



**INTERNATIONAL CIVIL AVIATION ORGANIZATION**  
**ASIA AND PACIFIC OFFICE**

**REPORT OF  
THE MEETING OF  
AUTOMATIC DEPENDENT SURVEILLANCE – BROADCAST (ADS-B) STUDY  
AND IMPLEMENTATION TASK FORCE WORKING GROUP (ADS-B/TF/WG)**

**Singapore, 13-15 October 2004**

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### **APPENDIX**

Appendix A:	Contact points for ADS-B Study and Implementation
Appendix B:	Outcome of the meeting and action items agreed
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### **ATTACHMENTS**

Attachment 1:	List of participants
Attachment 2:	List of working and information papers

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**1. INTRODUCTION**

1.1 The Meeting of Automatic Dependent Surveillance – Broadcast (ADS-B) Study and Implementation Task Force Working Group was held from 14-15 October 2004 in conjunction with ADS-B Seminar on October 13 at the Singapore Aviation Academy.

1.2 On behalf of Civil Aviation Authority of Singapore, Mr. Yeo Cheng Nam, Senior Engineer Surveillance extended welcome to all participants and industries to the Seminar and expressed their full support to the meeting.

1.3 Mr. Greg Dunstone, Chairman of the Task Force, welcomed all the participants, highlighted work programme of the Seminar and the task of the Working Group Meeting.

**2. ATTENDANCE**

2.1 The meeting was attended by 46 participants from Australia, China, Hong Kong China, Fiji, India, New Zealand, Singapore, Thailand, United States, IATA, SITA, and representatives from four industries. List of participants is at Attachment 1.

**3. OFFICERS AND SECRETARIAT**

3.1 Mr. Greg Dunstone, Senior Technical Specialist of Airservices Australia Chaired the Meeting. Mr. Li Peng, Regional Officer, CNS of the ICAO Asia and Pacific Regional Office acted as Secretary. Ms. Wee Toon Cheng, Melisa, Engineer of Civil Aviation Authority of Singapore provided all administrative support.

**4. ORGANIZATION, WORKING ARRANGEMENTS AND LANGUAGE**

4.1 The meeting met as a single body. The working language was English only inclusive of all documentation and this Report. Lists of Working Papers and Information Papers presented at the Seminar and Meeting are at Attachment 2.

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**Agenda Item 1: Adoption of Agenda**

1.1 The following agenda items prepared based on the task list and work item for the working group was adopted by the meeting:

1. Adoption of Agenda
2. Review of outcome APANPIRG/15 and updating progress of Work Items
  - 2.1 Review outcome of APANPIRG/15 and other sub-groups of APANPIRG on ADS-B
  - 2.2 Review and present responses to Work Items/Task Lists:
    - a) FAA: Advise timing of TSO C166;
    - b) Members report on progress – expected traffic densities now & 2005 (due 2005);
    - c) Members report on progress – ADS-B data sharing policies (due 2005);
    - d) Members report radar – ADS-B comparison data;
    - e) Members present available “price data”;
    - f) IATA presents: Bay of Bengal Benefits;
    - g) ADS-B Problem reporting establishment: Australia; and
    - h) Report on number of airframes fitted.
3. Presentation by city pair co-ordinators
  - a) Singapore: On Singapore – Australia routes;
  - b) Japan: On Hong Kong, China – Tokyo routes;
  - c) India: On Singapore – Delhi routes; and
  - d) All States designate focal point of contact.
4. Progress items due in 2005
  - 4.1 Develop a draft operational manual
    - a) Progress report by New Zealand & USA.
  - 4.2 Progress development of Guidance material for implementation of ADS-B in ASIA/PAC region
    - a) Sample Business case component; and
    - b) How to implement component
  - 4.3 Progress development of draft for amendment to Doc. 7030 for implementation of ADS-B in the ASIA/PAC region pending separation criteria developed by relevant ICAO Panel.

## 4.4 Progress development of Regional Implementation Plan

- a) Attending States present WP of their ADS-B plans including implementation date, sites being considered and plan for mandate (if any);
- b) Attending States present WP of any significant progress in ADS-B planning or deployment; and
- c) Consideration of initial draft “strawman” regional plan

## 5. Any other business

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**Agenda Item 2: Review of outcome of APANPIRG/15 and updating progress of Work Items****APANPIRG/15 Meeting on Result of the Second Meeting of the Task Force**

2.1 The meeting reviewed actions taken by APANPIRG/15 on the result of Second Meeting of the ADS-B Study and Implementation Task Force. The meeting noted that the report of the Second Meeting of the Task Force was also reviewed by the Fourteenth Meeting of the ATM/AIS/SAR Sub-Group of APANPIRG held from 28 June to 2 July 2004 and by the Eighth Meeting of CNS/MET Sub-Group held from 12 to 16 July 2004. APANPIRG/15 adopted two Conclusions formulated by the Task Force and approved a task list for the ADS-B Task Force.

2.2 The meeting discussed the comments made by the Sub-groups of APANPIRG on the data integrity issues of ADS-B surveillance data exchange and identified the need to specify the format and means for the exchange of ADS-B surveillance data between States. The meeting noted the need to further carry out inter-regional coordination with neighboring regions as emphasized by the ATM/AIS/SAR Sub-group. The meeting agreed to agree on an interface standard.

State letter on Follow-up Action for Recommendation 1/7 of AN-Conf/11 (2003)

2.3 The meeting reviewed the ICAO State Letter ST 12/4-04-65 dated 30 June 2004 on follow-up action for Recommendation 1/7 of AN-Conf/11 on ADS-B. The meeting noted that ADS-B had been identified as enabler of the global ATM operational concept and States are encouraged to implement cost-effective ground and airborne ADS-B applications.

**Review and Present Responses to Work Items/Task Lists**Development of Technical Standard

2.4 USA informed the meeting (IP14) that the United States Technical Standard Order (TSO)-C166 Extended Squitter ADS-B and TIS-B Equipment Operating on 1090 MHz became effective on 20 September 2004 which can be electronically downloaded at :

[http://www.airweb.faa.gov/Regulatory\\_and\\_Guidance\\_Library/rgTSO.nsf/MainFrame?OpenFrameSet](http://www.airweb.faa.gov/Regulatory_and_Guidance_Library/rgTSO.nsf/MainFrame?OpenFrameSet)

TSO-C166 is for manufacturers of 1090 MHz ADS-B and TIS-B equipment applying for a TSO authorization or approval of design.

2.5 Australia informed the meeting (WP/5) of the possibility that some aircraft may not be adequately equipped for UAP operations. The paper analyzed different avionics using DO260 and DO260A. It was recommended to ensure that:

- a) ACSS transponders apply the service bulletin 7517800-23-6010 to make the transponder –10005 Mod A;
- b) Aircraft are configured to use HPL until they are equipped with DO260A capabilities; and
- c) ADS-B Safety cases take into account the remote possibility of errors from HFOM based integrity data being transmitted.

2.6 The meeting was informed (WP18) that Airbus has certified in 2003 three new Mode S transponders, capable of ELS (Elementary Surveillance), EHS (Enhanced surveillance) and 1090ES (Extended Squitter, first implementation of ADS-B out). These three Mode S transponders els/ehs/es capable are:

- Honeywell TRA-67A, P/N 066-01127-1402
- Collins TPR-901, P/N 822-1338-021
- ACSS XS-950, P/N 7517800-10005

2.6.1 Basically, Airbus aircraft are equipped with Honeywell transponder P/N: 066-01127-1101, which is not ELS-EHS capable. However, through the RFC process, new Airbus customers have the possibility to install on their aircraft an ELS-EHS capable transponder from the list above. This RFC is free of charge for customers, and the installation of a new transponder capable of extended squitter does not imply additional costs to customers.

