



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

**REPORT OF
THE AUTOMATIC DEPENDENT SURVEILLANCE – BROADCAST (ADS-B)
SEMINAR AND THE FOURTH MEETING OF
ADS-B STUDY AND IMPLEMENTATION TASK FORCE
(ADS-B SITF/4)**

Nadi, Fiji, 24-28 October 2005

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1. Introduction

1.1 The Fourth Meeting of Automatic Dependent Surveillance – Broadcast (ADS-B) Study and Implementation Task Force and an ADS-B Seminar hosted by Airports Fiji Limited. (AFL) were held from 24 to 28 October 2005 at Mocambo Hotel, Nadi, Fiji Islands.

1.2 The Seminar and the Meeting were opened by Mr. Sakiusa Tuisolia, Chief Executive Officer, Airports Fiji Limited, who extended warm welcome to all participants. He gave an introduction outlining the economic status of Fiji and briefed the meeting on the developments of Airports Fiji Limited. He highlighted the importance of civil aviation transportation for the tour industry and economy development. He emphasized that flight safety is the extremely high priority and ADS-B can be considered as a cost effective tool of surveillance to enhance flight safety.

1.3 On behalf of Mr. Lalit B. Shah, Regional Director, ICAO Asia and Pacific Office, Mr. Li Peng, Regional Officer CNS expressed appreciation and gratitude to Airports Fiji Limited for hosting the Seminar and the Meeting. He pointed out that the large number of participants had shown the timeliness of the Seminar in discussing ADS-B related issues at the area where no radar surveillance service is provided. He recalled that Fiji took the lead in FANS 1 based ADS implementation in 1990s.

1.4 He informed the meeting that APANPIRG/16 noted with appreciation the progress made by the ADS-B Task Force and the progress of trial and implementation progress of ADS-B made by States in the region. He emphasized the need to implement ADS-B in a harmonized manner in the region and between regions with respect to operational procedures, supporting data link and ATM application. He informed the meeting of the recent development of ADS-B related ICAO SARPs, Procedures and the progress in the relevant ICAO panels. He highlighted the importance of the Seminar in exchanging ADS-B related information. He thanked all contributors and experts for the seminars conducted in last two years. He also highlighted the main tasks to be progressed by the Task Force and issues to be addressed by the meeting.

1.5 Mr. Greg Dunstone, Chairman of the Task Force, stated that ADS-B is a cooperative technology and benefits will only be realized through common efforts made by all stakeholders. He stressed that a positive approach should be taken to progress ADS-B trial and implementation activities while watching result of the Upper Air space Project committed by Australia. He also thanked Airports Fiji Limited for hosting the Seminar and for the excellent arrangements made for the Task Force meeting.

2. ADS-B Seminar

2.1 The ADS-B Seminar was organized in conjunction with the ATNTTF/4. The objective of the Seminar was to provide information to the participants on ADS-B planning and implementation. The Seminar covered a comprehensive list of topics on the ADS-B, as follows:

- Basic ADS-B Concept, applications
- Regional and APANPIRG ADS-B activities
- ADS-B Performance
- Ground stations and Demonstration
- ATC Automation and ADS-B
- Regulatory Considerations
- Trial and Deployment Plans

2.2 During the Seminar, a number of speakers from various States and Industry provided valuable information on the ADS-B. The ADS-B Seminar was well received by all participants who expressed that such seminars should be organized in the future.

3. Attendance

3.1 The Seminar was attended by 79 participants and the meeting was attended by 39 participants from Australia, Brunei Darussalam, China, Hong Kong China, Fiji, French Polynesia, India, Malaysia, Mongolia, Nepal, New Caledonia, New Zealand, Republic of Korea, Singapore, Tonga, Thailand, Vanuatu, ASPA, IATA, IFATCA, SITA and Representatives from the Industry. List of participants is at Attachment 1.

4. Officers and Secretariat

4.1 Mr. Greg Dunstone, Senior Technical Specialist of Airservices Australia presided over the both Seminar and Meeting. Mr. Li Peng, Regional officer CNS acted as Secretary. The Seminar and the Meeting were facilitated by Mr. Moagrava Elaisa, Manager Telecommunication Services, Airports Fiji Limited and his team.

5. Organization, Working Arrangements and Language

5.1 The working language was in English only inclusive of all documentation and this report. List of working papers, information papers and seminar papers presented at the meeting and seminar are at Attachment 2.

Agenda Item 1: Adoption of Agenda

1.1 The following agenda items were adopted by the meeting:

- 1) Adoption of Agenda
- 2) Review of outcomes of APANPIRG/16 and sub-groups on ADS-B
Particularly deliveries on:
 - a) ADS-B Implementation and operational Guidance Document (AIGD);
 - b) Amendment to Regional Plan for new CNS/ATM system;
 - c) FASID update; and
 - d) Amendment to the BORPC for regional air navigation planning
- 3) Review the progress made by ADS-B related ICAO Panels:
 - a) OPLINK Panel ADS-B activity;
 - b) SAS Panel ADS-B activity; and
 - c) SCRS Panel activity
- 4) Review TOR, Subject/Tasks List and List of Action Items
- 5) Review States' activities on trials and demonstration of ADS-B
- 6) Review States' activities on implementation of ADS-B
 - a) States to present WP of their ADS-B plans including implementation dates, sites being considered and plan for mandate (if any); and
 - b) States to present WP of any significant progress in ADS-B planning or deployment
- 7) Review of progress by European - USA RFG
- 8) Review items from ADS-B problem report database
- 9) Review progress on ASTERIX Cat 21 data exchange ICD
- 10) Progress the remaining action items for the Task Force
 - a) Preparation of the Sample business case; and
 - b) Preparation of draft amendment to Doc7030;
- 11) Progress plans for deployment and further updates to regional plan and FASID
- 12) Cost benefit study and sub-regional based ADS-B implementation plan
- 13) Discuss issues observed during the trial and implementation of ADS-B
- 14) Discuss the need to consider ADS-B air-to-air surveillance service for use in the Asia Pacific regions
- 15) Any other business

Agenda Item 2: Review of outcomes of APANPIRG/16 and sub-groups on ADS-B. Particularly deliveries on:

- a) ADS-B Implementation and operational Guidance Document (AIGD);
- b) Amendment to Regional Plan for new CNS/ATM system;
- c) FASID update; and
- d) Amendment to the BORPC for regional air navigation planning.

APANPIRG/16 on ADS-B and result of 3rd Meeting of the ADS-B Task Force

2.1 The meeting reviewed actions taken by APANPIRG/16 on the result of Third Meeting of the ADS-B Study and Implementation Task Force. The meeting noted that the Sixteenth Meeting of APANPIRG held from 22 to 26 August 2005 reviewed the work accomplished by the Task Force. The meeting noted actions on ADS-B taken by the Ninth Meeting of CNS/MET Sub-group of APANPIRG held from 11 to 15 July 2005 and the Fifteenth Meeting ATM/AIS/SAR Sub-group of APANPIRG held from 25 to 29 July 2005.

