

International Civil Aviation Organization



**AUTOMATIC DEPENDENT
SURVEILLANCE – BROADCAST SEMINAR
AND FOURTEENTH MEETING OF
AUTOMATIC DEPENDENT
SURVEILLANCE – BROADCAST (ADS-B)
STUDY AND IMPLEMENTATION TASK
FORCE (ADS-B SITF/14)**



Christchurch, New Zealand, 14 – 17 April 2015

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

**PERFORMANCE OF THE ADS-B GROUND STATIONS AND THE
AVIONICS WITHIN THE SINGAPORE FIR**

(Presented by Singapore)

SUMMARY

This paper shares with the Task Force on the performance of the ADS-B ground stations and the avionics in the Singapore FIR.

1. Introduction

1.1 This paper shares with the Task Force on the performance of the ADS-B ground stations and the avionics operating in the Singapore FIR.

2. Discussions

Monitoring of ground station performance

2.1 Singapore is using the ADS-B data from Con Son, Matak, Natuna and Singapore. The theoretical coverage of the ADS-B stations are shown in the diagram below:

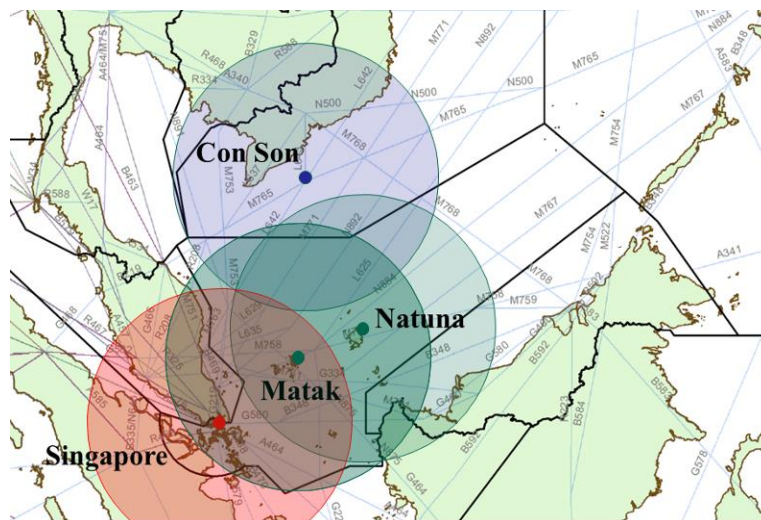


Fig 1: Theoretical coverage of ADS-B stations

2.2 Using the surveillance monitoring tool, we ensure that the quality of the ADS-B data meets the requirement as assumed in the safety case (i.e. the probability of detection for the area of operations at 10s update rate is kept above 95%). Similar analysis is also done for each and every ADS-B station. The diagram below shows a typical probability of detection chart.

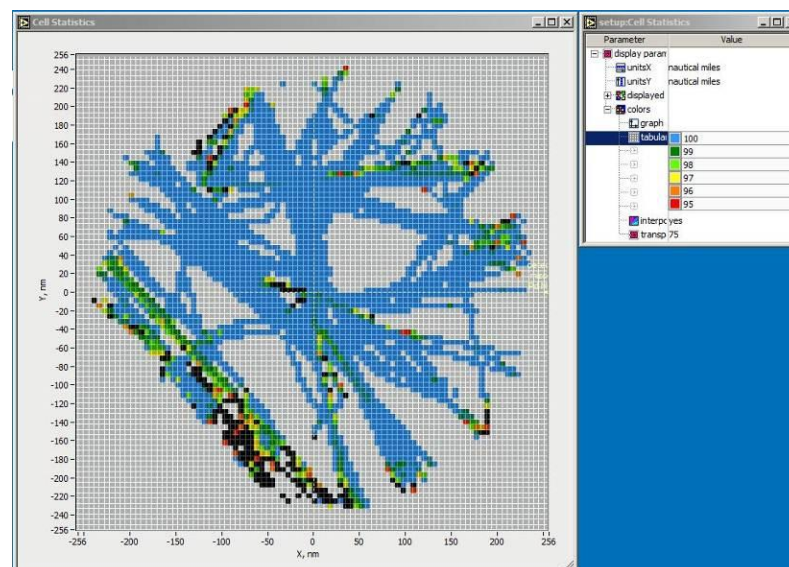


Fig 2: Typical probability of detection chart

Distribution of Avionics Type

2.3 The distribution of DO-260, D0-260A and DO-260B avionics equipment in Singapore is shown in the following diagram. The percentage of aircrafts equipped with D0-260, D0-260A and D0-260B are as follows:

