International Civil Aviation Organization

Fourteenth Meeting of the APANPIRG ATM/AIS/SAR Sub-Group (ATM/AIS/SAR/SG/14)

Bangkok, Thailand, 28 June – 2 July 2004

Agenda Item 4:   **Consider problems and make specific recommendations concerning the provisions of ATM/AIS/SAR/ in the ASIA/PAC Region**

**SECOND MEETING OF
AUTOMATIC DEPENDENT SURVEILLANCE-BROADCAST (ADS-B) STUDY
AND IMPLEMENTATION TASK FORCE**

(Presented by the Secretariat)

SUMMARY

This paper reviews the work accomplished by the second meeting of ADS-B Study and Implementation Task Force Meeting held in Bangkok, Thailand and presents draft Decision and Conclusions developed by the meeting for comments.

1.   **INTRODUCTION**

1.1   The Second Meeting of Automatic Dependent Surveillance-Broadcast (ADS-B) Study and Implementation Task Force (ADS-B SITF/2) was held in at the "Kotaite Wing" of the ICAO Asia and Pacific Office in Bangkok, Thailand from 22 to 26 March 2004. The report of the meeting is posted in the ICAO APAC web page www.icao.int/apac.

2.   **DISCUSSION**

2.1   The second meeting was attended by thirty-three experts from Australia, China, Hong Kong China, Fiji, India, Indonesia, Japan, Mongolia, New Zealand, Singapore, Sweden, Thailand, United States, IATA and SITA. The meeting was also attended by representatives from two industries.

2.2   The meeting reviewed the latest ADS-B related activities conducted by States, ICAO Panels and Industries.

2.3   In accordance with revised Terms of Reference (TOR) approved APANPIRG/14, the meeting further discussed the benefits of implementation of ADS-B in the region. The meeting noted that implementation of ADS-B is included in the List of Key Priorities for implementation of CNS/ATM systems in the region.

2.4   The Task Force recognized that it would be beneficial to know the airlines plans for the deployment of ADS-B and requested IATA to provide airline's plan for implementation of ADS-B and formulated the following draft Conclusion:

Draft Conclusion 2/1 - Airlines plan for the deployment of ADS-B

That, IATA be requested to conduct a survey of its member airlines' plan for the deployment of ADS-B in the ASIA/PAC region and provide result to the next meeting of the ADS-B Task Force or its Working Group.

2.5   In order to develop an implementation plan on a sub regional basis, a sample model business case for three specific city pairs were developed. A Workshop of the whole meeting was conducted to examine and prepare sample city pairs. The sample is provided in Attachment 1 to this paper, which highlighted a number of issues including:

- need for States to evaluate the age of their radars and whether potential exists to replace them with ADS-B;
- need to consider ADS-B in surface movement solutions;
- need for surveillance data sharing in ASIA/PAC region. An opportunity exists with ADS-B deployment to plan at the early stages of deployment to share data. e.g. there is potential to share data in at least the following areas:

    o Australia & Indonesia (Christmas Is, Timor area, Bali…)
    o Australia & Papua New Guinea
    o Australia and Fiji
    o Australia and New Zealand
    o Indonesia & Singapore
    o China & Japan

- each of the above mentioned States were required to investigate and report on their organisational policy regarding sharing of ADS-B data with their neighbours.

In view of foregoing discussions, the meeting formulated following Conclusion:

Draft Conclusion 2/2 – Exchange of ADS-B surveillance data with neighbours

That, States be encouraged to share ADS-B surveillance data with neighbouring States and to develop mechanisms to achieve this as ADS-B ground infrastructure requirements are being identified during the design phase.

2.6   It was recognised that work needed to continue on the development of plans for selected city pairs to highlight issues for possible implementation in any sub-region. It was considered necessary for a coordinator to gather information such as possible benefits and to make proposals for each city pair to use ADS-B to improve capacity. The meeting designated members of the Task Force from States concerned to act as co-ordination for 3 city pairs as follows:

- City pair 1 (Australia - Singapore): Singapore will act as co-ordinator;
- City Pair 2 (Hong Kong, China - Tokyo): Japan will act as co-ordinator; and
- City Pair 3 (Singapore - Delhi): India will act as co-ordinator.

2.7   In order to develop an implementation plan on a sub-regional basis, the meeting identified various tasks to be undertaken by the ADS-B Study and Implementation Task Force and developed a Subject/Tasks List, which is provided in Attachment 2 for consideration by APANPIRG. Accordingly, the meeting formulated the following draft Decision.