2.1.1 It was noted that APANPIRG/16 adopted all four Conclusions and two Decisions formulated by the Third Meeting of the Task Force and endorsed by the CNS/MET SG/9 and ATM/AIS/SAR SG/15. The updated Subject/Tasks List of the ADS-B Study and Implementation Task Force was also approved by APANPIRG/16.

2.1.2 APANPIRG/16 appreciated efforts made by the ADS-B Task Force in completing the ADS-B Implementation and Operational Guidance Document (AIGD). It was informed that the adopted AIGD and the updated Regional Plan for the CNS/ATM System were posted on the ICAO APAC website: <http://www.icao.int/apac/edocs/index.html>

2.1.3 APANPIRG/16 agreed that the FASID Table CNS 4 - Surveillance Systems be replaced with the amended table proposed by the Task Force in accordance with the established procedure. It was informed that Eurocontrol Asterix Cat 21 version 0.23 or later version of Cat 21 was recommended by APANPIRG for ADS-B data exchange format to be used in the Asia/Pacific Region.

2.1.4 The meeting noted that APANPIRG/16 recommended amending paragraph 7.2 of the revised BORPC in its next cycle of update.

Agenda Item 3: Review the progress made by ADS-B related ICAO panels:

- a) OPLINK Panel ADS-B activity;
- b) SAS Panel ADS-B activity; and
- c) SCRS Panel activity.

OPLINK Panel ADS-B activity

3.1 The meeting noted the progress of the draft ADS-B SARPs and Procedures developed by the Operational Data Link Panel. It was informed that the First Meeting of OPLINK Panel held in Montreal from 12 to 23 September 2005 had progressed ADS-B related SARPs and Procedures.

ADS-B SARPs and Procedures

3.1.1 It was noted that the amendment to PANS-ATM concerning ADS-B was essentially cooperative effort between OPLINKP and SASP. OPLINKP took the lead in advancing the relevant procedures and re-writing Chapter 8 in a manner that incorporated ADS-B with the radar procedures and, at the same time, left much of the material generic enough to apply equally to radar, ADS-B and other forms of surveillance (e.g. multilateration). In this respect, the terms “radar” and “radar service” were replaced (except where the applicable provision applied specifically to radar) with the generic terms “ATS surveillance system” and “ATS surveillance service”. The main changes identified by OPLINKP/1 are as highlighted as follows:

Annex 10 - Aeronautical Telecommunications, Volume III - Communication Systems

The definition of “automatic dependent surveillance — broadcast (ADS-B)” in Annex 10 Volume III was amended to more accurately reflect the contents of ADS-B messages.

Annex 2 - Rules of the Air, and Annex 11 - Air Traffic Services

As a consequence of the introduction of automatic dependent surveillance - broadcast (ADS-B) amendments to terminology in Annexes 2 and 11 were considered necessary.

Annex 4 - Aeronautical Charts and Annex 15 - Aeronautical Information Services

As a consequence of amendments to the PANS-ATM concerning the introduction of ADS-B, consequential amendment to terminology in Annexes 4 and 15 was considered necessary. Of particular note, was the need to amend “Radar minimum altitude chart” to read “ATC minimum altitude chart” to reflect that the chart was used by the pilot to cross-check altitudes assigned by ATC and the relevant provisions applied equally to all ATS surveillance systems. In this way, the chart should not be confused with any other aeronautical chart.

Annex 15 was amended to provide for a description of data link services and associated operating procedures within the contents of the AIP.

Procedures for Air Navigation Services - ICAO Abbreviations and Codes (PANS-ABC, Doc 8400)

The abbreviations “ADS-B” and “ADS-C” were incorporated into the document Doc8400 so as to standardize their use in operational communication. The terms ADS-B and ADS-C were also proposed for radio-telephony pronunciation in a non-phonetic form. A new NOTAM code for ADS-B was proposed and the existing description of the code for CPDLC/ADS-C was modified to distinguish more readily between the two applications.

3.1.2 Based on the significant amount of work completed by OPLINKP and SASP on the ADS-B amendment to the PANS-ATM, the OPLINKP/1 meeting made a recommendation to amend Annexes 2, 4, 11 and 15, the PANS-ATM and PANS-ABC, Doc 9694 and Annex 10 (Volume III) concerning ADS-B. The report of OPLINKP/1 will be considered by the Air Navigation Commission. Consultation with States on proposed amendments could be expected during 2006, with the likely applicable date for these changes being November 2007.

3.1.3 In order to keep consistency with the proposed changes made by OPLINKP/1, the meeting considered necessary to review all regional relevant documents to replace ADS with ADS-C where appropriate. Secretary was requested to identify regional documents that may contain such abbreviations.

SAS Panel ADS-B activity

3.2 The meeting noted that the work of SASP had concentrated on advancing the development of separation minima for ADS-B and focusing on issues raised in connection to the comparative assessment of ADS-B with a single monopulse SSR. The horizontal separation minima supported by the work to date, based on radar and/or ADS-B alike, was 9.3 km (5.0 NM). In drafting conditions upon which 9.3 km (5.0 NM) could be applied, SASP was also finalizing a safety case document that captured all the relevant arguments, information and documentation in support of the task of developing the separation minima. While the meeting noted that this document was not completed in time for OPLINKP/1, it was expected to be completed prior to presentation of the Report of OPLINKP/1 to the Air Navigation Commission.

7th SASP Working Group of the whole meeting

3.2.1 At the seventh meeting in May 2005, the SASP Working Group of the Whole was informed that a number of issues had been raised related to the proposed amendment to Chapter 8 of PANS-ATM which involved inclusion of values for some of the technical requirements for ADS-B relative to the use of 5 NM separation minima. As result of a review, the Working Group supported the project team’s view that technical requirements (such as values for HPL, NIC and SIL) should only be identified in the same document as all the other requirements in the comparative assessment.

3.2.2 The meeting was advised that the project team had spent a considerable amount of time in reviewing the revised documentation for the comparative assessment in support of the ADS-B separation minima. It was informed that the unfinished work would be completed prior to the next SASP Working Group of the Whole meeting in November 2005.

SCRS Panel activity

3.3 The meeting noted the surveillance-related part of the draft ICAO Business Plan presented by the Secretariat. It was noted that many ADS-B items were listed as priority with target date 2007 including 1090 MHz ES SARPs with additional features, system-level and performance SARPs for ADS-B and strategy for the evolution of ground surveillance, etc. The target date in the draft plan was clarified as adoption date by the Council.

3.3.1 A question was raised regarding development of provisions for ADS-B ground stations (1090 MHz ES) in the operational plan. The meeting was of a view that it would be overly stringent to specify detailed provisions for ground stations noting that there are no ICAO specifications in place for radar station but rather SARPS for signals in space. However, it was informed that Regional Air Space Safety Monitoring Advisory Group (RASMAG) has been developing a regional document of requirements and specification for function, performance and minimum interface of the ATM stations using FANS 1/A CPDLC/ADS-C. The secretariat was requested to forward the above concerns expressed at the meeting to the SCRS Panel.

