENTATION WORKING GROUP (SEA/BOB ADS-B WG/11)

New Delhi, India 17 – 19 November 2015

Agenda Item 4: Report on ground system and avionics performance monitoring and improvement in compliance

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

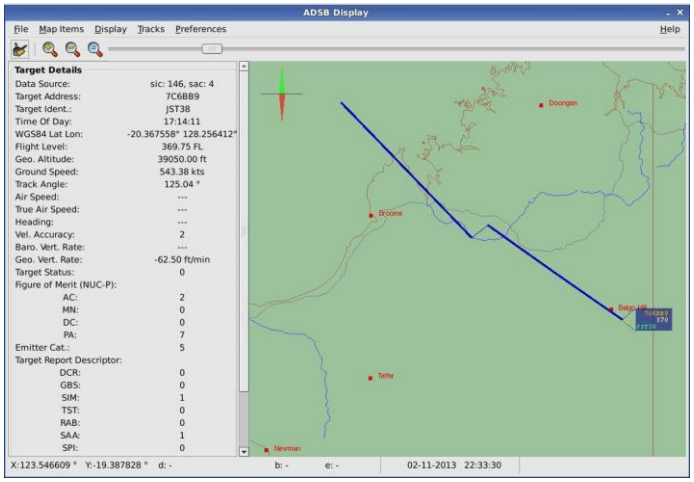
1.1 This paper describes the current status of the ADS-B deficiency that afflicts Boeing 787 aircraft with DO-260A ADS-B, and the plans for rectification of the operational fleet.

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 IP/04.

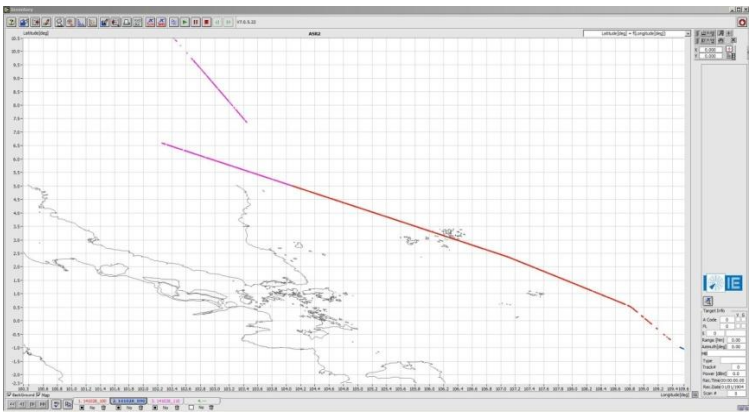
2. HISTORY

2.1 On 29th 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 which computes 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 to be implemented by Boeing is to retrofit new software simultaneously with the software update which will provide the new DO260B Surveillance processor capability for the B787. The DO260B software proved to be not subject to the root cause defect (even though it had been developed prior to the issue being fully understood by Boeing).

2.6 Since the initial reports, Airservices Australia has not reported any 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.
>
> Operator must notify Air Services Australia (Milns, Alex Alex.Milns@AirservicesAustralia.comand 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 Boeing will encourage the operators to accomplish the upgrade as soon as possible after the Service Bulletin release (expected December 2015) but the times will vary from operator to operator. Boeing expects the fleet upgrades to take place through 2016.

3.4 Australia will progressively remove B787 aircraft from A-SMGCS "blacklist" when information is received that aircraft have been upgraded. It should be noted that this 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 the avionics software upgrades will still take some time to be deployed across the B787 fleet; and

c) discuss any relevant matters as appropriate.

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