2.6.2 It was concluded that

- Airbus Enhanced Surveillance wiring provisions provide HIL parameters to the transponder;
- The ACSS transponder -10005 mode a uniquely uses HIL to compute NUCp and that the SB for this modification is FOC to customers that have a -10005; and
- Other transponder manufacturers are yet to provide confirmation of the status of their transponders to Airbus.

#### Traffic Densities

2.7 Thailand provided traffic statistics conducted for the period 1998-2003. The overall average annual growth of en-route traffic for Bangkok FIR was 1.79%. Discounting the outbreak of Severe Acute Respiratory Syndrome (SARS) and the return of the Area of Responsibility (AOR) to Cambodia, the overall average annual growth should have been at 3.77%. Based on this figure, the traffic over Bangkok FIR is expected to reach 450,000 by 2015. Typical traffic density over Bangkok International Airport is between 20 and 30 aircraft per hour based on a radial area of 250 NM. This rises to 40 aircraft per hour during festive seasons and long holidays.

2.8 The members of the Task Force were encouraged to provide traffic information to the ADS-B Task Force using the format as provided in IP/01 by Thailand as example.

2.9 The meeting noted a snapshot of traffic densities seen by Sydney airport terminal area radar on 27 September 2004 during a small 15 minutes period (WP/09). This method of traffic density capture may be used by other states as a simple and effective way of capturing current traffic densities in radar airspace. The numbers represent the maximum number of aircraft **PER ANTENNA REVOLUTION**, detected by the radar within the range shown.

#### ADS-B Data Sharing Policies

2.10 The meeting discussed a paper on ADS-B data sharing policy (WP/06) presented by Australia. The paper analyzed the characteristics of potential data sharing of radar, FANS 1 based ADS-C and ADS-B. It was stated that the following two levels of service could be adopted for sharing ADS-B data.

**LEVEL 1:** Use of the ADS-B data for radar like separation standards (eg. 5 NM). This requires availability, reliability, accuracy and integrity equivalent to that offered by radar.

**LEVEL 2:** Use of ADS-B data for situational awareness and perhaps some automated safety alerting features such as Cleared level adherence monitoring. For this service, integrity and accuracy are most important whilst lower standards could be tolerated for availability and reliability. Accuracy and integrity are determined in most part by the system design and by the avionics. Maintenance support is not as critical for this level of service.

2.10.1 While discussing the ADS-B data sharing, two related issues were identified i.e. data format to be used and telecommunication links including protocol used between States. It was proposed to use Eurocontrol ASTERIX. Cat 21 as data exchange format. It was also informed that USA is using ASTERIX Cat 33 rather than Cat 21. Therefore, Australia and USA were tasked to make further study on this matter, contacting Eurocontrol for the latest development or version on data exchange format. The result of study and recommend data format will be discussed at the next Task Force meeting.

#### **Decision 1/1 –ADS-B data exchange format**

That, members from Australia and USA conduct study on ADS-B data exchange format and present result to the next ADS-B Task Force meeting.

2.10.2 Regarding means and integrity of ADS-B data exchanging between States, it was recommended that Cyclic Redundancy Check (CRC) should be employed on either dedicated links leased or ground networks in the region.

2.10.3 Regarding the legal aspect of sharing ADS-B data, it was agreed that a LOA would always be required between the two states sharing ADS-B data. A sample data sharing agreement proposed by Eurocontrol in 1997 was provided to the meeting as a sample.

2.11 The meeting noted the potential ADS-B based surveillance capability at the Australian FIR Boundary (WP/13) which may be considered for use to improve the boundary safety and operational efficiency.

2.12 The meeting noted the performance and ability of ADS-B using Mode S ES including detect ability of aircraft compared to operational Monopulse secondary surveillance radar (WP/17).

2.13 The meeting noted the U.S. activities (IP12) concerning comparison of ADS-B vs. radar data and plan for a national 3 NM terminal ADS-B separation standard. These activities are documented in the *Plan to Obtain Approval for Automatic Dependent Surveillance - Broadcast (ADS-B) Terminal Area Separation Standards (TermSepStdPlan)*. (FAA, Final Coordination v1.0, 31 August 2004). Analyses were performed on the horizontal position accuracy of ADS-B and radar targets reported to the ATC automation system. Comparing ADS-B accuracy to terminal SSR cross track accuracy at 40 NM from the radar, the data indicates that ADS-B is from 18 to 60 times more accurate. Comparing ADS-B accuracy to enroute SSR cross track accuracy at 200 NM, the data indicates that ADS-B is from 90 to almost 300 times more accurate.

2.14 Thailand informed the meeting (IP/2) that a cost estimate for provision of a 9600 bps communication link without ADS-B ground station between ADS-B site and the air traffic control centre in Thailand is about US\$ 4,800 covering both additional hardware to accommodate an extra communication link and initial installation. The cost estimate was based on the assumption that the ADS-B system would be installed at a location which already has a communication infrastructure (VSAT Network). Annual maintenance costs are minimal as these will be shared with the other systems/applications using the existing infrastructure. The meeting noted that the cost could be different in the different environment. Therefore, members of the Task Force were encouraged to provide relevant information on the cost to the Task Force.

2.15 IATA informed the meeting of the estimated costs of an airline fitting various types of aeroplanes with ATC transponders and other necessary equipment to enable ADS-B out using 1090ES (IP/03). Airlines have been installing Mode A, C, S 1090 MHz Transponders with and without the capability for extended squitter. The recent European mandate of enhanced radar surveillance required these ATC transponders to be upgraded for extended squitter. There is an additional cost to further upgrade the aeroplane wiring and systems to enable ADS-B air-ground surveillance service using 1090 ES. It was indicated that the cost to do so is very dependent on the particular airframe, the number of aircraft in the fleet, the relationship between aircraft owner and the aircraft supplier and many other variables.

#### An Example of A-SMGCS Trial

2.16 Singapore updated meeting on activities and work carried out on ADS-B in the Singapore FIR. Singapore plans to implement ADS-B in 3 phases as follows:

- (a) Phase 1 (2006/7) involves the tracking of ground movement of vehicles with ADS-B transponders and ADS-B equipped aircraft using sensors installed at Changi Airport. The ADS-B tracking will be displayed at the Advanced Surface Movement Guidance and Control System (A-SMGCS) at Tower.
- (b) Phase 2 (2007/8), the ADS-B coverage will be extended up to 250 NM by installing a high-gain antenna in the airport vicinity, if required.
- (c) Phase 3 (2009/10) we will integrate ADS-B data into the new ATC system for ATC operations.

2.16.1 In early October 2004, Singapore took the opportunity of flight inspection to long range radar to conduct a simple ADS-B trial (with the support from Singapore Engineering Software Systems Pte Ltd and Sensis Corporation) to assess performance of ADS-B. After analysis of the data captured during the radar flight check, the following results were observed:

- a) Initial pick-up of aircraft

The ADS-B receiver (located at Changi) was able to track the flight check aircraft at Seletar Airport (about 13 KM away from Changi) while still on the ground. Due the fact that there is no line of sight between the long range radar and the flight check aircraft at Seletar Airport, the long range radar was able to pick up the flight check aircraft only after take-off;

b) At Changi Airport, touch and goes were conducted at the 4 runway ends. The long range radar performed accurately according to the specifications for all runway ends except for one probably due to blockage. In comparison, ADS-B was able to track the aircraft from arrival, touch-down to taxi-ing. At a certain point, the flight track was dropped probably due to the blockage by the terminal buildings.

c) ADS-B antenna cone of silence

At a certain distance from radar head, the radar would drop the flight check aircraft track. Flying at varying flight levels of FL 350, 330 and 290, it was observed that the cone of silence for the long range radar was 9, 8 and 7 NM radius respectively. For ADS-B, it was observed that the cone of silence was larger at 11, 10 and 9 NM radius. It was understood that the cone of silence of the ADS-B antenna was wide as a standard DME antenna was used for this trial.

d) Potential ADS-B coverage

The flight check aircraft was flying on a specific airway at 7000ft. It was observed that ADS-B could track the flight check aircraft all the way to 118 NM while the radar could only track the aircraft up to 130 Nm but intermittent detection started at around 120 NM.

e) Performance on specific SID /STAR and aircraft maneuvering

When the flight check aircraft flew along the SID/STAR, both radar and ADS-B provided comparative position reporting. At certain points of the aircraft maneuvering, we lost some ADS-B tracks. That was probably due to the fact that the aircraft was only equipped with 1 transponder antenna attached on the top of the aircraft. However, with the fast update rate of ADS-B, the track drop was recovered within 2 - 3 seconds. This fast update rate would be useful in improving the conflict alerts (ie reduce false alerts) in the ATC system.

