International Civil Aviation Organization

**AUTOMATIC DEPENDENT SURVEILLANCE –
BROADCAST SEMINAR AND ELEVENTH MEETING
OF AUTOMATIC DEPENDENT SURVEILLANCE –
BROADCAST (ADS-B) STUDY AND
IMPLEMENTATION TASK FORCE (ADS-B SITF/11)**

Jeju, Republic of Korea, 24-27 April 2012

Agenda Item 5:   **Report and updates by the leading member of the Task Force on Tasks assigned**

ADS-B EQUIPAGE AND NUC VALUE ANALYSIS

(Presented by Singapore)

SUMMARY

This paper analyse the quality of the ADS-B reports observed by the Singapore ADS-B station and the level of ADS-B equipage within the Singapore FIR.

1.   Background

1.1   The success of ADS-B implementation is often determined by the equipage of ADS-B avionics on aircraft. Even if an aircraft is equipped with ADS-B avionics, the usability of the ADS-B messages from the aircraft would depend on the Navigation Uncertainty Category (NUC) values of the messages. The NUC value indicates the accuracy of the position reported in an ADS-B message and a minimum accuracy may be required before the position reported in the ADS-B message can be used for an air traffic control function.

1.2   This paper analyses the NUC values observed by the Singapore ADS-B station and the level of equipage within the Singapore FIR.

2.   Brief Explanation of Navigation Uncertainty Category

2.1   The table below maps the NUC value to the Horizontal Protection Limit (HPL). The HPL indicates the horizontal position error. For this analysis, we considered NUC values of 5 and above as good NUC, i.e. reported position is accurate enough for separation.

NUC	Airborne Position
9	HPL < 7.5m
8	7.5m ≤ HPL < 25m
7	7.5m ≤ HPL < 0.1NM
6	0.1NM ≤ HPL < 0.2NM
5	0.2NM ≤ HPL < 0.5NM
4	0.5NM ≤ HPL < 1.0NM
3	1.0NM ≤ HPL < 2.0NM
2	2.0NM ≤ HPL < 10NM
1	10NM ≤ HPL < 20NM
0	HPL ≥ 20NM

3.   Analysis of Data

3.1   Data collection

3.1.1   We collected the data from 11 July 0630 UTC to 12 July 0645 UTC using the Singapore ADS-B station. For the purpose of the analysis, we do not consider the ADS-B reports from ground vehicles and test transponders.

3.1.2   The ADS-B station saw a total of 502 airborne targets. Out of the 502 airborne targets, 429 entered the Singapore FIR within the said timeframe.

3.1.3   In terms of movements (i.e. call-signs), the ADS-B station saw a total of 1,282 movements of which 996 entered the Singapore FIR.

3.1.4   The analysis will be split into 2 parts. The first part is analysis of the data within the coverage of the ADS-B station. The second part is analysis of the data within the Singapore FIR and the coverage of the ADS-B station.