Airbus view regarding SCRSP/1

3.4 The meeting recalled a decision (3/1) made by the 3rd ADS-B SITF meeting regarding an Airbus view on the proposed amendment to Annex 10 - Aeronautical Telecommunications, Volume III - Communication Systems Part I - Digital Data Communication System Appendices to Chapter 5 Mode S Data Link Surveillance by the 1st meeting of the Surveillance and Conflict Resolution Systems Panel (SCRSP/1). Airbus stated that the amendment requiring RTCA DO-260A MOPS for air-to-air ASAS applications is considered unnecessary. The Task Force member from Japan was requested to prepare an information paper for consideration by the CNS/MET/SG/9 meeting regarding this issue based on the outcome WG meetings of SCRSP held in May 2005.

3.4.1 It was noted that Japan had presented an information paper to the CNS/MET/SG/9 meeting on the result of discussion of two working group meetings of SCRSP held in May 2005. It was informed that the working group meeting was unable to reach a conclusion in this regard and the question had been referred to a technical group meeting to be held in July 2005 and Working Group of whole meeting to be held in October 2005.

3.4.2 Australia presented an update on this issue. It was recalled that SCRSP/1 approved the creation of a new appendix (Appendix 2) to Annex 10 Vol. III Chapter 5. This appendix specified requirements for extended squitter in line with RTCA DO-260A MOPS and introduced material for TIS-B. The existing appendix to Chapter 5 was renamed as Appendix 1. The requirements contained in Appendix 1 are generally equivalent to the earlier DO-260 MOPS.

3.4.3 Following SCRSP/1, there was a request to restructure the proposed changes, leaving only high level requirements in SARPs and placing more detailed technical material in a manual. In the restructured material, it has been proposed to replace the words in Section 5.2.7 of Annex 10 Vol. III with the following text to be included in a new technical manual:

“Appendix 1 contains Version 0 ES message formats and related requirements suitable for early implementation of extended squitter applications. Surveillance quality is reported by navigation uncertainty category (NUC) which can be an indication of either the accuracy or integrity of the navigation data used by ADS-B. However there is no indication as to which of these, integrity or accuracy, the NUC value is providing an indication of.

Appendix 2 contains Version 1 ES message formats and related requirements that apply to more advanced ADS-B applications. Surveillance accuracy and integrity are reported separately as navigation accuracy category (NAC), navigation integrity category (NIC) and surveillance integrity level (SIL). Version 1 ES formats also include provisions for enhanced reporting of status information and the ground-to-air transmission of Traffic Information Service – Broadcast (TIS-B) messages.”

3.4.4 The formats for the two versions are interoperable. An extended squitter receiver can recognize and decode both version 0 and version 1 message formats. It is recognised that some Civil Aviation Authorities may require Version 1 transmit capabilities in combination with extended squitter reception capabilities to support certain applications.

Agenda Item 4: Review TOR, Subject/Tasks List and List of Action Items

4.1 Under this agenda item, the meeting reviewed current Terms of Reference, Subject/Task List as approved by APANPIRG. The meeting also reviewed and updated the list of actions items.

4.1.1 The meeting reviewed the Terms of Reference approved by APANPIRG/14 held in August 2003 under Decision 14/23 and also considered information presented to the meeting under Agenda Item 14. The meeting agreed to propose a new task on air-air applications related study into the Term of Reference. Accordingly the meeting formulated the following draft Decision for consideration by APANPIRG.

Draft Decision 4/1 - Revision of the Terms of Reference

That, the revised Terms of Reference of the ADS-B Study and Implementation Task Force be adopted as shown in **Appendix A** to the report of ADS-B SITF/4.

4.1.2 The meeting reviewed and updated the Subject/Tasks List of the ADS-B SITF approved by APANPIRG/16 under Decision 16/38. The updated Subject/Tasks list is provided at **Appendix B** to this report. The meeting also updated the list of action items to be taken by the Task Force members. The meeting agreed to continue its efforts in cost benefit study and progress sub-regional ADS-B implementation plan and/or project based on city pair's approach. Coordinators for the three city pairs were requested to coordinate with States concerned and with Chairman of the Task Force and develop and complete a template or table to show cost/benefits for each city pair or a proposed project. A sub-regional plan based on each city pair is expected to be prepared and presented to the next Task Force meeting in March 2006. Accordingly the meeting made following decision:

Decision 4/2 - Sub-regional implementation plan

That, coordinators for city pairs complete cost/benefit study for each city pairs and prepare a sub-regional implementation plan (at least do points) by next meeting through coordination with States concerned and Chairman of the Task Force.

Focal point of contact for ADS-B

4.2 The meeting reviewed an action item agreed by the 41st Conference of Directors General of Civil Aviation (DGCAs), Asia and Pacific Regions held in Hong Kong, China in November 2004 regarding designation of a focal point of contact responsible for coordinating, planning and implementation of ADS-B in each administration and providing contact details to the ICAO Asia and Pacific Regional Office.

4.2.1 The meeting reviewed and further updated the list of focal point of contact responsible for coordination, planning and implementation of ADS-B. The updated list of focal point of contact is provided at **Appendix C** to this Report.

Key Priority Identified by APANPIRG

4.3 The meeting reviewed the updated list of key priority adopted by APANPIRG/16. It was noted that both ADS-C and ADS-B are identified as the key priorities.

4.3.1 It was also noted that the consolidated list of key priorities was considered to be highly focused, fit the purpose intended and be time bound.

Agenda Item 5: Review States' activities on trials and demonstration of ADS-B**CRISTAL Toulouse Airport**

5.1 Thales ATM provided an update of the ADS-B validation trials performed based on a 1090 MHz ES Ground station installed in Toulouse Airport, France within EUROCONTROL Project. CRISTAL project has started with the participation of local stakeholders to perform validation on site for ADS-B including ADS-B NRA (for Non Radar Area), ADS-B RAD (for area covered by radar), Sequencing & Merging and Surveillance Infrastructure. Validation of ADS-B data are performed by CRISTAL Toulouse Consortium consists of Airbus, DSN, Thales ATM and Alticode using already equipped commercial flights, Airbus flight tests aircraft, Airbus delivery and ferry flights, and two airport ground vehicles equipped with transponders. It was informed that ADS-B Ground Station and recording data analysis tools had been put in place and data had been recorded. On-going data analysis is being conducted for Mode S/SSR/ADS-B comparison, dedicated analysis will be conducted for anomalies detected automatically and compliance of the content of ES with available standards.

ADS-B technical trial in New Zealand

5.2 New Zealand informed the meeting that an ADS-B trial was conducted over a three month period from July to September 2005 using a Thales ATM system. The purpose of the trial was to evaluate the system for deployment in New Zealand, specifically to consider deployment in the Queenstown area.

5.2.1 The trial performance was assessed in the local environment utilizing flight testing aircraft and targets of opportunity detected during the trial period. The location of the ground station chosen is within the airspace painted with both a primary radar (PSR) and a secondary (SSR), the latter having recently been also upgraded with new Mode S capability in readiness for operational deployment. Comparative data was obtained. The trial system included a remote control monitoring system which recorded and displayed the ADS-B data alongside which was a workstation/display of the latest LINUX version of the New Zealand ATM system which receives and displays live radar and AFTN data.

