International Civil Aviation Organization

The Sixteenth Meeting of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/16)

Bangkok, Thailand, 20 – 24 February 2012

Agenda Item 5: Airspace Safety Monitoring Activities/Requirements in the Asia/Pacific Region

FOREIGN REGISTERED AIRCRAFT IN THE AUSTRALIAN AIRSPACE MONITORING AGENCY (AAMA) ADS-B HEIGHT-KEEPING MONITORING PROGRAM

(Presented by Australia)

SUMMARY

This paper provides details on foreign-registered aircraft seen in the AAMA ADS-B ASE program and therefore which fleets may immediately benefit from the height-keeping performance monitoring.

This paper relates to –

Strategic Objectives:
A: ***Safety*** *– Enhance global civil aviation safety*

Global Plan Initiatives:
GPI-2 Reduced vertical separation minima

1. INTRODUCTION

1.1. The Australian Airspace Monitoring Agency (AAMA) has commenced aircraft height-keeping monitoring using ADS-B technology following endorsement of the methodology by both the ICAO Separation and Airspace Safety Panel (SASP) and the Regional Monitoring Agencies Coordination Group (RMACG) in June 2011. As a result of this activity, the AAMA has been able to calculate altimetry system error measurements for a large number of aircraft, often ensuring multiple measurements of the same aircraft whenever flights occur within the Australian ADS-B network coverage area.

1.2. As well as enabling the monitoring of Australian registered aircraft, ADS-B data collected by the AAMA has enabled ASE calculations, and hence the successful monitoring, of a large number of aircraft registered in other States. Additionally, the data has identified a number of aircraft that are ADS-B equipped but not approved for ADS-B services in Australian airspace. These latter aircraft have been included in any assessments of successful monitoring.

1.3. This paper provides details on foreign-registered aircraft seen in the AAMA ADS-B ASE program and therefore which fleets may immediately benefit from the height-keeping performance monitoring. December 2011 was used as the sample month for the study.

2. DISCUSSION

2.1 The geographical area from which ADS-B data is being collected is essentially the entire Australian continent. However for traffic coordination purposes Airservices also receives ADS-B data from a set of Indonesian ground stations close to the northern boundaries of the Brisbane and Melbourne FIRs. The AAMA automatically processes all available ADS-B data.

2.2 Figure 1 shows the percentage of the total aircraft ASE monitored in December 2011 by operator. A more complete list is given in the alphabetically-sorted Table 1. The latter includes the small percentage operators and a breakdown into aircraft types is provided for each operator.