2.16.2 From the few days of recordings, we managed to track about 20 aircraft per day which equates to about 3% of aircraft in the Singapore FIR (based on current traffic density). This figure is very promising as compared to the early days of FANS implementation.

2.17 Singapore informed the meeting that the total aircraft movement in the Singapore Flight Information Region (FIR) in 2003 was 251,573. Based on the ICAO forecast (which has been adjusted for SARS), the total aircraft movement in the Singapore FIR is envisaged to increase to 472,000 by 2015.

2.18 As part of the efforts to implement ADS-B in the Asia / Pacific region, Singapore is willing to consider the sharing of ADS-B surveillance data as well as other forms of cooperation with neighboring States.

#### Options for Small Aircraft ADS-B Avionics and their Costs

2.19 The meeting noted the information provided by Australia on options and cost for small aircraft ADS-B avionics from various manufacturers (WP/11). It was recommended that a nominal lowest value of \$5,000 USD + \$1000 USD = \$6,000 be used as the price for low end General aviation avionics in the APANPIRG Cost Benefit study.

#### ATC Automation Costs

2.20 The meeting noted the information (WP/12) on the range of prices for changing ATC automation systems necessary to integrate ADS-B data. The cost for a single integration with ATC system would be US\$50,000.- PC Based system and \$5M-\$10M for integration into an advance automation system. A medium automation system with radar capabilities could be expected to cost in the order of US\$2M to \$3M. It is impossible to define precisely the price as it depends on the specified optional functions and the level of requirements for integration, redundancy, training, logistic support etc.

#### ACSS ADS-B Capable Transponders

2.21 The meeting noted the information on ADS-B capable transponders produced by ACSS (WP/16). The latest versions of the XS-950 for air transport aircraft are capable of extended squitter and provision of navigational data. The Part No. for Boeing is:7517800-11006 and for Airbus: 7517800-10005. RCZ-852 is for GA/Business type of aircraft. For all existing XS-950 (10xxx) transponders, the upgrade to included extended squitter is via a software change only which can be performed whilst the unit is still installed upon the aircraft. However, to upgrade an existing XS-950 -1000x transponder to -11006 (Boeing model), it must be returned for the hardware modification.

#### ADS-B Problem Reporting System

2.22 The interim problem report database has been developed by Australia based on the proposal of establishment of a database agreed by the Task Force. The database can be access at [www.airservicesaustralia.com/adsb/issues](http://www.airservicesaustralia.com/adsb/issues) with following user name and password. Members of the ADS-B Task Force were invited to provide any comments regarding the web page and the database to Mr. Greg Dunstone.

User name: icao  
Password: abit2004  
Domain: leave this field blank

#### Contact point for implementation and ADS-B problem reporting system

2.23 The meeting noted that the ADS-B Task Force had recognized the need to invite States to provide contact points for ADS-B study and implementation. According to Task No.6 of Subject/Task List for the ADS/B Task Force as approved by APANPIRG/15 (Decision 15/27), the list of contact points has been compiled at ADS-B WG meeting and provided at Appendix A to this paper. States that have not provided the names of contact points are invited to provide their names of contact points on ADS-B Study and Implementation to the ICAO Regional Office.

#### **Draft Decision 1/2 - Comments on ADS-B Problem Reporting System**

That, Members of the ADS-B Task Force provide comments to Australia on the web based ADS-B Problem Report System.

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Inconsistent Use of Flight Numbers by Flight Crew

2.24 Australia informed the meeting of an observed problem of inconsistencies in flight number/flight identification formats entered by flight crew in aircraft flight management systems. Typically, in air transport category aircraft, an ADS-B capable transponder will broadcast the flight identification entered by the flight crew in the FMS. When a match is found and the position information meets specified flight plan route criteria, a series of automatic events are triggered, including activation of the flight plan, target identification of the aircraft on controllers' display screens and the updating of "down stream" flight information.

2.24.1 Variations in flight identification formats observed in ADS-B reports received through the Bundaberg ground station. Typically, flight plan using ICAO three-letter designator plus the flight number, without leading zeros, eg. IAD12. The ATC service provider would therefore expect to receive ADS-B reports with target identification in the same format. A number of different flight number formats that do not match the corresponding flight plans are being observed in ADS-B reports as follows:

- IATA airline code and flight number, eg. "IC12"
- Flight number only, eg. "12"
- Flight numbers with leading zeros, eg. "IC012" or "IAD012"
- Something completely different, eg. "IC2312"

2.24.2 The meeting noted that this problem also existed for FANS 1/A operation. Pilots may have confused with radio call sign used. It was informed that no minimum number of digits for the call sign but now 3 digits is the minimum number. The meeting agreed that the problem should be brought to attention of ATM/AIS/SAR sub-group of APANPIRG. It was emphasized that the flight identification entered in the flight management system or transponder should match the aircraft identification (Item 7) in the ATS Flight Plan. Guidance material (ADS-B operation manual) being drafted should specify this requirement. IATA agreed to issue a reminder to directors of flight operation of its member airlines concerned. Problem like this should be input to the Problem Reporting System.

**Draft Conclusion 1/3 - Flight Identification Format**

That, IATA issue a reminder to directors of flight operations of its member airlines to use correct flight identification format required to enter into FMS or transponder.

*Note: The aircraft identification entered should use the same as filled in item 7 of the ATS Flight Plan.*

Australia undertook to contact Eurocontrol (John Law) to find out the approach taken by Europe to avoid this problem during the deployment of Elementary surveillance in Europe.

### ADS-B Equipage Forecast

2.25 The meeting noted that operational ADS-B equipage is growing in U.S. (IP/15) and the meeting also noted some observed operational anomalies. The details information can be found at following FAA websites:

Alaska Capstone Program: <http://www.alaska.faa.gov/capstone/>

Safe Flight 21 Program: <http://www.faa.gov/safeflight21/>

East Coast ADS-B Implementation: <http://www.flyadsb.com>

2.25.1 The growth in ADS-B operational use and capable aircraft requires ADS-B system installations and broadcast data meet industry airborne and ground system standards. Inconsistencies are currently being observed from some aircraft broadcasts in the U.S., including continuous NUC=0 data, incorrect ICAO codes and/or call signs, and on rare occasions erroneous position information. Some of these anomalies were traced back to installation issues or pilot configuration error, and/or software bugs.