5.2.2 The observed coverage was very consistent with that predicted coverage. The general accuracy of positional data was very good, both in-flight and for ground movements. The system performed well and was easy to use. Even though the fleet equipage observed is very low (0.5%) there were sufficient regular observations to achieve the goals of the technical trial. Regular international ADS-B flights operating from Wellington, Dunedin and Christchurch were observed. It was noted that visiting airline fleets are increasing their fitment.

5.2.3 Two anomalies were observed. The first, on several occasions, was a single aircraft that provided many erroneous positions along a general line of latitude. Being a single airframe, the problem was suspected as a fault in the transponder. The second one involved several A345 airframes from an airlines that gave faulty positions during flight and more impressively when maneuvering slowly and taxiing. There were no RAIM outages reported and other simultaneous ADS-B flights had no error. The observations were passed on to the airlines engineering who is expected to follow up with Airbus.

5.2.4 Given the low fleet fitment in New Zealand, with zero reported domestic operators fitted and the fact that New Zealand are currently installing new Mode S radars for the enroute surveillance through to 2020, it is unable to justify a case for replacement of existing radars with ADS-B in the domestic airspace. A national mandate of carriage would be very difficult. While further evaluation will continue of ADS-B and Multilateration options, a full review of the case for incorporating ADS-B only into the surveillance network is scheduled for mid-life of the radars. This decision does not apply to oceanic airspace. However consideration for using ADS-B in the oceanic airspace is in very early stage of investigation.

5.3 Noting the problems observed during the trial, the meeting asked New Zealand to provide detailed report for those problems identified during the trial of ADS/B. The meeting also requested New Zealand to advise if a data analysis tool can be made available for common reporting purposes.

Data collection reporting form

5.4 In noting number of planned ADS-B trials and ADS-B ground stations being planned for installation in the different parts of the Region, it was considered useful to take the opportunity to collect data from these stations to assess number of value or figures such as number of aircraft with ADS-B capability, aircraft equipage rate, type and quality of data received from aircraft, name of operators currently operating ADS-B capable aircraft. The collected information would provide a regional picture of the aircraft readiness status etc. for use by States in their planning process. The meeting agreed that Aerothai, Thailand will develop such data report form with proposed data fields to be collected for consideration by the next Task Force meeting. Accordingly, the meeting formulated the following Decision:

Decision 4/3 - Data collection reporting form

That, Task Force member from Thailand to develop an ADS-B data collection reporting form for consideration by the next Task Force meeting.

Use of ADS-B in an air space of Northern Asia

5.5 The area concerned in the northern Asia includes the part of airspace in Republic of Korea, DPR. Korea and Russian Far East. In follow-up to a decision agreed at the Task Force meeting held in Singapore, IATA visited Pyongyang in March 2005. During the visit, it was concluded that for Pyongyang ACC, ADS-B air-ground surveillance service was identified as an appropriate cost/effective solution. It was expected that IATA would assist DPR. Korea for installation of ADS-B ground stations at places to be decided in 2006. It was agreed that IATA would coordinate with the neighboring states in order to share the data for using ADS-B. Further update in this regards is expected from IATA at the next Task Force meeting.

IATA Position for implementation of ADS-B

5.6 In a presentation of statement at the ADS-B Seminar, IATA stated that IATA fully supports the implementation of ADS-B globally as an eventual replacement of all enroute ATC surveillance radar facilities. IATA sees the introduction of ADS-B as part of the evolution of ATC to new CNS in accordance with ICAO resolutions. It was further stated that the use of ADS-B is applicable in all types of en-route airspace, but it is recognized that the earliest applications will provide the most immediate benefits in airspaces presently without adequate ATC surveillance for operational efficiency and safety services. It is acknowledged that ADS-B provides both operational and safety benefits to airspace users at a reasonable cost. ADS-B also forms the basis for introducing enhancements to ACAS and other new concepts of operation incorporating air to air situational awareness displays for flight crews.

5.6.1 The IATA informed the meeting that as indicated in its CNS-ATM road map published in 2005, IATA supports to mandate the use of ADS-B from 2010 and to simultaneously avoid the installation of new or replacement ATC radar facilities where there are demonstrated operational and cost benefits.

ADS-B Trial in Thailand

5.7 Thailand updated the meeting regarding the planned ADS-B trial. It was informed that the procurement of the trial system was completed in September 2005 and Sensis Corporation was awarded the contract for the supply of the ADS-B Ground Station. The delivery and installation was expected to be completed by December 2005 and data collection was expected to begin from January 2006. It was further informed that Thailand planned to use ADS-B as supplementary means to provide radar like coverage for BKK FIR from 2010.

ADS-B Trial Planned in Indonesia

5.8 It was informed that DGAC Indonesia was progressing the ADS-B implementation plans through the establishment of an ADS-B demonstration trial. DGAC was collaborating with Airservices, Australia and SITA who established a partnership in October 2004. The priority on ADS-B was focused on city pair routes as defined in ADS-B Task Force and busy airspace in South China Sea. The objectives of the trial are to assess aircraft equipage levels, the performance and functionality and cross FIR data sharing. The project is supported by Airservices Australia and SITA. It was expected to start the trials from January 2006 for 6 months. The trials Report will be submitted to ICAO ADS-B Study and Implementation Task Force shortly thereafter

Agenda Item 6: Review States' activities on implementation of ADS-B

- a) States to present WP of their ADS-B plans including implementation dates, sites being considered and plan for mandate (if any); and
- b) States to present WP of any significant progress in ADS-B planning or deployment

6.1. Under this agenda item, the meeting reviewed several papers presented by States on their planning and implementation activities of ADS-B.

Multilateration

6.1.1 The meeting was informed that Australia had approved a project to install a Wide Area Multilateration (WAM) system in Tasmania to replace the existing transportable radar. The detailed is available at http://www.airservicesaustralia.com/tenders/rft_taswam/default.asp. Australia plans to deploy at least 5 ADS-B multilateration sites in Tasmania to support surveillance services before ADS-B aircraft fitment becomes widespread.

6.1.2 Multilateration is a system whereby multiple ground stations use triangulation to work out the position of an aircraft. At least 3 stations need to receive a signal from the aircraft before a position can be determined. The signal used is the ATC transponder signal (Mode S squitter, ADS-B transmission or mode A/C reply). Multilateration can provide surveillance for aircraft not equipped with ADS-B. In the short term, before ADS-B equipage, multilateration is an alternative to radar. The multilateration system is also able to receive and process ADS-B messages.

6.1.3 Australia informed that it is redundant to install a UAP ADS-B ground station in Tasmania. It has therefore been decided to relocate the Tasmanian ADS-B Ground station destined for Mt Barrow, to Gove Northern Territory. The UAP ADS-B coverage will include Gove. The coverage from the multilateration sites would be 250 x 250 NM and will be significantly better than the coverage by the previously proposed single UAP ADS-B ground station.