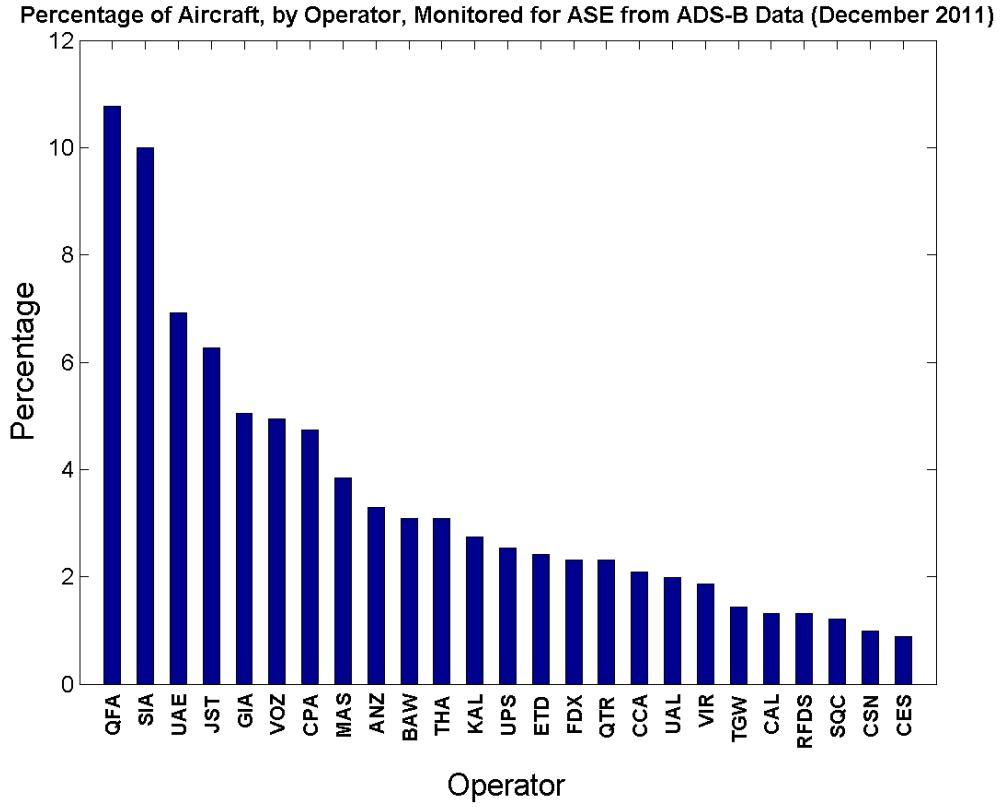

Figure 1. Percentages of the total airframes ASE monitored in December 2011 by operator. The data is truncated just under 1%.

Operator	Operator name	Types
AAR	Asiana Airlines	B772(3)
ACA	Air Canada	B772(6)
ACI	Air Caledonia	A320(1) A330(1)
AGC	Strategic Airlines	A330(1)
AIH	Airtours International	B752(1)
ANG	Air Niugini	B767(1)
ANZ	Air New Zealand	A320(12) B744-10(2) B744-5(2) B767(2) B772(8) B773(4)
AVN	Air Vanuatu	B737NX(1)
BAW	British Airways	B744-10(14) B744-5(5) B772(9)
CAL	China Airlines	A330(12)
CCA	Air China	A330(19)
CES	China Eastern Airlines	A330(8)
CHH	Hainan Airlines	A330(3)

CLX	Cargolux	B744-10(2)
CPA	Cathay Pacific	A330(16) B744-10(11) B744-5(8) B748(4) B773(4)
CSH	Shanghai Airlines	B767(2)
CSN	China Southern Airlines	A330(8) B772(1)
DAL	Delta Airlines	B772(6)
ETD	Etihad Airways	A330(10) A340(6) A346(5) B772(1)
EVA	EVA Airways	A330(7)
FDX	Federal Express	MD11(21)
FJI	Air Pacific	B737NX(1)
GIA	Garuda Indonesia	A330(7) B737NX(39)
GTI	Atlas Air	B744-10(3)
HVN	Vietnam Airlines	A330(6) B772(1)
JAL	Japan Airlines	B772(2)
JSA	Jetstar Asia	A320(5)
JST	Jetstar Airlines	A320(47) A330(10)
KAL	Korean Airlines	A330(7) B744-10(13) B772(5)
LAN	LAN Chile	A340(5)
MAS	Malaysian Airlines	A330(8) B744-10(10) B772(17)
MAU	Air Mauritius	A340(2)
OZW	Skywest Airlines	F100(1)
PAL	Philippine Airlines	A330(1)
PBI	Polynesian Blue	B737NX(4)
PBN	Pacific Blue	B737NX(6)
QFA	Qantas Airways	A330(18) A380(11) B737NX(38) B744-10(13) B744-5(12) B747CL(1) B748(1) B767(4)
QNZ	Qantas Jet Connect	B737NX(6)
QTR	Qatar Airways	B772(9) B773(12)
RBA	Royal Brunei Airlines	B772(5)
RES	Australian Maritime Safety Authority	D328(1)
REU	Air Austral	B773(4)
RFDS	Royal Flying Doctor Service	BE20(9) PC12(3)
SIA	Singapore Airlines	A330(19) A380(11) B772(35) B773(26)
SOO	Southern Air	B772(1)
SOR	SonAir Servicio Aereo	A320(1)
SQC	Singapore Airlines	B744-10(11)
SVA	Saudi Arabian Airlines	A330(1)
TGW	Tiger Airways	A320(13)
THA	Thai Airways	A345(4) A346(5) B772(14) B773(5)
UAE	Emirates	A380(9) B772(9) B773(45)
UAL	United Airlines	B744-10(11) B744-5(7)
UPS	United Parcel Service	MD11(23)
UTY	Alliance Airlines	F100(1) F70(1)
VAU	V Australia	B773(5)
VIR	Virgin Atlantic	A346(17)
VOZ	Virgin Blue Airlines	A330(2) B737CL(2) B737NX(38) E190(3)
XAX	Air Asia X	A330(8)

Table 1. Airframes ASE-monitored from the December 2011 data.