3.2   Analysis within the coverage of the ADS-B station

3.2.1   The graph below shows the number of targets with respect to the modal NUC value. It was observed that the highest NUC value from an airborne target was 7.
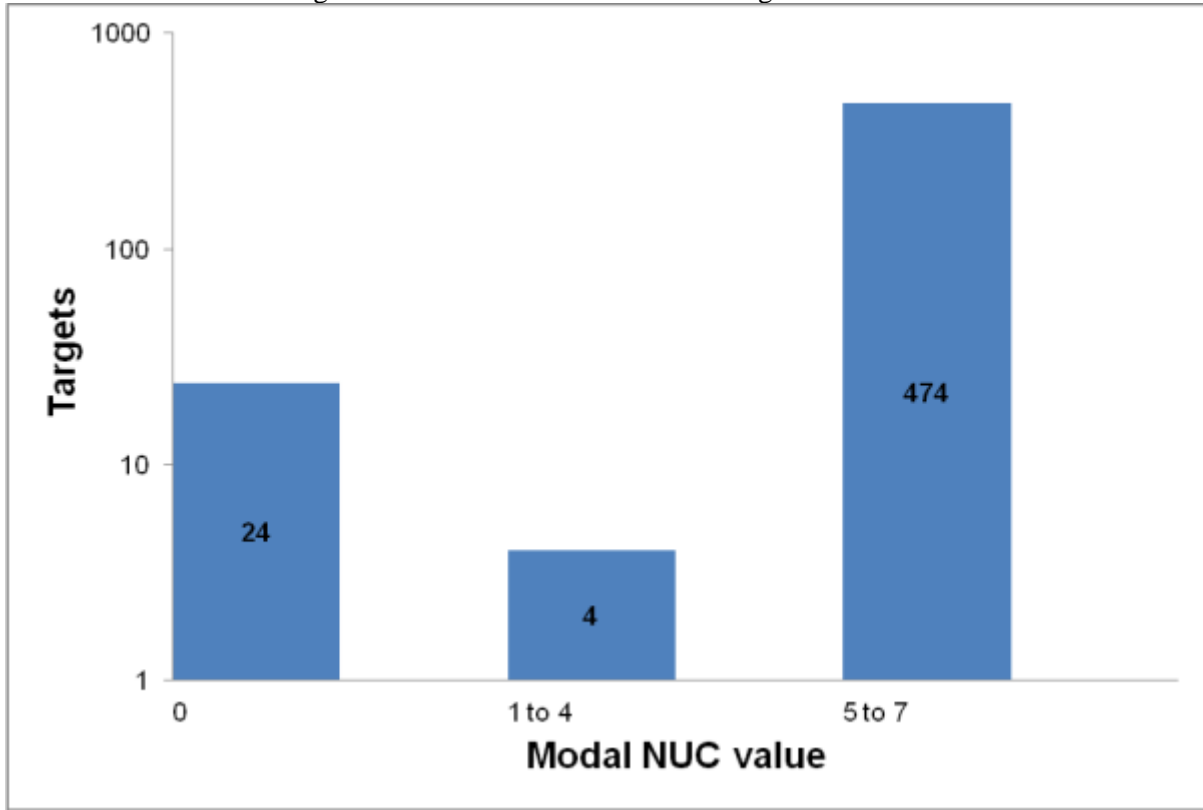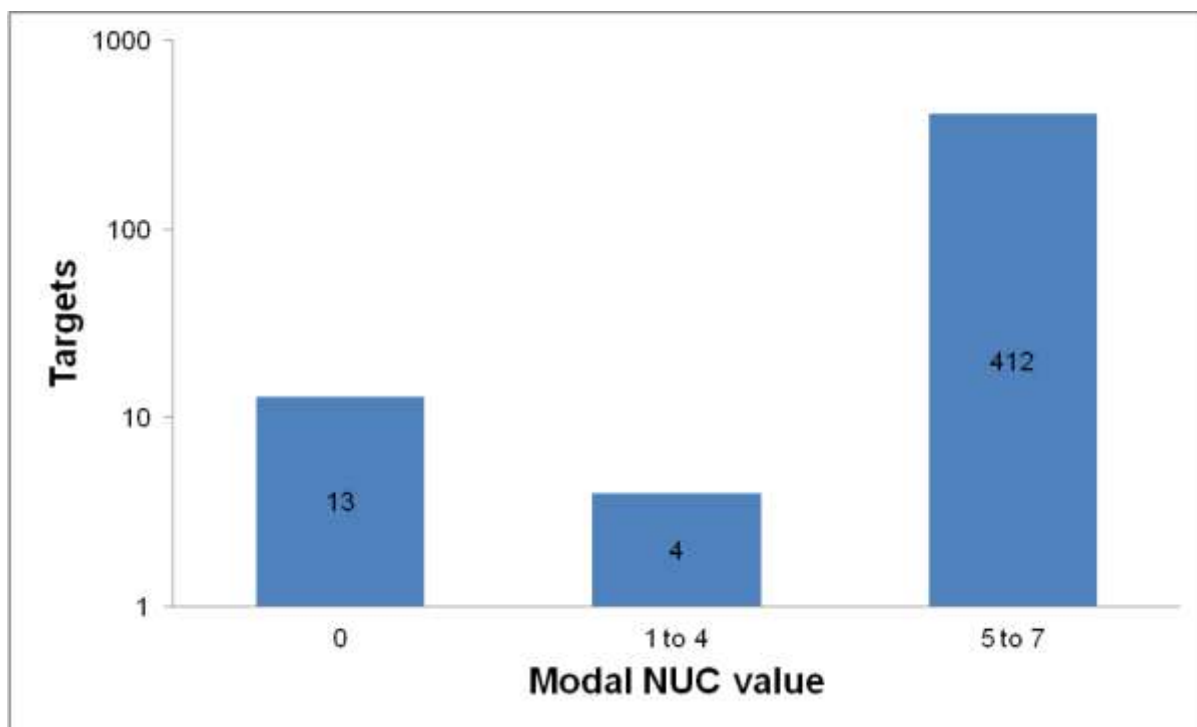