Cross industry business case study in Australia

6.2 Australia provided an update on the progress of cross industry business case study in Australia. The Australian Aviation Industry contracted the company "Access Economics" to prepare a cross Industry business case for ATLAS formerly called the ADS-B Lower Airspace Project. The purpose of the study was to examine whether the introduction of the ATLAS benefited the aviation community as a whole taking into all Australian industry costs and identified benefits. The report has been validated by stakeholders and is now available at:
http://astra.aero/downloads/ABIT/ASTRA_CIBCBA_ADSB_Report%20-%20Version1.1.pdf

6.2.1 Access Economics commenced work on ADS-B LAP in Nov 2004. Consultations with stakeholders were conducted in November and December 2004. Six scenario options were considered including the replacement of the existing enroute radars. In all cases benefits were kept as conservative (lower bound) values, and costs were maintained at the higher level of expectation. Costs were significant and mostly upfront due to the expected near term investment in avionics. Benefits are long lived and spread evenly across time. Benefits flow over 15 years from 2008-09 to 2022-23 was considered. Some benefits are only those derived from a mandate beyond voluntary fitment in the upper airspace.

6.2.2 A large range of benefits were identified, however only benefits that were tangible and measurable were counted in the analysis. The benefits that were quantified included:

- Avoided radar purchase and maintenance
- Avoided Navaid replacement and maintenance
- Airline savings from increased operation at preferred level
- Airline savings from closer passing with crossing traffic (avoidance of level change)
- Airline savings from reduced CPDLC datalink charges
- Community benefits (lives saved) mainly from GA CFIT and improved SAR
- Community benefits - passenger time savings
- Improved air traffic control efficiency and capacity - marginal staff savings
- Benefits to remote aerodromes regarding better knowledge of arrival times
- More optimal flight through introduction of User Preferred Routes, for which ADS-B is one of several enabling technologies
- Improved surrounding traffic information and situational awareness - more efficient approach and departure from non-radar aerodromes. Resulted in Flight time savings (particularly regional aircraft flights)

6.2.3 It was recognized that increased safety had a role including the following benefits which were not included in the study quantitative assessment:

- Increase in airspace total system safety/reduction in overall system risk
- Improved aircraft position and identification reporting
- Improved in-flight emergency response (from ATC and other aircraft)
- Enhanced see and avoid benefits in non-radar airspace, through optional ADS-B “in” cockpit displays
- Reduced uncontrolled aerodrome collision risks
- Reduced IFR-VFR and VFR-VFR collision risks
- Most VFR aircraft known to IFR aircraft and ATC
- Improved pilot and ATC situational awareness
- Improved accident investigation
- Reduced runway incursion risks, where used for surface movement surveillance
- Enabler of additional ATC safety net functionalities
- Improved pilot / ATC communication
- Reduced Violations of Controlled Airspace (VCAs)
- More accurate navigation and surveillance
- Safer ATC tactical and vectoring operations

6.2.4 A number of problematic issues were identified.

- a) How to quantify the costs and benefits of defence related aspects? The cost of equipage of defence aircraft is difficult to quantify– and is highly variable. Access Economics modeled the inclusion of defence costs and the exclusion of defence costs.
- b) Difficulty was experienced for Airlines to define which aircraft would still be operating in 2009. This can have a huge impact on the costs.

6.2.5 It is anticipated that work will continue of the Cross Industry Business case until early 2006. The analysis showed sensitivity to the following factors- replacement cost of radars (avoided cost if we proceed with ADS-B) and cost of General Aviation avionics. Airservices Australia has issued a Request for Tender for new Terminal Area Radars. This tender includes an option for the supply of replacement SSR radars. It is expected that the results of the RFT will provide a solid cost for SSR radars that can allow the Cross Industry Business case to be revised. Airservices Australia has also issued a Request for Proposal for General Aviation Avionics. It is expected that this RFP will provide a solid cost for General Aviation ADS-B out avionics that can allow the Cross Industry Business case to be revised. It is expected that the revision of the business case will occur early in 2006 and a decision on whether to proceed with ATLAS is currently expected to be taken approximately in April 2006.

Update on Upper Airspace Programme

6.3 Australia provided an update on the Upper Airspace Programme (UAP) which will be conducted in three stages over a transition period of approximately 10 months. The transition programme has been designed to minimize the operational impact of the process on the majority of aviation industry.

6.3.1 The first stage of the transition process will see the continuation of ADS-B services in the Burnett Basin region of Queensland using UAP-supplied ground station hardware and new ATC system software. This stage will take place in November, 2005 and will include the possible entry of Virgin Blue and Jetstar in the Burnett Basin ADS-B Operational Trial since both airlines now operate ADS-B equipped jet aircraft into Hervey Bay.

6.3.2 During Stage 2 of the transition programme, ADS-B ground stations will progressively be installed at remote locations across the country. The associated ground stations will be connected to the ATC system. The effective range of some ground stations may be limited for a period of time in order to prevent ADS-B processing in sectors managed by controllers that have not yet been trained. This transition stage will run from March until the end of August, 2006 and will include the application of procedural separation standards based on ADS-B derived position and altitude information in sectors where controllers have received ADS-B training. ATC "safety net" alerting functions such as short term conflict alert and route and altitude conformance monitoring based on ADS-B data will also be implemented. 5-nautical mile separation services will continue in the Burnett Basin for ADS-B trial participants during this stage of the transition.

6.3.3 The final stage of ADS-B implementation is scheduled to commence on 31 August, 2006 when all ground stations are operating and all controllers have been trained in ADS-B radar-like separation services. The full range of radar-like surveillance services, including 5-nautical separation, will be provided nationally for ADS-B equipped aircraft operating within upper level ADS-B coverage. In selected areas, mid-level and low-level surveillance services may also be provided. ADS-B-specific procedures and phraseologies will be introduced at this time therefore pilot ADS-B training is expected to be completed by 31 August 2006.

Australia's ADS-B programme

6.4 Australia further updated the ADS-B activities progressed recently in Australia. It was informed that 28 duplicated ADS-B ground stations for the ADS-B Upper Airspace (UAP) project have been purchased and delivered. Installation is to occur progressively during the next 6 months. Two UAP ground have already been installed for evaluation and testing at Melbourne airport and Bundaberg.

6.4.1 These two Australian ADS-B ground stations have detected over 140 different airframes, including aircraft operated by the following airlines or operators:

Qantas Airways, Virgin Blue, Jetstar Airways, Emirates, Air New Zealand, Pacific Blue, Eva Air, Virgin Atlantic, Asiana, Vietnam Airlines, Malaysia Airlines, British Airways, Singapore Airlines Cargo, Thai Airways, Korean Air, Air Mauritius, Air China, Cathay Pacific, China Airlines, UPS Airlines, QantasLink (Sunstate), Sunshine Express, Royal Flying Doctor Service, Bundy Flying School, Sunshine Coast Rescue Helicopters

The following aircraft types have been detected:

B747, B767, B737, B777, A320, A330, A340, B200, SH36, DHC8, BK17, B206, J200

6.4.2 In addition a number of ancillary systems have been provided or upgraded as follows:

- A RAIM prediction system has been developed to deliver predictions of possible ADS-B outages due to GPS satellite geometry, outages, etc to ATC controller screens. This system is in the final stages of testing prior to commissioning.
- Enhancements to the ATC automation system to support 1,000 ADS-B aircraft, revised rules for matching ADS-B data to flight plans and a number of other changes are being provided. Formal testing of these changes is almost complete. Commissioning is expected in the November 2005 timeframe.
- An ADS-B Bypass system has been developed which takes ADS-B data from the ADS-B ground stations and presents it to the controller workstation directly without centralized processing. Commissioning is expected in the October/November 2005 timeframe.
- An Ultimate Fallback system provides controllers with a “secondary” controller workstation processor which can be used in the event of common mode workstation failure. This “secondary system” has been adapted to provide ADS-B and flight plan data independent from the main ATC system.