2.3 Figure 2 shows a breakdown of the December 2011 monitoring data by State. There is potential for confusion between State of Operator and State of Registration in some cases and the results should not be taken too literally. For example most of the Tiger Airways (TGW) aircraft were registered in Australia and some were registered in Singapore. For TGW the aircraft were divided between the two States according to the registration proportions.

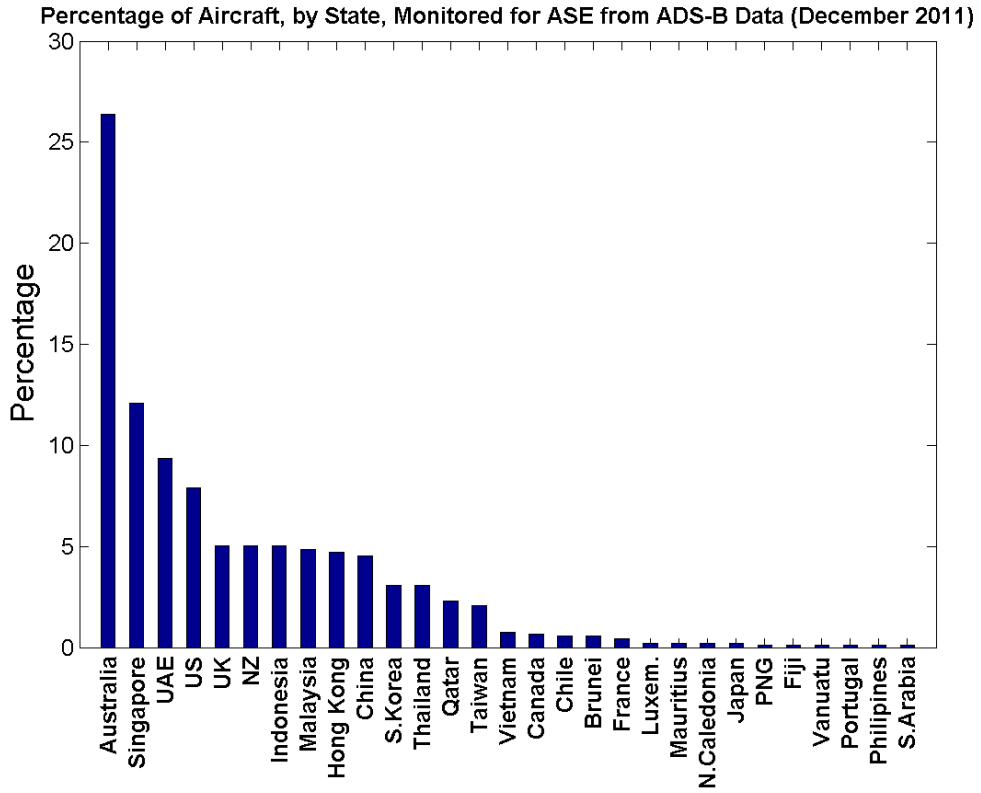

Figure 2. Percentages of the total airframes ASE monitored in December 2011 by State.

2.4 The significant outcome from having this monitoring data for foreign aircraft available is that the AAMA has been able to complete monitoring of large proportions of the identified monitoring burden for some operators to comply with the Annex 6 requirements. For example, the successful monitoring of Air New Zealand operated aircraft during December 2011 using ADS-B has resulted in the AAMA successfully monitoring enough of that operator's fleet types to meet the Annex 6 monitoring burden. The only type operated by Air New Zealand with RVSM approval not monitored by the AAMA is the B733. Similarly for Singapore Airlines the only types not monitored by the AAMA are the A345 and B744. Further examples include Thai Airways where the only types not monitored are the B744 and A333; Cathay Pacific the B772 and A343 fleets; and Malaysian Airlines the B734 and B738 fleet.