3.2.2   It was also observed that out of the 502 airborne targets, 20 targets were equipped with DO260-A avionics.
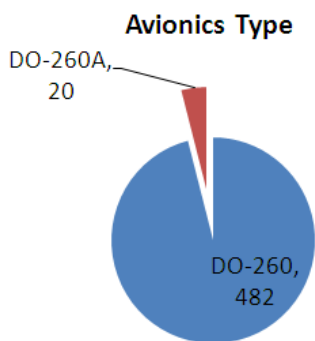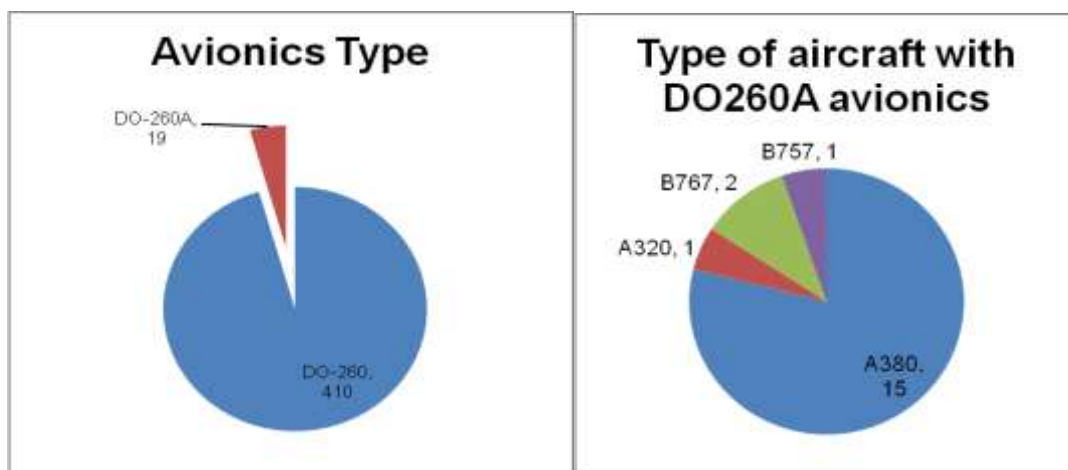

3.3   Analysis within the Singapore FIR within the coverage of the ADS-B station

3.3.1   The graph below shows the distribution of the 429 airbourne targets within the Singapore FIR with respect to the modal NUC value.

3.3.2　　　Within the Singapore FIR, it was observed that out of the 429 airborne targets, 19 targets were equipped with DO260-A avionics. According to the flight plans, the aircraft types of these 19 DO260A targets were one A320, one B757, two B767s and 15 A380s.