**Draft Decision 2/4 – Subject/Tasks List of ADS-B Study and
Implementation Task Force**

That, the Subject/Tasks List of the ADS-B Study and Implementation
Task Force provided in Appendix C be adopted.

2.8   The Task Force also decided to set up a Working Group to address various issues
identified by its second meeting. The meeting of the Working Group of the Task Force is tentatively
scheduled for October 2004.

Implementation Team

2.9   It was proposed that the Task Force should establish a problem-reporting database
similar to that used successfully by ISPACG. The meeting therefore endorsed a proposal to establish a
database, which will be initially managed by Australia. It was suggested that when States move from
trials to full-scale deployment, the Task Force needs to work as an Implementation Team to ensure
implementation of ADS-B in a harmonized and an evolutionary manner.

3.   ACTION BY THE MEETING

3.1   The meeting is invited to

a) note the work of the Second Meeting of ADS-B Study and Implementation Task
    Force;

b) review the draft Conclusions and Decision formulated by the Task Force; and

c) recommend additional tasks required to be undertaken by the Task Force, as
    required.

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In view of foregoing discussions, the meeting formulated following Conclusion:

Draft Conclusion 2/2 – Exchange of ADS-B surveillance data with neighbours

That, States be encouraged to share ADS-B surveillance data with neighbouring States and to develop mechanisms to achieve this as ADS-B ground infrastructure requirements are being identified during the design phase.

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2.8   The Task Force also decided to set up a Working Group to address various issues identified by its second meeting. The meeting of the Working Group of the Task Force is tentatively scheduled for October 2004.

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3.   ACTION BY THE MEETING

3.1   The meeting is invited to

a) note the work of the Second Meeting of ADS-B Study and Implementation Task Force;

b) review the draft Conclusions and Decision formulated by the Task Force; and

c) recommend additional tasks required to be undertaken by the Task Force, as required.

WORKSHOP SESSION ON 3 CITY PAIRS

A mini workshop of the whole meeting was conducted to examine 3 city pairs.

The objective was to commence the process of develop a sample model for a elected city pair. It was decided to include both

Air to Ground (downlink only) and surface movement surveillance (downlink only)

Furthermore, only large aircraft of the Boeing/Airbus type are to be considered:

The issues identified were:

a)   **What are the costs?**

Airborne and Ground for current users
Use real costs wherever possible

b)   **What are the changes in Service Levels? (Benefits)**

3 options
- Do nothing
- ADS-B deployment
- Radar, limited ADS-B

The following pages are notes related to the discussion:

CITY PAIR 1: SYDNEY - SINGAPORE

ATC providers
Singapore/ Australia/ Indonesia

Regulators
CASA, CAAS, DGAC

Airlines that use route

Alitalia	
BA	744
Emirates	(A340 & B777)
Egypt air	A340
Qantas	767, 744
KLM	744
SIA	744, 777
Swiss	MD11
ANZ	744
FedEx	
UPS	
DHL	

But crossing tracks & other aircraft that "mix" with city pair need to be equipped.

Say 10 airlines on route Say 10 airlines that cross/mix.

Number of airframes using route………………

Existing radar sites – ability to replace?

Australia	Ability to replace
– Sydney TAR, , …….	No
– Mt Boyce	Yes
– Darwin military	No
Indonesia Existing radars – Banda Aceh – Medan – Natuna – Tanjung Pinang – Pontianak – Pekanbaru – Palembang – Jakarta – Semarang – Banjarmasin – Balikpapan – Yogyakarta – Surabaya – Bali – Waingapu – Ujung Pandang – Manado – Kendari Envisaged ADS-B Phase 1 (Eastern) Start at Semerang Phase 2 (Western) Plan for ADS-B 2005 5 Ground stations	May be
Singapore:	
– Singapore RSR 256nm	No
– Singapore TAR 200nm	No

ADS-B how many sites?