2.5 The AAMA has already commenced notifying other RMAs of aircraft registered to States within those RMAs' jurisdiction so that information regarding last successful monitoring of these aircraft can be included in those RMAs' web sites. Additionally such monitoring activity by the AAMA should assist with easing the overall monitoring burden within Asia/Pac. Information on the type of reports provided by the AAMA is shown in an information paper presented at this meeting.

2.6 The AAMA identified approximately 229 ADS-B equipped aircraft in December 2011 which were not provided ADS-B services by ATC because these aircraft are currently not ADS-B approved in Australia. These aircraft are additional to those the AAMA normally processes. These non ADS-B approved aircraft are already transmitting ADS-B position reports, but the AAMA has not undertaken a quality check of the ADS-B data.

2.7 Figures 3 and 4 provides counts of this data shown for Operator and State and includes some identified from data from the four Indonesian ADS-B sites shared with Australia. These aircraft would be easy to add to the monitoring.

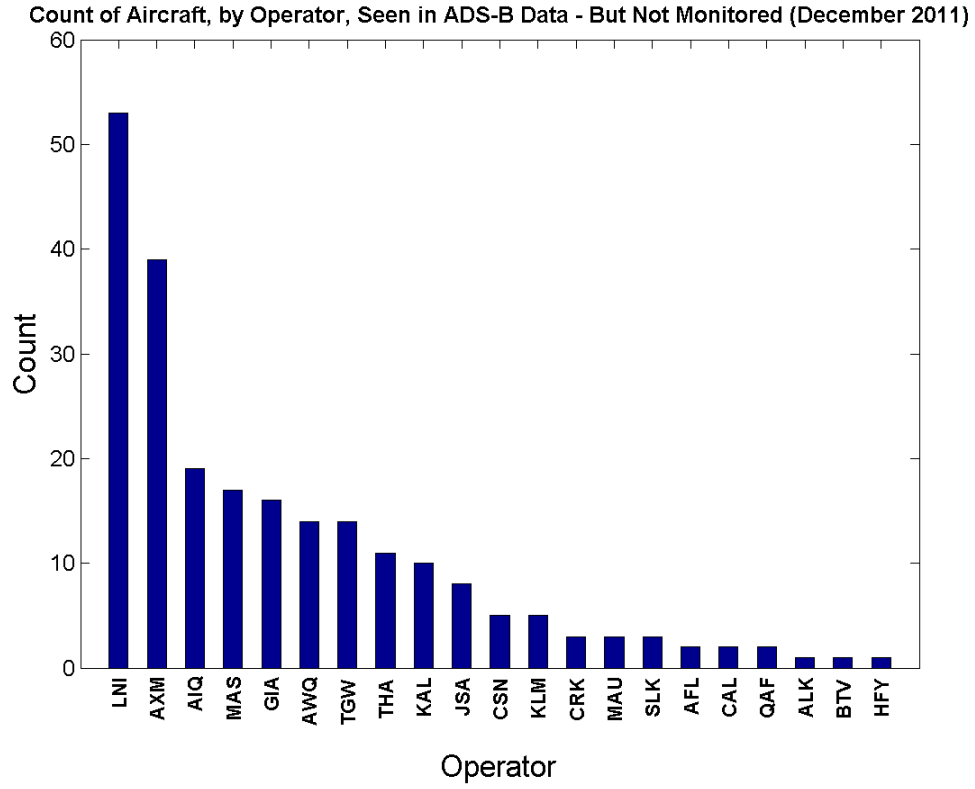

Figure 3. Counts by operator of non ADS-B-approved airframes appearing in the December 2011 ADS-B data.