6.4.3 ATC procedure development and ATC training development has commenced for this project. It is envisaged that the Bundaberg UAP ground station will be commissioned first as a one-for-one replacement of the existing commissioned system. Then as other sites come on line, and as ATC training is completed, the new sites will provide a situational awareness service. Following CASA approval, Airservices Australia anticipate authorization to use a 5NM separation standard across the complete continent.

ATLAS Project (formerly the lower airspace project)

6.4.4 The Australian aviation community is currently considering a project called ATLAS which envisages the fitment of ADS-B out avionics and GNSS receivers to a large number of aircraft. The project also envisages replacement of enroute radars with ADS-B ground stations and also the removal of a large number of NDBs and VORs. A cross industry funding package and a fitment mandate are also being considered to expedite fitment and transition to the new technologies. An industry commitment to ATLAS is expected in the first quarter 2006. In support of the ATLAS project, Airservices Australia has been encouraging the development of Mode S extended squitter ADS-B transmitters and has recently issued a Request for Proposal for the purchase of up to 1,500 avionics units for general aviation aircraft

http://www.airservicesaustralia.com/tenders/rfp_adsbavionics/default.asp

ADS-B research and development programme

6.4.5 Airservices has begun testing two cockpit display systems that are designed to provide pilots with accurate position and altitude information on proximate traffic. The two systems, supplied by Eurotelematik of Ulm, Germany, use GPS and extended squitter ADS-B technology to provide pilots with navigation, terrain and traffic information on a moving map display. The information can be shown on Eurotelematik's certified CDTI 2000 multifunction display or, as a lower cost alternative, on a pocket PC.

ADS-B regulatory activity

6.5 An overview of regulatory activity being undertaken in Australia in support of ADS-B trial and implementation projects was presented to the Seminar and meeting. As use of ADS-B for ground-based and aircraft-based surveillance has been identified as a key enabler of a number of strategies in The Australian Air Traffic Management Strategic Plan, a large number of stakeholders have been involved in this work, and are coordinating their efforts through ASTRA, the Australian Strategic ATM Group. The Civil Aviation Safety Authority (CASA) is a member of ASTRA and has been working with other stakeholders to ensure regulatory issues for trial and implementation activities are addressed in a timely manner.

6.5.1 CASA has been providing regulatory oversight of the trial conducted in airspace around the Burnet Basin, Queensland since its inception and, on 5 December 2004, approved the use of a 5 NM minimum horizontal separation distance between ADS-B OUT equipped trial aircraft. The trial is expected to continue into 2006, and expansion of the trial to include A320 and B737 aircraft is now being considered.

6.5.2 Commissioning of the Upper Airspace Project is expected to take place in 2006, which will require an operational approval from CASA by means of a re-issue of Airservices Australia's CASR Part 171 (Aeronautical telecommunications service and radio-navigation service providers) Operational Certificate. Operational (non-trial) use of ADS-B to provide separation services will require promulgation of a separation standard under CASR Part 172 (Air traffic service providers). Amendment to the Part 172 Manual of Standards and AIP reflecting the amendments proposed by OPLINKP to ICAO documentation is now being progressed. Public consultation on the regulatory changes is expected to take place in November 2005.

6.5.3 ADS-B standards for aircraft and pilots will also be required to support operational use in 2006. CASA initiated public consultation on these issues in December 2004 and the process is continuing in parallel with the development of additional standards to support the ATLAS project. To date, CASA has issued two Australian Technical Standard Orders (ATSOs) for the certification of ADS-B avionics. ATSO-C1004 is a standard for Mode A/C transponders capable of transmitting ADS-B 1090ES messages, while ATSO-C1005 is a standard for the certification of a stand-alone (non-transponder) ADS-B 1090ES transmitter. Copies of the two ATSOs are available at <http://www.casa.gov.au/avreg/aircraft/ATSO.htm>.

6.5.4 The Australian ATM Strategic Plan also includes the use of ADS-B at lower levels and ATLAS, formerly known as the Lower Airspace Project (LAP) which has been proposed to provide greater ADS-B coverage as well as replacing the current enroute network of secondary surveillance radars at the end of their service life (in 2009) with ADS-B ground stations. ATLAS relies on a wide fitment of ADS-B OUT avionics to ensure a level of surveillance equal to or better than that currently achieved with transponders in radar coverage.

6.5.5 In support of the UAP and ATLAS, CASA issued a discussion paper (DP) addressing the carriage and use of ADS-B in December 2004. The DP was intended to seek industry comment on various options that CASA could adopt in initiating regulatory changes. The DP is available at http://rrp.casa.gov.au/download/04_dp.asp. The response period closed in February 2005 and a joint CASA/Industry project team evaluated the responses in preparation for drafting operational rules. Almost all responses welcomed the introduction of ADS-B to the Australian ATM system and there was strong support expressed for a staged implementation of regulatory requirements for the carriage of ADS-B OUT avionics. In September 2005, CASA published a Summary of Responses (SOR) that presented CASA's evaluation of the comments received on the DP, together with the consequent disposition. CASA is now preparing draft rules for the carriage and use of ADS-B for further consultation with the aviation community. A copy of the SOR is available at http://rrp.casa.gov.au/sor/sor0410as_v3.pdf

6.5.6 Airservices Australia and NASA are planning a joint trial of ADS-B for In-Trail Climb (ITC) procedures in oceanic airspace beyond the coverage of radar or ADS-B ground stations. This is a procedure by which an ADS-B IN aircraft can climb through the altitude of higher traffic with a separation less than could be offered by ATC using procedural separation methods. The ITC procedure is based on an existing procedure that uses TCAS displays for surveillance, but overcomes some of the main limitations associated with the TCAS technology. At this stage CASA involvement is limited to oversight, but it is expected that regulatory action will be required as the project progresses.

6.5.7 The meeting appreciated Australia for sharing the information on regulatory activities for ADS-B which provides good examples and experiences for consideration by other States. (CASA is doing right job for ADS-B).

ADS-B update in Mongolia

6.6 Mongolia informed the meeting of the future plans for expanding the implementation of ADS-B in its most busy Airspace. The main goal of implementing ADS in Mongolia is to improve the surveillance capability in Mongolian airspace for both domestic and international traffic services.