- ADS-B GS in Singapore (surface)
- ADS-B GS in Sydney (surface)
- ADS-B GS in Indonesia enroute & remote monitoring
- Data infrastructure to get data to centres
- Ensure VHF available where surveillance is provided.
- ADS-B processing capability in
- Singapore ASMGCS
- Sydney ASMGCS

- Indonesian centres (2) Ujung Pandang/Jakarta
- Say 8 ADS-B sites in Indonesia
- Say 2 ADS-B sites in Timor sea (oil rigs)
- Are "sites" available with power
- RAIM prediction service capability in Indonesia

Funding cycles
Sites available
Develop procedures
Documents MOU Indonesia/Australia

        LOA on boundaries
        Doc. 7030 "Standards over the high seas"
        Doc. 4444 in process by SASP/OPLINK
        Australian MATS document
        Indonesian MATS
        Singapore MATS
        AIPs
        FAA TSO for 1090
        Update/ prepare safety cases

Training ATC
Training flight crews
Regulator cooperation
Maintenance training (Ground stations)

Benefits:
- Singapore & Sydney surface movement
  - (AUTOMATED) Runway incursion (safety) including service vehicles
  - Reduce surface coverage holes (blockages)
  - Provides identity to ASMGCS
  - Improved gate management (airline & airport)
  - Improve surveillance under heavy rain (L band coverage vs X band)
  - More efficiency in low visibility
  - Faster response from Airport emergency services
  - Improved ATC determination of aircraft position leading to reduced ground movement delays
  - Better airport charging veracity
  - Improved de-icing management due availability of positional and identity data
  - Reduced ground taxi time (in low visibility)
  - Reduced noise & environmental impact as a result
  - Improved surveillance performance (velocity vectors, accuracy…..) Lower risk of alert false alerts
  - Increased coverage & hence potential changed separation standards & associated benefits

Safety:
  - Safety alerts
  - ATC Situational awareness
  - FIR boundary discontinuity surveillance

Operational benefits for users:

- Chance of preferred level (fuel, operating time, money)
- Probability of optimum route (fuel, operating time, money)
- Improved predictability (can allow increased payload)
- Reduced separation
- Improved coordination with Military for clearance release through active military areas
- Improved coordination between sectors/centres (earlier clearances….)
- Better conflict resolution solutions for users
- Improved recording & data capture and hence better planning capabilities
- Better incident analysis tools

Operational benefits for ATC providers

- Improve safety alert performance due better velocity vectors
- Optimise controller workload

Operational control

- Improved flight following
- Improved ramp management (inbound taxi times)

Environmental
- Reduced greenhouse gases (optimum flight levels, less "delay").

CITY PAIR 2 : HONG KONG, CHINA - TOKYO

ATC providers
Hong Kong, China ATC
Chinese Taipei ATC
China (ATMB) ATC
Japan(JCAB) ATC

Regulators
CAAC, CAD, Hong Kong, China, JCAB

Airlines that use route

CathayPacific	B744,777,743,a340,a330
All Nippon	744,767,772,777
Air Hong Kong	A300
JAL	747,767,777,dc10,md11
Nippon Cargo	747
Dragon Air	
China Eastern	
China Southern	
United Airlines	B777, B744

But crossing tracks & other aircraft that "mix" with city pair need to be equipped!

Number of airframes using route:……………..

Existing radar sites – ability to replace

Hong Kong	
- 4 SSR 3 primary Beacon Hill Mount Parker Tai Mo Shan Sha Chau	Not in near future
Chinese Taipei ATC	
China (ATMB) ATC	
Japan(JCAB) ATC	5 or 6 radars involved & 1 Terminal area + 1 ASDE ADS-B/Multilat on surface

Japan: potential to reduce surveillance overlap

ADS-B how many sites?

- ADS-B GS in Hong Kong (surface) – contract signed for trial. Trial period for 6 months. Option to buy after trial
- ADS-B GS in Tokyo (surface)
- ADS_B to supplement coverage to improve ATC tracking performance
- ADS-B GS in China enroute & remote monitoring
- Data infrastructure to get data to centres
- ADS-B processing capability in China (NESAC)

CITY PAIR 3: SINGAPORE- DELHI

ATC providers

Bangladesh
India
Malaysia
Myanmar
Singapore
Thailand

Regulators
CAA Singapore, DGCA India, DCA Thailand, DCA Myanmar and DCA Malaysia.

Airlines that use route

SQ	
Malaysian	
Thai	
AirIndia	
KLM	
CathayPacific	

JAL	
Qantas	
Gulf Air	
Korean	
ANA	
BA	
Emirates	

But crossing tracks & other aircraft that "mix" with city pair need to be equipped!

Number of airframes using route:……………..