2.25.2 The USA also advised that the US Military where to proceed with ADS-B equipage as part of the GATM program.

### UAP - Quick Survey of ADS-B Data

2.26 The meeting noted the growing equipage level in Australia (IP/07). Thales ATM provided some data from an ADS-B Ground station in Richmond, Melbourne Australia. The original purpose of the data provision was for the development/debugging of analysis tools which use Thales Ground station log files. However, the opportunity was provided to analyse the type of messages that were being received from aircraft. Airlines are requested to review the ADS-B performance of their aircraft and consider whether work is required to allow them to provide a service

### Quick Survey of European ADS-B data

2.27 The meeting also noted the mixed equipage currently in Europe (IP/10). The data provided was from an ADS-B Ground station in Stuttgart Germany. It was used to analyze the type of messages that were being received from aircraft. It was noted that due to the European mandate, many aircraft have installed the minimum – a squitting transponder plus wiring for identity only (perhaps with vertical rate). These aircraft often have altitude, identity and 24 bit aircraft address. But only 24% of them have useable positional data.

### TSO-129 vs TSO-145/146 GPS Integrity Considerations

2.28 It was noted (IP/13) that the U.S. is performing ongoing analyses on use of TSO-129 and TSO-145/146 for use in ADS-B applications. In order to move ahead with commissioning ADS-B ATC surveillance services, the FAA adopted a ground-based monitor for GPS. This monitor is a GPS sensor imbedded in the ADS-B ground station. The automation system simply compared the reported position from the ground station with survey coordinates for the site. An alarm is issued only when the reported position is out of tolerance, and the ADS-B reported integrity indications are ignored. The difficulty with the ground-based monitor is that it may not detect all satellite failures that are seen by aircraft in range. The new generation of Capstone avionics employs a GPS sensor certified to TSO C145a. Its minimum RAIM availability requirement is substantially higher (.998 in non-WAAS mode). The integrity performance requirement for GPS Sensors based on TSO-C129a and TSO-C145a was described in the paper.

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**Agenda Item 3: Presentation by city pair co-coordinators**

3.1 Under this agenda, the meeting discussed the papers on city pair study presented by Singapore, Japan and India.

**Australia (Sydney) – Singapore City Pair**

3.2 Singapore informed the meeting of the work done for the city pair between Singapore – Australia (Sydney) (WP/20). It was suggested to develop a matrix or a template for preparation of a regional implementation plan. The essential items have been identified:

- Propose possible siting of ground stations
- To use ADS-B to improve safety, efficiency and capacity
- To identify possible costs and benefits

3.2.1 After discussions with the States involved in this city-pair, it was agreed that the necessary work done should encompass a larger region and rather than a particular route. While proposing the possible sites, the existing ADS-B implementation plans for the States in the city pair were taken into consideration. The possible costs and benefits were identified.

3.2.2 It was recommended to take follow-up actions as below:

- For States to provide radar and ADS-B site coverage maps
- For Task Force to develop methodology for cost apportionment (eg consider extension of existing Tokyo – Hong Kong, China city pair to Singapore)
- For States to include risk assessment from project, system and operational point of views
- In accordance with a regional plan to be developed, States will implement their own ADS-B ground station(s) or jointly implement ADS-B ground station(s) with other States or service providers; and
- States to share ADS-B surveillance data with neighbouring FIRs to enhance the safety and efficiency of ATS

3.2.3 In discussing the paper, the meeting agreed to develop a template or matrix servicing as a checking list for implementation of ADS-B air-ground surveillance service. New Zealand and Singapore were requested to development such matrix.

**Decision 1/4 - Develop a checklist for implementation of ADS-B at Sub-regional basis**

That, member of ADS-B Task Force from New Zealand and Singapore develop a checklist for implementation of ADS-B at sub-regional basis and present to the next meeting of ADS-B study and implementation Task Force meeting.

3.2.4 It was also noted that it is difficult to quantify the cost for the safety benefit. Most benefit will be for the safety.

### **Singapore – Delhi City Pair**

3.3 India presented a paper (WP/19) that analyses the possible benefits that can be achieved by implementation of ADS-B along the ATS routes between Singapore – Delhi city pair. The information is purely analytical based on the information gathered from various aeronautical publications and feed back .

3.3.1 The major traffic flow between Singapore and Delhi is through 4 primary routes.

3.3.2 The paper further analyzed route segments, operating airlines and fleet flying along the ATS routes. The preliminary conclusions of the airspace analysis including following points:

- i. The vast area of oceanic airspace does not provide sufficient scope for ADS-B implementation in Yangon and Indian FIRs.
- ii. The route segments in Malaysian FIR is adequately covered by Radar and hence ADS-B requirement is not considered essential for the route segments in Malaysian FIR.
- iii. Only one route segment in Bangkok FIR (South of Bangkok) is not radar covered and also there is no scope for ADS-B ground station as the route segment falls within oceanic airspace.
- iv. The major portion of the route segments in Yangon FIR is not radar covered. Even though the route segments fall within oceanic airspace, there is possible scope for installation of 2 ADS-B GS one at SW (approx 200 NM NW of BGO) and another at PTN ( 105 NM SW of BGO) and DWI ( 140 NM W of BKK) will provide full surveillance cover on the route segment within Yangon FIR.
- v. The major portion of three out of four route segments falls within oceanic airspace in Indian FIRs. There is very little scope for installation of ADS-B GS in the oceanic portion of airspace, except at Port Blair. ADS-B at Port Blair also will not provide any significant advantage as this will remain as an isolated GS due to vast area of ocean around Port Blair all around and there is no scope to provide any contiguous Radar/ADS-B surveillance cover.
- vi. However, there can be significant advantage in Land portion to fill the gaps of radar cover. Three ADS-B GS one each at GAYA or JJS, one at LLK and one at KKJ will provide a seamless radar cum ADS-B cover to the route segments in Indian FIRs

3.3.3 In answer a query raised by IATA, India informed the meeting that India has plan to install ADS-B ground stations between Chennai and Mumbai and between Mumbai and Delhi.

3.3.4 India could not see additional benefit to put a ADS-B ground station at a place like Port Blaire at this stage. The benefit from using ADS-B for some portion of Singapore – Delhi city pair is very limited except for safety concern. Therefore, the future work needs to develop a project oriented proposal precisely.

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### **Hong Kong – Tokyo City Pair**

3.4 Japan provided WP/14 on a cost benefit study for Hong Kong-Tokyo City Pair. In the study it is assumed that the evaluation period for this CBA is 20 years from 2011 to 2030. It is assumed that data from these 3 sources (ASDE, multilateration, and ADS-B) is integrated to the airport surface surveillance system.

3.4.1 Japan Civil Aviation Bureau (JCAB) has no plan to implement ADS-B for the terminal airspace. The en-route airspace between Tokyo and Hong Kong is completely covered by radar. As Air Navigation Service Providers (ANSPs) of this area has no plan to phase out any radar facilities for ATS route between Tokyo and Hong Kong, the benefit derived from phasing out some radar facilities is not taken into consideration.

3.4.2 Automated Radar Terminal System is processing the terminal radar data to provide air traffic situation pictures for the controllers at Narita International Airport today. It is assumed that ARTS is upgraded to process both terminal radar data and surface surveillance data which is acquired by ASDE, multilateration and ADS-B. It is assumed that 10% of the aircraft on the surface of Narita Airport would be equipped 1090MHz extended squitter in 2007.

3.4.3 The benefit study for Hong Kong - Tokyo City Pair will be further conducted based on the methodology described in the paper.

3.5 The meeting recognized that with deployment of ADS-B, redundancy requirement for Radars would be reduced. ADS-B to replace radar would be the benefit for cost/benefit study. Assuming that in some area, surveillance service will be provided by ADS-B rather than using radar.

### **Decision 1/5 - Specific project proposals**

That, co-ordinators of the city pair study teams define an present papers for specific, appropriate ADS-B implementation projects for which both benefits and costs can be calculated.