	2014	2015
DO-260	90.07%	86.81%
DO-260A	6.27%	9.71%
DO-260B	3.66%	3.48%

Table 1: distribution of avionics type

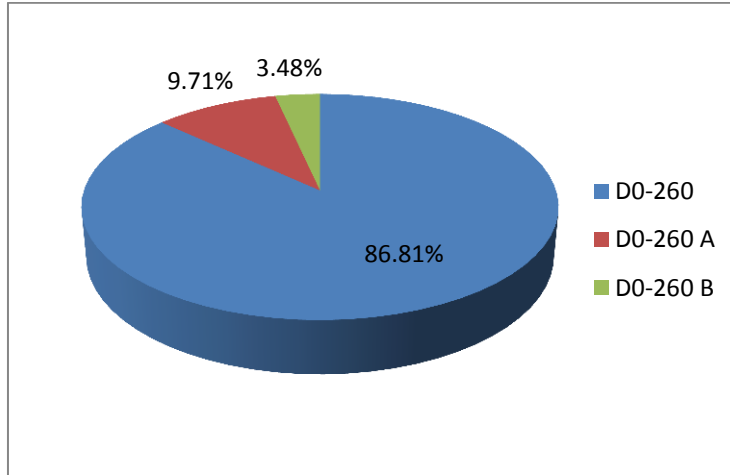


Fig 3: Distribution of avionics in 2015

Avionics issues

Toggling between high and low NUC

2.4 Singapore is monitoring the aircraft which sent NUC values toggle between high and low without apparent reasons. It is observed that these airframes have consistency in such behavior. Currently, there are fifteen aircraft observed with such behavior.

Consistent low NUC

2.5 Singapore is also monitoring aircraft which consistently transmit low or zero NUC. Currently, there are thirty-six aircraft observed with such behavior.

B787 ADS-B Positioning Error

2.6 In October 2014, an aircraft was observed by Singapore ATC to be 60 NM left off track while travelling on N891 airway. The aircraft was queried by Singapore ATC if it will be returning to the planned track. In actual fact, the aircraft was travelling on the planned track and this was verified by Kuala Lumpur and Ho Chi Minh radar systems. Good NUC was shown throughout the flight.