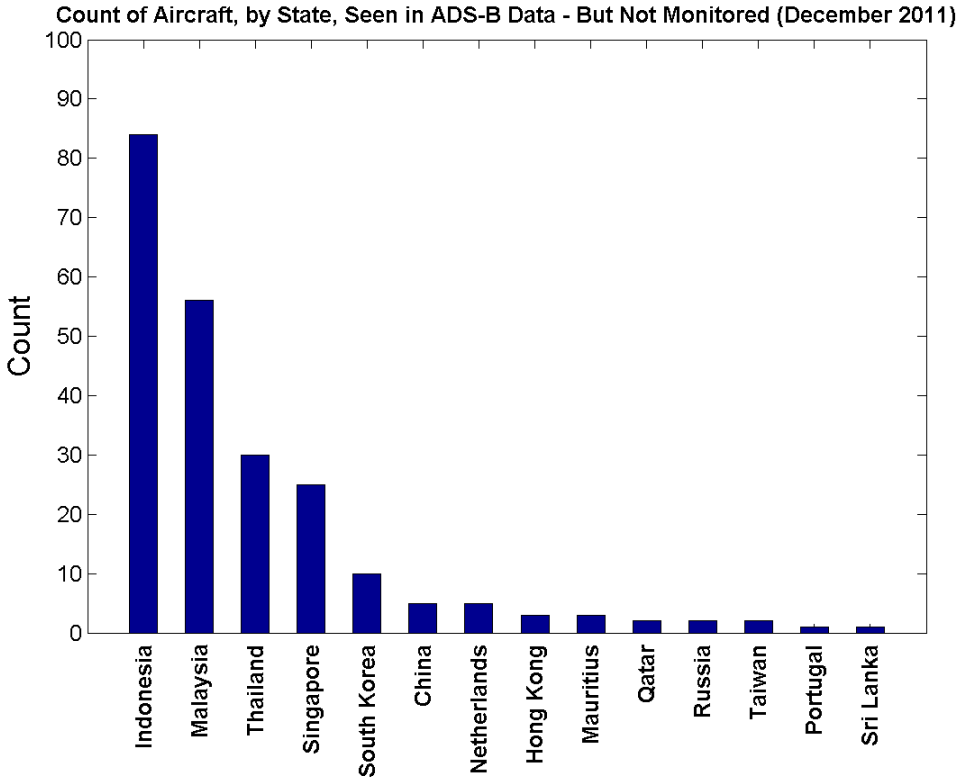

Figure 4. Counts by State for non ADS-B-approved airframes appearing in the December 2011 ADS-B data.

2.8 Table 2 below provides operator and aircraft type details for the aircraft which are ADS-B equipped but are not provided services in Australia. Not withstanding the non-approved status, which could simply be as a result of the operator not choosing to apply for ADS-B services, it is recognised that the GPS derived horizontal and vertical position data is good in almost all cases. Australia will be moving to a system in the near future whereby these aircraft will be assumed to be compliant, in the same way as for other avionics, because CASA 2007 regulations require ADS-B transmissions to be disabled if equipment does not comply with the appropriate ADS-B standards. In summary, ADS-B data will be assumed to be good unless the aircraft is identified to be transmitting bad data. In this case, the aircraft will be added to a "black list" to prohibit display to ATC, and the regulator informed of the non compliance. Under that system, the AAMA will use all the available ADS-B data for ASE calculations, anticipating that suspect geometric data will be easily identified and discarded.

Operator	Operator Name	Types
AFL	Aeroflot	A332(2)
AIQ	Thai Air Asia	A320(19)
ALK	Sri Lankan Airlines	A332(1)
AWQ	Indonesian Air Asia	A320(14)
AXM	Air Asia	A320(39)
BTV	Metro Batavia	A332(1)
CAL	China Airlines	A333(2)
CRK	Hong Kong Airlines	A332(3)
CSN	China Southern Airlines	A332(4) A333(1)
GIA	Garuda Indonesia	A320(3) A333(6) B738(7)
HFY	Hi Fly	A343(1)
JSA	Jetstar Asia	A320(8)
KAL	Korean Airlines	A333(10)
KLM	KLM Royal Dutch Airlines	B773(1) B77W(4)
LNI	Lion Air	B734(1) B738(1) B739(51)
MAS	Malaysian Airlines	A332(2) A333(5) B738(10)
MAU	Air Mauritius	A333(2) A343(1)
QAF	Qatar Amiri Flight	A320(1) A332(1)
SLK	SilkAir	A319(3)
TGW	Tiger Airways	A320(14)
THA	Thai Airways	A333(11)

Table 2, Non ADS-B-approved airframes – December 2011

2.9 An expansion of the aircraft ADS-B data able to be accessed by the AAMA, such as inclusion of the examples in Table 2, will assist in reducing the monitoring burdens for a number of operators and States.

3. ACTIONS BY THE MEETING

3.1 The meeting is invited to note and discuss the results of the analysis provided in this paper.

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