6.6.1 FANS/ADS-C was introduced in Mongolia several years ago with good coverage on the international air routes with four ADS-C VHF ground stations own by Mongolia. MCAA has taken several initiatives to promote ADS-C usage including new shorter air route M520 opened parallel to the main route A575. The route was aimed to serve only CNS/ATM equipped aircraft. However, it was advised that the ATM station at Ulaanbaatar ACC has been switched off as some airlines instructed their crew not to log on ADS-C because of high communication cost. Another reason was periodic report frequency by Mongolia ACC was every 5 minutes intervals much higher than recommended 27 minutes for normal operation in the remote area. Mongolia would consider switching on the ATM station again when certain percentage would be reached of aircraft equipped with ADS-C flying over Mongolia.

6.6.2 To facilitate the validation process and to provide input to the implementation planning, Mongolia has installed two CNS/VDL 4 Ground Stations at Ulaanbaatar and Muren and 5 airborne units with CDTI's (cockpit displays) for domestic operations. The airborne equipment installed on one An-24 and two Mi-8 helicopters. The Eastgate project has acquired a STC for F-50 aircraft and two units should be installed by end of the year. Avionics was recently delivered to a Cessna Caravan operator for installation. MCAA together with the Eastgate project team has prepared a draft ADS-B Implementation plan for Mongolia. This document describes the implementation of the ADS-B application over the VDL Mode 4 data link in lower airspace and ADS-B using Mode-S ES in upper airspace for international traffic in Mongolia. The implementation plan also covers the whole process from initial plan to operational use. It consists of four parts: Ground stations, Aircraft, Vehicle Equipment and Infrastructure.

6.6.3 It was further informed that US TDA had recently approved a technical cooperation project to assist MCAA, in improving the existing CNS/ATM systems through the deployment of ADS-B Mode S technology. The project will assist MCAA in evaluating the ADS-B Mode S functionality and effectiveness in international air traffic management to mitigate its air traffic congestion problems and maximize airspace capacity. Mongolia is aiming to conduct another demonstration in June 2006 in order to assist the validation of ADS/B.

6.6.4 In answer to a query raised, it was clarified that Mongolia has included TIS-B in the ADS-B plan. Mongolia has intension to install more VDL M4 stations for domestic surveillance service. Consideration was also given for deployment of wide area multilateration.

ADS-B Planning in Fiji

6.6.5 Fiji provided an update to its implementation plan for ADS-B. A general introduction was given on the Fiji FIR including the current status air navigation and air traffic services provided in the its oceanic and domestic airspaces. A planning team for ADS-B had been established comprising members from AFL, CAAFI, SASL, Airline representatives, ASPA, Service Providers – FINTEL, TFL, SITA. The national CNS/ATM Plan will be released & circulated as controlled document before the end of this year. The ADS-B Project Team consists of core team members from AFL, SASL, CAAFI and airlines. It has been concluded that a definite need for ADS-B implementation in Fiji. It will provide for improved surveillance resulting in enhanced safety with increased efficiency and expeditious flow of traffic. The target date for implementation is in 2006. It will require commitment from stakeholders i.e. AFL, Airlines and regulators.

Agenda Item 7: Review of progress by European - USA RFG**RFG avionics survey responses**

7.1 The meeting noted the information provided by Australia on the response to a survey of Airframe and avionics vendors. The survey was conducted by Requirement Focus Group (RFG) including questions for Boeing and Airbus regarding the solution Architecture and information on GNSS receiver models and vendors.

7.1.1 The information provided in a table form was considered very useful and answered a lot of frequently asked questions. Therefore it was proposed to convert some of the questions into FAQ and make it available at a webpage.

7.1.2 There was another proposal to add GPS monitoring activities into the TOR. It was informed that States in the region do have some kind monitoring program or projects. States were encouraged to provide such information to the next Task Force meetings.

7.1.3 Australia agreed to present a paper on Australian GNSS Implementation Team GPS papers to the next Task Force meeting.

7.1.3.1 The webpage containing information about the GNSS implementation team is at: www.astra.aero.

RFG ADS-B air-ground applications update

7.2 The meeting noted the activities of the Requirements Focus Group - RFG (Eurocontrol and FAA) in progressing a number of Air-Ground applications as follows:

- a) Enhanced ATS in Non Radar Areas using ADS-B Surveillance (ADS-B-NRA);
- b) Aircraft Derived Data for Ground Tools (ADS-B-ADD);
- c) Airport Surface Surveillance (ADS-B-APT); and
- d) ADS-B-RAD Enhancing ATS in Radar Areas using ADS-B;

7.2.1 The RFG is producing a set of documents in compliance with RTCA DO-264 and Eurocae ED78A, for each application comprising:

- a) Operational Service & Environment Definition (OSD);
- b) Operational Performance Assessment (OPA);
- c) Operational Safety Assessment (OSA);
- d) Safety Performance Requirements (SPR); and
- e) Interoperability document (Interop)

7.2.2 Australia informed the meeting that documents up to date are in working drafts. It was noted that the terminology used in RFG documents is information transmitted from aircraft to ground is called a message and information from ground stations (typically in Asterix format) to ATM systems is called a Report. It was further noted that Mode A code would not be required for ADS-B NRA operation in most of the world. It was informed that application for non radar area – NRA - is well advanced and all documents are already available in near final form.

Agenda Item 8: Review items from ADS-B Problem report database**Problem reporting database update**

8.1 Australia provided an update on the problem and issue reporting process and explanation to the problems recorded in the database.

8.1.1 It was informed that ADS-B problems and issues may be submitted online using a data entry form on the Airservices Australia website at www.airservicesaustralia.com/adsb/issues. The data in the entry form will then be incorporated into an Access database – and a report made available on the same website regularly. There is no longer any need to enter a password. There are links on the page to detailed data entry form instructions and to the latest report from the Problem and Issues database. States and users of ADS-B service were encouraged to use the form to create a new problem or to make comments relating to an existing issue or problem. It is important that information having impacts on other parties be distributed to all users as soon as possible. In this way, each party is made aware of problems already encountered by others and may be able to provide further information to aid in the solution of these problems. It was agreed that before dissemination of information to third parties, all references that could identify particular parties must be removed.

8.1.2 The meeting reviewed the eight problems reports currently recorded in the database. The members of the Task Force were encouraged to input problems observed during the trials and implementation projects and/or provide comments or support to resolve the issues reported.

8.2 The meeting discussed the necessity to create a webpage providing frequently asked questions (FAQ) including those questions reported and clarifications recorded in the database as well as those questions raised at the Seminar and meetings such as RFG avionics survey responses. Australia agreed to take follow-up action for such webpage in addition to the problem reporting database established. Accordingly, the meeting formulated following Decision:

Decision 4/4 - Establishment of webpage for FAQ regarding ADS-B

That, Australia be requested to set up and maintain a webpage containing frequently asked questions (FAQ) for ADS-B in addition to the problem reporting database established.

Agenda Item 9: Review progress on ASTERIX Cat 21 data exchange ICD

9.1 Secretariat informed the meeting that ASTERIX Cat 21 version 0.23 or later was recommended by APANPIRG/16 under Conclusion 16/35 as ADS-B Data Exchange Format. ICAO Regional Office will initiate coordination with Eurocontrol for agreement to use the Eurocontrol Asterix Cat21 document in the Asia/Pacific Region.