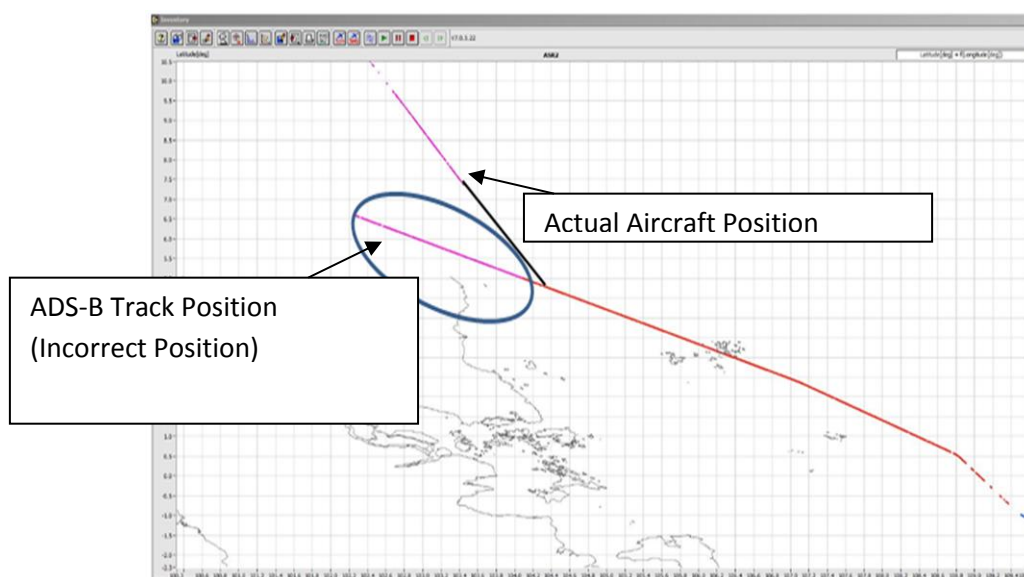


Fig 4: ADS-B Track position observed VS Actual Position

2.7 Boeing investigated the incident and identified that the fault was caused by the Rockwell Collins Integrated Surveillance System (ISS) on board the aircraft. A service bulletin, expected in August 2015 will resolve this issue. Aircraft delivered in and beyond August 2015 will also be equipped with the updated avionics.

2.8 Thus far, we observed one aircraft with this issue.

Multiple ADS-B Tracks

2.9 In December 2014, an aircraft was observed to have multiple ADS-B tracks, while showing good NUC. The aircraft was equipped with Rockwell Collins TPR901 transponder. We understand that the fault may occur when the aircraft crosses longitude 180. The current workaround is to power down the transponder completely after the aircraft crosses longitude 180.

2.10 Another aircraft from a different airline was observed with similar behavior in both December 2014 and January 2015. This was feedback to the State of registry via the ANSP.

2.11 Thus far, we observed two aircraft with this issue.

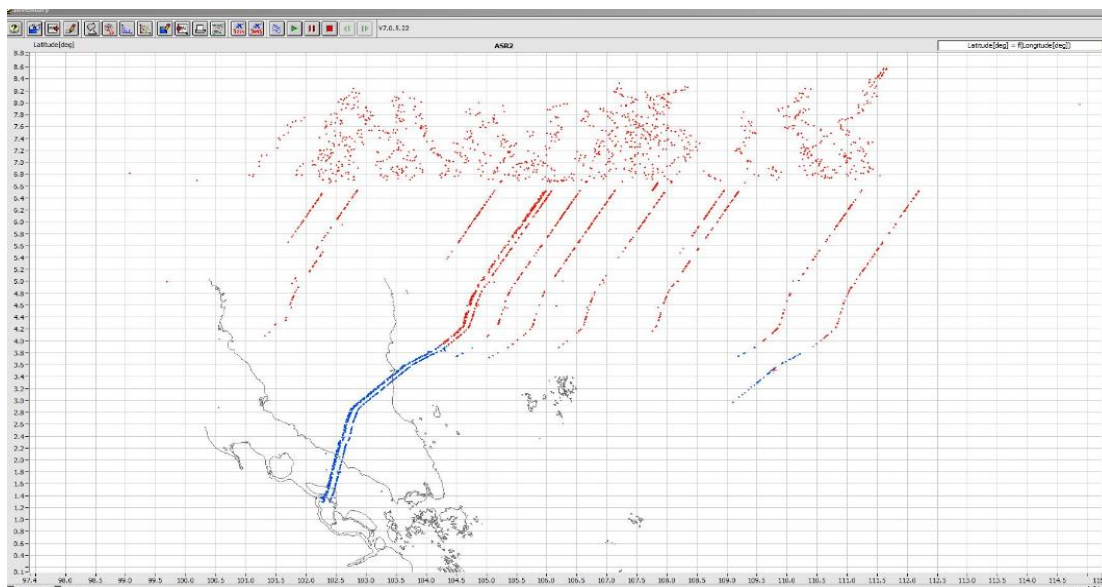


Fig5: Multiple ADS-B Tracks

3. Action by the meeting

3.1 The meeting is invited to:

- a) note the above information;
- b) urge States to share observations, especially with a neighboring State who is likely to observe the same issue; and
- c) urge airlines to work with ANSPs to aid in the investigation.

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