#### Potential Area for using ADS-B

3.6 IATA informed meeting that a requirement for using ADS-B can be identified in area between D.P.R. Korea and Russian fast east including Northern of Japan which would be potential area to use ADS-B technology serving those flights between Republic of Korea and Russia and beyond via DPR. Korea. There is minimal procedure airspace in DPR Korea and large part of military airspace in Northwest of Japan. IATA was requested to provide a paper with details information at next Task Force meeting listing advantage and benefits by extension of radar coverage with ADS-B ground station.

### **Decision 1/6 –Use of ADS-B in an air space of North Asia**

That, Member from IATA prepare and present a paper on study of using ADS-B technology in an airspace of North Asia at next Task Force meeting.

3.7 While the meeting agreed to continue efforts on the city-pair study and considering the result of study on three city pairs, the meeting agreed that the future study and implementation should be focus on an area along major traffic flow even for great circle routes rather than along one or two specific ATS routes. This approach would provide greater benefits and assist the cost/benefit analysis and broad business case. Such approach would also have the flexibility to support dynamic routes.

3.8 The meeting also discussed the ability to attribute ADS-B costs at a location to just one route or geographic direction. For example how should we quantify the cost for a link from/to a ground station if that ground station could be used for routes to the west and also to the east. It was concluded that states would have to make judgments in this regard depending on the circumstances.

3.9 The possibility was also raised of sharing the costs and benefits between enroute applications (city pairs) and ground surveillance ASDE applications at the same site.

#### ADS-B Radar – Like Service with a Regional ADS-B Provider

3.8 To minimize capital investment by ANSPs and technical/commercial ANSP risk, SITA made a proposal for provision of the ADS-B service jointly with ANSPs. For example SITA will buy, install and maintain ADS-B ground stations and operate on existing SITA RGS sites or on ANSP sites. Example of ADS-B data sharing implementation sites could be at Norfolk Island and Christmas Island of Australia and Port Blair of India. The meeting was informed that SITA and Airservices Australia had become partner in providing ADS-B radar like service.

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**Agenda Item 4: Progress items due in 2005**

- 4.1 Develop a draft operational manual.
- 4.2 Progress development of Guidance Material for implementation of ADS-B in ASIA/PAC region.
- 4.3 Progress development of draft for amendment to Doc. 7030 for implementation of ADS-B in the ASIA/PAC region pending separation criteria developed by relevant ICAO Panel.
- 4.4 Progress development of Regional Implementation Plan.

Progress of ADS-B Amendment to PANS-ATM

4.5 Australia informed the meeting of the progress by Operational Data Link Panel (OPLINKP) Working Groups to incorporate provisions for ADS-B in the PANS-ATM (WP/04). The amendments to incorporate ADS-B in the PANS-ATM (Doc 4444) are currently being progressed by the OPLINKP and the Separation and Airspace Safety Panel (SASP). In September 2004, at OPLINKP WG/WHL meeting held in Toulouse, the Secretariat presented a paper proposing a method of incorporating ADS-B in the Chapter 8 of PANS-ATM. SASP has been working to draft Chapter 8 provisions that will support 5NM separation standards for ADS-B. Chapter 8 requires close coordination between OPLINKP and SASP to blend operational and technical provisions for ADS-B. In reviewing the paper, the OPLINKP WG/WHL meeting endeavored, wherever possible, to draft generic procedures in Chapter 8 that would accommodate Radar, ADS-B and future “radar-like” systems to enable seamless service provision with a variety of high performance surveillance technologies. The term “Surveillance Systems” has been used in the most recent drafting as name for radar and radar-like systems. The Secretariat will present the outcome of OPLINKP WG/WHL to SASP WG/WHL for review in November this year. The meeting noted the draft amendments to PANS-ATM Chapter 8 as drafted by OPLINKP WG/WHL in Toulouse with understanding that further changes will be made.

4.5.1 It is expected at this stage that the total subject of the work of the Panels should finish at OPLINKP/1 (tentatively Sept. 2005) which would result in an applicability date of the amendment in November 2007 in accordance with established approval procedure.

4.5.2 The meeting recognized the complementary nature of the work by the Task Force to develop an ADS-B Operations Manual (AOB) and the work by OPLINKP to develop amendments to the PANS-ATM.

Progress of Regional ADS-B Operations Manual (AOM)

4.6 New Zealand presented a paper (WP/03) on the progress of the development of the Asia/Pacific Region ADS-B Operations Manual (AOM). The AOM has been developed in accordance with a task given by the second meeting of the ADS-B Task Force meeting held in March 2004 to provide guidance material for States in ASIA/PAC region that intend to deploy ADS-B technology to enhance surveillance service. It will be a user friendly document with comprehensive information for operational use. The draft version of AOM incorporates material supplied by New Zealand and USA and is modelled on the FANS 1A Operations Manual (FOM)

4.6.1 The meeting reviewed the structure of the draft AOM and discussed the role of AOM and its relation between AOM and PANS-ATM. The meeting considered that the AOM should be a living document and it should keep consistency with PANS-ATM. The Task Force wishes to take steps ahead and provide input to OPLINKP for the global guidance material. The AOM will continue align with works being carried out by OPLINKP and SASP.

4.6.2 The meeting discussed the draft AOM and provided comments on its contents such as the separation standard mentioned and update rate of ADS-B. It was suggested that AOM will include provision for flight call sign entry.

4.6.3 Any additional comments will be welcomed through emails to members from New Zealand and USA who will rewrite the draft by the end of December 2004. New edition of the draft AOM will be provided to OPLINKP for consideration in February 2005 before its presentation to the next ADS-B Task Force meeting in March 2005.

#### **Decision 1/7 - ADS-B Operational Manual (AOM)**

That, members from New Zealand and USA rewrite the draft of ADS-B Operational Manual by the end of December 2004 and provide to OPLINKP in February 2005 for consideration before its review by the next ADS-B Task Force meeting in March 2005.

#### Flight Identification Rules for Recreational Aircraft

4.7 The meeting noted the problem (WP/15) of call signs used by many Ultralight and other recreational aircraft which do not carry national registration. The flight identification (target identification) broadcast in ADS-B transmissions should reflect the identification (call sign) used in radio transmissions. The meeting also noted the proposed rule for setting ADS-B flight identification for non-national registered aircraft.

#### Procedure for amendment to SUPPs – Doc 7030

4.8 The Secretariat presented an information paper regarding the established procedure for the amendment of the regional supplementary procedure.

4.8.1 In accordance with the Task List for ADS-B Task Force as approved by APANPIRG/15, ICAO Regional Office was requested to prepare an amendment proposal to Doc.7030 for implementation of ADS-B in the region pending separation criteria developed by relevant ICAO Panels.

4.8.2 It was suggested by CNS/MET SG/8 that the fast track approach would be for a State in the region to submit a proposal for amendment to the SUPPs according to the established procedure.

4.8.3 IATA suggested that Australia prepare an amendment proposal to regional supplementary procedure -SUPPs to be processed through ICAO Bangkok Office to use 5NM ADS-B separation standards in offshore airspace. Australia agreed to draft regional procedure to amend Doc.7030. It was agreed that this proposal could rely on the work of SASP.

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### **Progress development of Regional Implementation Plan**

#### Thailand

4.9 Thailand informed the meeting (IP/4) that Thailand intends to initiate an operational trial of ADS-B for ATC surveillance from 2005 with the target time frame 2010 for full operation, operating in parallel with the existing Secondary Surveillance Radar (SSR). ADS-B is expected to provide improved radar like coverage for Bangkok FIR, as well as backup, or replace existing radar systems in Thailand.

#### Fiji

4.10 The meeting noted that Fiji is currently working on a business case and raising awareness among the stakeholders (airlines etc) and encouraging their participation in the Business Case study. Fiji is looking at ADS-B for its domestic use within the Fiji FIR. A plan of implementation of ADS-B in Fiji will be developed subject to the outcome of the business case study.