3.3.3　　　A further analysis was made on the NUC values and equipage in terms of aircraft movement within the ADS-B coverage and Singapore FIR. The results are as shown in the graph below. It was found that 72% of the aircraft was equipped with ADS-B and 70% is able to provide ADS-B messages with good NUC.
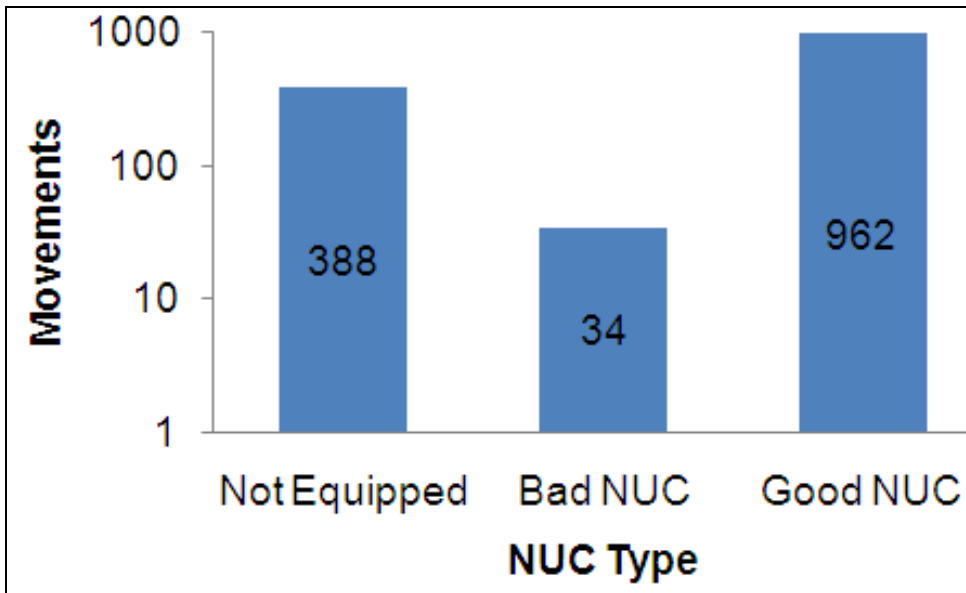
3.3.4   We also studied the equipage with respect to the aircraft types. The results are as shown below:
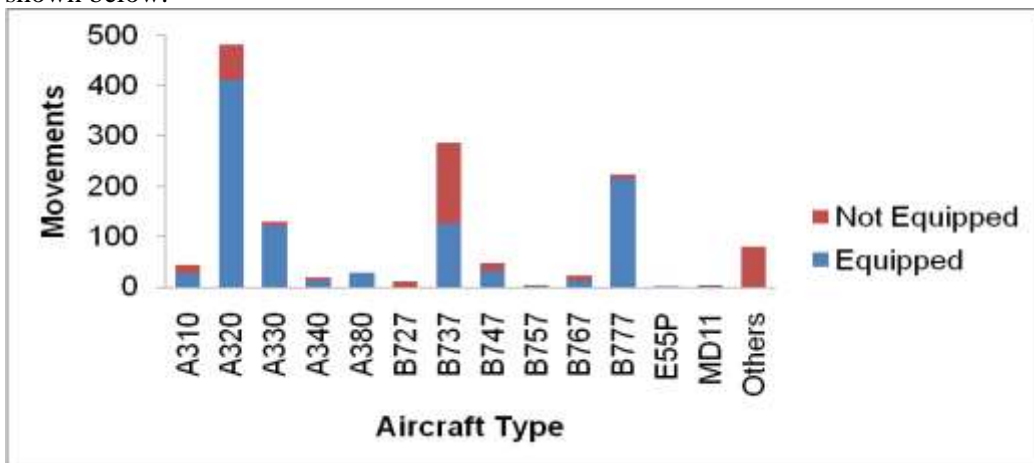
Type	Equipped	Not Equipped
A310	26	18
A320	411	70
A330	122	8
A340	13	7
A380	28	0
B727	0	12
B737	128	158
B747	33	15
B757	2	2
B767	14	9
B777	215	9
E55P	1	0
MD11	2	1
Others	0	80

3.3.5   There is a group of aircraft type labelled as 'others' in the table above which are not equipped with ADS-B. It was found that this group of aircraft comprises mainly propeller planes and military planes.

4.   Action by the Meeting

4.1   The meeting is invited to

      a)   note the contents in the paper; and

      b)   discuss NUC value which can be used to support procedure control and for situation awareness.

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