Existing radar sites from FASID – ability to replace/ new

Singapore	

Myanmar
   – Yangon 250 nm
   – ADS-B site (Pathein)
	2 radars, Gaps exists – could be filled. Gaps in VHF as well

Bangadesh – Dhaka 200 nm	

India
4 sites en route – 2 PSR/SSR only & 2 SSR only
(12 in total in India)
   – Ahmadabad
   – Trivandrum
   – Hyderabad
   – Guwahati
   – Calcutta
   – Chennai
   – Delhi
   – Mumbai
   – Mangalore
   – Berrhampur
   – Varanasi
   – Nagpur
 	
   – Port Blair (ADS-B only)
	No replacement in time horizon
	
	Some gaps in VHF & radar on route – could be filled (say 2 sites)

Malaysia
   – Langkawi
   – Subang
   – Genting Highlands
   – Senai Johor
   – Kota Kinabalu
   – Kuching
   – Kota Bahru
   – Kuala Lumpur
   – Sandakan
   – Miri	

Thailand
  – Bangkok
  – ChiangMai
  – Ubon
  – Suat
  – Hat Yai
  – Phuket
  – MaeHong Son
  – U Taphao	

Japan: potential to reduce surveillance overlap

ADS-B how many sites?

- ADS-B GS in Delhi (surface);
- ADS-B GS in Singapore (surface);
- ADS_B to supplement coverage to improve ATC tracking performance in Singapore Malaysia, India and Myanmar;
- ADS-B GS in Myanmar enroute & remote monitoring;
- Data infrastructure to get data to centres + VHF;
- ADS-B processing capability in Myanmar & India & Malaysia.

SUBJECT/TASK LISTS OF THE ADS-B STUDY AND IMPLEMENTATION TASK FORCE

No.	Ref.	Task	Priority	Action Proposed/In Progress	Target
1	APANPIRG Concl.13/19 TOR	Subject: Selection of links for near term and long term. Task: 1) Select near term link; 2) Select long tern link.	A	1) SSR Mode S 1090 ES has been selected for the near term; 2) Additional data links may be specified as necessary.	Completed TBD
2	APANPIRG Concl. 14/21	Subject: Guidance material for implementation of ADS-B in ASIA/PAC region. Task: Develop a guidance package	A	1) Sample Business case component; 2) Based on OPLINK Concept of use and other ICAO Docs for ADS-B air-ground surveillance service.	2005
3	APANPIRG Concl. 14/21	Subject: Report of ADS-B problem. Task: Establish a problem reporting system	A	Develop a database and a form of report	2004 /Australia
4		Subject: Draft amendment proposal to SUPPs 7030 Regional Supplemental Procedures Task: Prepare a draft for consideration by ATM/AIS/SAR Sub-Group of APANPIRG.	B	Prepare a draft for amendment to Doc7030 for implementation of ADS-B in the ASIA/PAC region pending separation criteria developed by relevant ICAO Panel.	2005/ICAO Regional Office

No.	Ref.	Task	Priority	Action Proposed/In Progress	Target
5	APANPIRG Concl. 14/21	Subject: ASIA/PAC ADS-B operational manual Task: Develop operational procedure manual for using ADS-B.	A	Develop a draft operational manual (include material on NOTAM and available manual data)	2005 New Zealand/ USA
6	APANPIRG Concl. 14/21	Subject: Coordination between States at planning level Task: Coordination for timing of implementation and designate focal point of contact, points of contact for regulators, airframes & ground systems.	A	1) Develop an coordinated implementation plan by city pairs; 2) Inform ICAO regional office names of designated focal point of contact.	2005/States concerned 2004/States
7	APANPIRG Concl. 14/21	Subject: Regional implementation plan Task: Develop a Regional implementation plan taking into account the individual national plans in accordance with a coordinated plan between city pairs.	B	1) States present their ADS-B plans (including any necessary associated air ground voice communication) as WPs to ADS-B study and implementation Task Force; 2) Implementation date, sites being considered and plans for mandates (if any) should be specified; 3) Develop optimal regional plan based on State inputs.	2005

No.	Ref.	Task	Priority	Action Proposed/In Progress	Target
8		Subject: Number of airframes fitted Task: Report on number of airframes fitted	A	Collect and report to the Task Force information on types, operators (numbers of each) and NUC (NIC/NAC/SIL)	2005/USA