#### Australia

4.11 The meeting noted the updated status of Australian of ADS-B plan including ADS-B Upper Airspace Project (UAP) and ADS-B Lower Airspace Project (LAP). The ADS-B Lower Airspace Project is not yet approved. It is now being subjected to a cross Industry Business Case and CBA.

4.12 Australia informed the meeting (IP/05) of the cost benefit work being undertaken to support the implementation of ADS-B in Australia. The meeting noted the key expected safety and economic benefits of widespread fitment of ADS-B avionics to Australian aircraft. A benefits matrix was provided to illustrate the potential benefits to the Australian aviation industry and community generally. The introduction of ADS-B technology offers considerable economic, safety, security, environmental and other benefits.

4.13 Australia updated the meeting their regulatory work being undertaken to support the implementation of ADS-B in Australia. The Civil Aviation Safety Authority (CASA) recently established an ADS-B Project Team to examine changes to the safety regulatory framework required to include the carriage and use of ADS-B avionics. In addition to CASA Staff, the project team includes industry representatives from across the ATM community. Terms of Reference and a Project Plan have been written and key issues for the project team to address include:

- Mandate Applicability – Aircraft, Airspace,
- AltitudeImplementation Date
- Avionics capability and specifications
- Operating procedures
- Training needs
- Costs and Benefits
- Exemptions

Further details are available at

<http://rrp.casa.gov.au/rulechange/airspc.asp#as0403>

4.14 Industries informed the meeting that Airline equipage is growing rapidly. Raytheon indicated that 10 to 15% of TCAS aircraft in the London area U.K. are transmitting 1090 ES ADS-B data. It was noted that the U.K. Elementary Mode S mandate from March 2005 is expected to require transponder to be ADS-B capable.

Sharing Experience of Implementation of ADS-B

4.15 While discussing the development and implementation plan of States, Australia and USA offered to share their ADS-B study and implementation experience with other States. The meeting recognized the need to use the resource available in the Region to help individual States who may wish to visit the ADS-B site for one or two days to share lessons learnt and experience gained. Contact point for Australia will be Mr. Greg Dunstone and for USA will be Mr. Dennis R. Beres whose contact number can be found in Appendix 1 to this paper.

Proposal for Amendment to Regional Plan for CNS/ATM System

4.16 The meeting reviewed a draft amendment proposal to the regional plan for CNS/ATM System in the Asia Pacific region. The plan needs revision to include planning and implementation activities of ADS-B. It was recommended that members of the Task Force provide comment and required changes to incorporate ADS-B into the regional CNS/ATM plan including timing of national implementation into relevant tables of the Plan. The meeting agreed that Australia would present updated result of amendments to the next ADS-B Task Force meeting.

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**Agenda Item 5: Any Other Business**

5.1 The Outcome of Discussions agreed at the end of the meeting is summarized and provided in Appendix 2 to this report. The updated work items of the ADS-B working Group is provided in Appendix C to this report. The Subject/Tasks List of the ADS-B Study and Implementation Task Force adopted by APANPIRG/15 is provided at Appendix D as reference.

5.2. The meeting expressed thanks to CAA Singapore for hosting the Seminar and for the excellent arrangement made for the meeting.

ADS-B Demonstration

5.3 The meeting appreciated the live and recorded demonstrations on ADS-B provided by Raytheon, Sensis and Thales ATM during the Seminar and the meeting. The companies showed that ADS-B ground stations for demonstration could be setup within a few hours of arriving on site.

Time and Venue of Next Meeting

5.4 The next meeting of ADS-B Task Force will be held in Bangkok from 21 to 25 March 2005. It was agreed that the next Task Force meeting be preceded by two day Seminar. The ICAO Regional office was requested to invite all States of the ASIA/PAC region to the Seminar and the Task Force meeting.

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**LIST OF DESIGNATED CONTACT PERSONS  
RESPONSIBLE FOR ADS-B STUDY AND IMPLEMENTATION  
IN THE ASIA/PAC REGION**

State/ Organization	Name/Address	Fax/Telephone	E-mail Address
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	Mr. Nick King Flying Operations Inspector Civil Aviation Safety Authority GPO Box 2005 Canberra, ACT 2601 <u>AUSTRALIA</u>	Tel: +61 (2) 6217-1193  Fax: +61 (2) 6217-1700	Nick.King@casa.gov.au
<b>BANGLADESH</b>			
<b>BHUTAN</b>			
<b>BRUNEI DARUSSALAM</b>			
<b>CAMBODIA</b>			
<b>CHINA</b>			

Appendix A to the report of ADS-B Task Force Working Group Meeting

State/ Organization	Name/Address	Fax/Telephone	E-mail Address
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	Chief Electronics engineer (projects)	Tel: +852-2591-5004 Fax: +852-2845-7160	
<b>MACAO, CHINA</b>			
<b>COOK ISLANDS</b>			
<b>DEMOCRATIC PEOPLE'S REP. OF KOREA</b>			
<b>FIJI</b>	Mr. Norman H.Y. Yee Chief Executive Officer Civil Aviation Authority of Fiji Islands Private Mail Bag NAP0354, Nadi Airport <u>FIJI</u>	Tel: +679-622-1555 Fax: +679-672-1500	ce@caaf.org.fj
	The Chief Executive Officer Airports Fiji Ltd. <b>Attention:</b> Mr. Ratu Sakiusa Tuisolia	Tel: +679-6725777 Ext. 4700 Fax: -	sakiusast@afl.com.fj

Appendix A to the report of ADS-B Task Force Working Group Meeting

State/ Organization	Name/Address	Fax/Telephone	E-mail Address
<b>FIJ (Cont'd)</b>	Mr. Petero K. Delai Development Engineer Airports Fiji Limited (AFL) Private Mail Bag Nadi Airport <u>FIJI</u>	Tel: +679 673 1725, Fax: +679 672-2492 Mobile: +679 990-6101	peterod@afl.com.fj
<b>FRANCE</b>			
<b>INDIA</b>	<u>For ATM operation</u>  Mr. V. Somasundaram General Manager (ATM) Airports Authority of India Rajiv Gandhi Bhavan Safdarjung Airport New Delhi 110003 <u>INDIA</u>	Tel: +91 (11) 2465-2648 Fax: +91 (11) 2461-1078	vsomasundram@aai.aero gmatmchqnad@aai.aero
	<u>For Regulatory Function</u>  Director general of Civil Aviation, India, DGCA, India Technical Centre Opp. Safdarjung Airport New Delhi <u>INDIA</u>	Tel: +91 (11) 2462-7830 Fax: +91 (11) 24671272	dgoffice@dgca.delhi.nic.in
<b>INDONESIA</b>	Mr. Nanang Swastya Taruf Deputy Director System and Procedure for Air Navigation Directorate General of Air Communication Gedung Karya Lt. 23 Jl. Merdeka Barat No. 8 Jakarta 10110 <u>INDONESIA</u>	Tel: +62 (21) 350-6451 Fax: +62 (21) 350-7569	cns_atm@telkom.net
<b>JAPAN</b>			

Appendix A to the report of ADS-B Task Force Working Group Meeting

State/ Organization	Name/Address	Fax/Telephone	E-mail Address
KIRIBATI			
LAO PEOPLE'S DEMOCRATIC REPUBLIC			
MALAYSIA			
MALDIVES			
MARSHALL ISLANDS			
MICRONESIA, FEDERATED STATES OF			
MONGOLIA			
MYANMAR			
NAURU			
NEPAL			
NEW ZEALAND			
PAKISTAN			
PALAU			

Appendix A to the report of ADS-B Task Force Working Group Meeting

State/ Organization	Name/Address	Fax/Telephone	E-mail Address
<b>PAPUA NEW GUINEA</b>			
<b>PHILIPPINES</b>			
<b>REPUBLIC OF KOREA</b>			
<b>SAMOA</b>			
<b>SINGAPORE</b>	<u>For CAAS</u> Mr. Yeo Cheng Nam (Technical) Senior Engineer (Surveillance) Civil Aviation Authority of Singapore Singapore Changi Airport P.O. Box 1 <u>SINGAPORE</u> 918141  Kwek Chin Lin (Operational)	Tel: +65 6541-2442  Fax: +65 6542-2447	Yeo_Cheng_Nam@caas.gov.sg
	<u>For SIA</u> Mr. Voon Yih Meng (Technical) Manager Technical Services  Mr. Joseph Phua (Operational)	Tel: +65 6541-6031	YihMeng_Voon@singaporeair.com.sg
<b>SOLOMON ISLANDS</b>			
<b>SRI LANKA</b>			

Appendix A to the report of ADS-B Task Force Working Group Meeting

State/ Organization	Name/Address	Fax/Telephone	E-mail Address
<b>THAILAND</b>	Mr. Choosit Kuptaviwat Director, Air Traffic Services Engineering Planning and Standards Department Aeronautical Radio of Thailand Ltd. 102 Ngamduplee, Tungmahamek Sathorn, Bangkok 10120 <u>THAILAND</u>	Tel: +66 (2) 285-9457 Fax: +66 (2) 287-8645	choosit.ku@aerothai.co.th
<b>TONGA</b>			
<b>USA</b>			
<b>VANUATU, REPUBLIC OF</b>			
<b>VIET NAM</b>			

**CONCLUSIONS BY THE MEETING**

1. The meeting noted the significant growth in ADS-B equipage had occurred during the last 6 months. Significant numbers of airlines are equipping as a matter of course. It also noted the increasing availability of ADS-B ground stations.
2. The meeting concluded that the “City pair study work” needed to continue and progress from capturing generic costs and benefits to the definition of specific projects for costs and benefits could be attributed.
3. The meeting noted the ease by which ADS-B vendors were able to install and demonstrate ADS-B ground systems and associated displays. It is believed that demonstrations at many locations in Asia Pacific would be useful. The meeting thanked CAAS and providers of equipment for establishing these demonstrations.
4. The meeting noted the need for more information from individual avionics vendors on mode S equipage in addition to continuing updates from Airframe manufacturers.
5. The meeting recommended that stakeholders (States, Aircraft manufacturers, Airlines and ATC providers) have greater interaction during the formulation of ADS-B plans in individual states. It would be helpful if all parties knew who was committed to ADS-B and who wasn’t.
6. The meeting noted that there is increasing evidence that ADS-B performance matches radar. The meeting supports that the use of this comparison is the best path towards approval of ADS-B separation standards.
7. The meeting noted that the states have the option of using ADS-B Service providers to deliver ADS-B reports as well as using traditional ATM provided surveillance facilities.
8. The meeting noted the need for low cost, low power consumption ADS-B avionics to support the General aviation market.
9. The meeting decided that the Asia Pacific ADS-B Operations manual will continue to align with OPLINKP and SASP outcomes.
10. The meeting noted that it was considered possible to replace some radars with ADS-B. It was also considered possible for ADS-B to act as a backup to radar in some high density areas;
11. The meeting recommended that states with ADS-B experience of implementation allow other States to observe and learn from the experience gained; Australia and USA invited representatives to contact their ADS-B Task Force members to initiate any proposed activity.
12. The meeting noted some inconsistencies that have been seen in some ADS-B data. The ADS-B operation manual will address these issues.
13. The meeting noted the critical importance of the ADS-B Operations manual, and noted that it may have an impact globally on ADS-B deployment.
14. The meeting noted the critical importance of ADS-B data sharing and its impact on site selection and hence the costs for ADS-B deployment. The meeting agreed that States should have agreement (LOA) for sharing ADS-B data;

15. The meeting agreed that the problem of entry of incorrect Flight numbers should be brought to attention of ATM/AIS/SAR sub-group of APANPIRG. The flight identification entered in the flight management system or transponder should match the aircraft identification (Item 7) in the ATS Flight Plan.

16. The next ADS-B Task Force meeting will be held in Bangkok, provisionally on 21-25 March 2005. It will consist of a 2 days seminar and a 3 days meeting.

**AGREED ACTIONS TO BE TAKEN:**

(These have been incorporated into Appendix C)

1. States are to provide information to support the APANPIRG Regional plan. This can be in the form of comments and additional required changes to incorporate ADS-B into the regional CNS/ATM plan including timing of national implementation into relevant tables of the Plan. Australia will collate these and present to the next Task Force Meeting.

**ACTION: ALL and Australia**

2. Australia agreed to draft regional procedure to amend SUPPs –Doc7030 - for use of ADS-B from aircraft greater than 12 NM offshore.

**ACTION: AUSTRALIA**

3. NZ/US are to progress the ADS-B operations Manual (AOM). They are to distribute a rewrite in December 2004 to TF members and is to be provided to OPLINK in FEB 05.

**ACTION: EW ZEALAND and USA**

4. Thailand is to identify an existing ICAO definition of low-density airspace.

**ACTION: THAILAND (NB: Already provided)**

5. Australian and USA are to coordinate a recommendation to the next Task Force, recommending an ASTERIX format message set to be used for sharing of ADS-B data in the Asia Pacific region for the next meeting (Most likely it will be either format 21 or 33).

**ACTION: AUSTRALIA & USA**

6. Singapore and New Zealand will prepare a Business case matrix or template (checklist) by next meeting.

**ACTION: NEW ZEALAND and SINGAPORE**

7. The ADS-B City pair co-coordinators will develop specific appropriate ADS-B implementation project proposals for which benefits and costs can be calculated.

**ACTION: CITY PAIR COORDINATORS**

8. IATA will continue a survey of fitment plans and will report at the next TF meeting.

**ACTION: IATA**

9. IATA agreed to encourage airlines to attend the next Seminar.

**ACTION: IATA**

10. IATA issue a reminder to directors of flight operations of its member airlines for the correct flight identification format required to enter into FMS or transponder.

**ACTION: IATA**

11. IATA will prepare and present a paper on study of using ADS-B technology in airspace in the North Asia at next Task Force meeting.

**ACTION: IATA**

12. Australia undertook to contact Eurocontrol (John Law) to find out the approach taken by Europe to avoid Flight ID entry problems during the deployment of Elementary surveillance in Europe and report at the next meeting.

**ACTION: Australia**

13. All members are asked to consider hosting the October 2005 meeting. The objective is to maximize the exposure of ADS-B to as large an ATM provider community as possible.

**ACTION: ALL**

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**WORK ITEMS OF THE ADS-B WORKING GROUP (Updated in Singapore Meeting)**

Serial No.	Work Items	Action to be taken by	Target date
1	Ascertain timing with FAA for the issue of DO260A based TSO	USA	CLOSED
2	Research maximum traffic densities now & expected in 2015	All members	2005
3	Report organizational policy on ADS-B data sharing with neighbors	All members	2005
4	Make available radar-ADS_B comparison analyses	USA	2004
5	Distribute analyses on use of GPS TSO129 vs TSO145/6 avionics for ADS-B (Lee & Moody papers)	USA	2004
6	Prices: <ul style="list-style-type: none"> <li>• GS prices (any ground station provider);</li> <li>• Communication and ATC automation costs (each State);</li> <li>• Big Aircraft &amp; regional aircraft avionics prices;</li> <li>• Small GA aircraft avionics prices.</li> </ul>	Industry All members IATA Australia	2004 CLOSED CLOSED CLOSED
7	Coordinate examination of sites for city pairs (existing route structure: aim for capacity increase): <ul style="list-style-type: none"> <li>• Australia – Singapore</li> <li>• Hong Kong, China- Tokyo</li> <li>• Singapore - Delhi</li> </ul>	Singapore Japan India	CONTINUING CONTINUING CONTINUING
8	Bay of Bengal presentation of IATA envisaged benefits to ADS-B TF including avionics fit etc.	IATA	2004

Appendix C to the Report of ADS-B Task Force Working Group Meeting

Serial No.	Work Items	Action to be taken by	Target date
9	States are to provide information to support the APANPIRG Regional plan. This can be in the form of comments and additional required changes to incorporate ADS-B into the regional CNS/ATM plan including timing of national implementation into relevant tables of the Plan. Australia will collate these and present to the next Task Force Meeting.	ALL and Australia	March 2005
10	Draft regional procedure to amend SUPPs –Doc7030 - for use of ADS-B from aircraft greater than 12 NM offshore.	Australia	March 2005
11	Rewrite the draft ADS-B operations Manual (AOM) and distribute it in December 2004 to TF members and is to be provided to OPLINK in FEB 05. Singapore <u>Decision 1/7</u>	New Zealand/ USA	December 2004
12	Identify an existing ICAO definition of low-density airspace.	Thailand	March 2005
13	Coordinate a recommendation to the next Task Force, recommending an ASTERIX format message set to be used for sharing of ADS-B data in the Asia Pacific region	Australia / USA	March 2005
14	Prepare a Business case matrix or template (checklist) Singapore <u>Decision 1/4</u>	Singapore and New Zealand	March 2005
15	Develop specific appropriate ADS-B implementation project proposals for which benefits and costs can be calculated. Singapore <u>Decision 1/5</u>	City Pair coordinators	March 2005
16	Continue a survey of fitment plans and will report at the next TF meeting.	IATA	March 2005
17	Encourage airlines to attend the next Seminar.	IATA	March 2005
18	IATA issue a reminder to directors of flight operations of its member airlines for the correct flight identification format required to enter into FMS or transponder.	IATA	March 2005

Appendix C to the Report of ADS-B Task Force Working Group Meeting

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Serial No.	Work Items	Action to be taken by	Target date
19	IATA will prepare and present a paper on study of using ADS-B technology in airspace in the North Asia . Singapore Decision 1/6	IATA	March 2005
20	Contact Eurocontrol (John Law) to find out the approach taken by Europe to avoid Flight ID entry problems during the deployment of Elementary surveillance in Europe and report at the next meeting.	Australia	March 2005
21	Members to consider hosting the October 2005 meeting. The objective is to maximize the exposure of ADS-B to as large an ATM provider community as possible.	ALL	March 2005

Appendix D to the Report of ADS-B Task Force Working Group Meeting

**Subject/Tasks List 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 term 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 and Pacific regions  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 and Pacific regions pending separation criteria developed by relevant ICAO panel.	2005/ICAO Regional Office  2002
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/NZ,USA

Appendix D to the Report of ADS-B Task Force Working Group Meeting

No.	Ref.	Task	Priority	Action Proposed/In Progress	Target
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 cities pairs;  2) Inform ICAO regional office names of designated focal point of contact.	2 005/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 cities 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
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

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**Automatic Dependent Surveillance – Broadcast (ADS-B) Study and  
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*International Civil Aviation Organization*

**Meeting of Automatic Dependent Surveillance –Broadcast (ADS-B) Study  
and Implementation Task Force Working Group (ADS-B TF WG)**

Singapore, 14-15 October 2004.

**LIST OF WORKING PAPERS**

<b>WP No.</b>	<b>Agenda Item</b>	<b>Subject</b>	<b>Presented by</b>
1	1	Provisional Agenda	Secretariat
2	2.1	Outcome of APANPIRG/15 on matters relating to ADS-B	Secretariat
3	4.1	Draft version of the Asia/ Pacific regional ADS-B operations manual	Wayne Blythe, New Zealand
4	4.1 & 4.3	Progress of ADS-B Amendment to PANS-ATM	Nick King, Australia
5	2.2 (a)	Risk of Non-Compliant Aircraft	Greg Dunstone, Australia
6	2.2 (c)	ADS-B Data Sharing between Foreign FIRS	Greg Dunstone, Australia
7	2.2 (g)	Inconsistent Use of Flight Numbers by Flight Crew	Bob Brown Greg Dunstone, Australia
8	2.2 (g)	ADS-B Problem Reporting System	Bob Brown Greg Dunstone, Australia
9	2.2	Future Australian Maximum Traffic Densities	Greg Dunstone, Australia
10	4.4	Draft Edit of APANPIRG CNS/ATM Plan	Greg Dunstone, Australia
11	2.2 (e)	Options for small aircraft ADS-B Avionics and their costs	Greg Dunstone, Australia
12	2.2 (e)	ATC Automation Costs	Greg Dunstone, Australia
13	2.2 (c)	Potential ADS-B Coverage at Australian FIR Boundary with other States	Greg Dunstone, Australia

WP No.	Agenda Item	Subject	Presented by
14	3 (b)	Cost/Benefit Studies - City Pair 2: Hong Kong, China - Tokyo, Japan route	Japan
15	4.1	Proposed ADS-B Flight Identification rules for Recreational (non- registered) Aircraft	Bob Brown Greg Dunstone, Australia
16	2.2 (e)	ACSS ADS-B Capable Transponders	Michel Procoudine, Thales ATM
17	2.2 (d)	ADS-B and Radar Detection Comparison	Greg Dunstone, Australia
18	4.2	Current status of Airbus Transponders	Airbus
19	3 (c)	Coordination Examination of Sites for City Pairs (Existing Route Structure: Aim for Capacity Increase): Singapore-Delhi	V. Somasundaram, India
20	3(a)	Update on Singapore-Australia City Pair	Melissa Wee, Singapore

**LIST OF INFORMATION PAPERS**

IP No.	Agenda Item	Subject	Presented by
1	2.2 (b)	Bangkok Flight Information Region (FIR) Statistics	Thailand
2	2.2 (e)	Communication Link Cost Estimate	Thailand
3	4.4	Implementation Time Frame of ADS-B for Thailand	Thailand
4	2.2 (e)	Estimated Cost of an Airline	IATA
5	4	Carriage and Use of ADS-B Avionics in Australia –Expected Safety and Economic Benefits	Caroline Tulip & Nick King, Australia
6	4	Carriage and Use of ADS-B Avionics in Australia	Nick King, Australia
7	2.2 (h)	UAP: Quick Survey of Australian ADS-B Data	Greg Dunstone, Australia
8	4	Scope of Australian ADS-B Lower Airspace Project	Greg Dunstone, Australia

IP No.	Agenda Item	Subject	Presented by
9	2.1	ICAO State Letter of 30 June 2004 on ADS-B	Greg Dunstone, Australia
10	2.2 (h)	UAP: Quick Survey of European ADS-B Data	Greg Dunstone, Australia
11	4	Australian ADS-B Plans	Greg Dunstone, Australia
12	2.2 (a)	United States (U.S) ADS-B to Radar Data Analyses and Plan for Terminal ADS-B Separation Standards	Jim Cieplak, USA
13	2.2 (h)	TSO-129 vs TSO-145/146 GPS Integrity Considerations for ADS-B Applications	Chirs Moody & Jim Cieplak, USA
14	2.2 (a)	Status of TSO-C166 Extended Squitter ADS-B and TIS-B Equipment Operating on the Radio Frequency of 1090 MHz	Jim Cieplak, USA
15	2.2 (h)	United States ADS-B Equipage Status	Jim Nickum & Jim Cieplak, USA
16	2.2 (b)	ADS-B Activities in Singapore FIR	Melissa Wee, Singapore
17	4.3	Procedure to amend Doc. 7030 SUPPs	Secretariat