9.1.1 Regarding adoption of ASTERIX Category 21 version 0.23 or later, it was recalled that previous advice from Eurocontrol was that all new versions would be backwards compatible. The meeting was then informed that unfortunately the latest version is 0.25 issued in March 2005 is not backwards compatible with the previous versions. It was noted that for version 0.23, the resolution is 2.4 meters and expressed with two bytes code while for version 0.25, the resolution required is at least better than 0.6 meter and indicated with three bytes. This would result in changes to be made to software or firmware of ground stations and ATC systems. As a result of discussion, the meeting considered it safer to stick to a fixed version in order to avoid cost for further changes. In light of foregoing, the meeting formulated following Draft Conclusion.

**Draft Conclusion 4/5 - Category and Version No. of ADS-B Data
Exchange Format**

That, Eurocontrol Cat 21 version 0.23 report format be adopted as the format for the exchange of ADS-B data in the Asia/Pacific Region (rather than “version 0.23 or later”)

9.2 Members of the ADS-B Study and Implementation Task Force were requested to prepare details of each country’s ADS-B data sharing policy and presented at next meeting of the Task Force.

Agenda Item 10: Progress the remaining action items for the Task Force

- a) Preparation of the Sample business case; and
- b) Preparation of draft amendment to Doc7030;

10.1 Under this agenda item, the meeting recalled the IP24 presented by New Zealand and Singapore at 3rd meeting of the Task Force. A template for an example of ADS-B business case was prepared and provided to the last meeting to assist business case planning. It helps prepare the Business Case for ADS-B Technical and Operational trial and for deployment in the national implementation plan. The sample template consists of several parts including Executive summary, financial summary, introduction to ADS-B Data Links, ADS-B Out Avionics, Ground Station, Integration with ATC System, Operational Benefits of ADS-B expected, Safety case, State regulatory authority requirements, Avionics fitment and certification, Potential suppliers and reference prices of their products. It also has a part of proposed implementation plan and business risk.

10.2 The meeting also recalled WP7 presented by Japan at 3rd meeting of the Task Force. The methodology of EUROCONTROL Cost Benefit Analyses and assumptions described in the paper was referred to be used for the cost and benefits analysis for Hong Kong – Tokyo city pair. The cost benefit ratio (CBR) will be calculated using a formula presented in the paper.

10.3 To help States to conduct cost benefits analysis, Chairman of the Task Force agreed to prepare and present a sample CBA with some figures based on the experience gained in Australia. IATA was also requested to provide Airlines' perspective of ADS-B benefits.

10.4 It was informed that the coordination was conducted between Australia and ICAO regional office regarding preparation of draft amendment to Doc7030. On-going coordination would be required subject to further progress made by OPLINKP and SASP in the proposed amendments to PANS ATM which are expected to be applicable in November 2007.

Agenda Item 11: Progress plans for deployment and further updates to regional plan and FASID

11.1 The secretariat informed the meeting that APANPIRG/16 under Decision 16/58 approved the draft amendment proposal developed by the ADS-B SITF to the ASIA/PAC Regional Plan for CNS/ATM System to include ADS-B. The amended plan is posted on ICAO APAC website as Issue 7: <http://www.icao.int/apac/edocs/index.html> APANPIRG/16 also concluded that the updated draft of FASID Table CNS 4 - Surveillance Systems to be amended in accordance with the established procedure.

Regional plan for the new CNS/ATM System

11.1.1 The meeting noted that Issue 7 of the ASIA/PAC Regional Plan for CNS/ATM System included ADS-B related planning and description materials. The changes are contained in the Chapter 3, 5, 6 and Chapter 9. The updated time lines of trials and implementation activities of surveillance systems updated by CNS/MET SG/9 Meeting was also reflected in the Table 9-1 of the Plan.

11.1.2 It was further informed that in conducting the review of the bar chart timelines table for surveillance system in the Asia/Pacific Regional Plan for the New CNS/ATM, APANPIRG/16 noted that the plan was in need of significant revision. Considering the need to achieve alignment with the Global Plan and that the information provided in the plan is being transferred into the FASID, the extensive revision to the ASIA/PAC Regional Plan for the new CNS/ATM system was considered necessary. The most appropriate option considered was to eliminate the Regional Plan and to capture any specific regional information in a Supplement to the Global Plan for the CNS/ATM Systems. Implementation status and plans will be reflected in the relevant FASID Tables using the nomenclature available in the tables. Recognizing that the new edition of Global Plan is still to be finalized and would be available only after June 2006, the APANPIRG/16 formulated the following Decision.

Decision 16/59 - Review of the Regional Plan for the New CNS/ATM System

That, the CNS/MET, ATM/AIS /SAR Sub-groups and RASMAG be tasked to review the Global Air Navigation Plan for the CNS/ATM System and the ASIA/PAC Regional Plan for the New CNS/ATM system with a view to avoiding any duplication with the updated Global Plan. The work should commence immediately after issuance of new edition of the Global Plan.

11.1.3 The meeting also noted that the Secretariat would finalize the second amendment to the Global Plan and present to the Air Navigation Commission for its initial review in October - December 2005 and for its final review during its Jan-March 2006 session followed by final acceptance by the Council in May-June 2006. It was noted that that the Global Plan will continue to be the primary element of the regional planning framework for a coordinated implementation of a harmonized and seamless global ATM system. In view of the forgoing, the meeting agreed **that no further amendment** to the Regional Plan for the New CNS/ATM System should be proposed by ADS-B SITF.

FASID Table CNS 4 –Surveillance Systems

11.2 It was informed that APANPIRG/16 reviewed the updated the information contained in the Table CNS 4 of the ASIA/PAC Air Navigation Plan FASID. It was noted that ADS-B was marked as emerging technology and listed as one system in the table. The meeting suggested that such remark should be removed as ADS-B has been identified by APANPIRG as one enabler for new ATM concept and system. It was also proposed to add a new column called A-SMGCS to reflect the current requirement. Considering that States were encouraged by APANPIRG to implement ADS-B at sub-regional bases with target date commencing 2006 and information contained in the

Regional Plan for the CNS/ATM System needs to be gradually transferred into the tables of FASID, APANIRG/16 adopted following Conclusion formulated by the ADS-B SITF.

Conclusion 16/37 –Amendment to Table CNS-4–Surveillance System

That, the existing Table CNS-4 – Surveillance System provided in ASIA/PAC FASID, Part IV CNS be replaced with an updated Table in accordance with established procedure.

11.2.1 The meeting verified and updated the information contained in the Table CNS 4 - Surveillance System of the ASIA/PAC Air Navigation Plan FASID and the Secretariat was requested to take further action in accordance with established procedure.

11.2.2 The meeting agreed to propose adding multilateralisation into Table CNS 4 of FASID which needs further deliberation at the next Task Force meeting.

Agenda Item 12: Cost benefit study and sub-regional based ADS-B implementation plan.

ADS-B certification issue

12.1 Under this agenda item, Australia presented a paper on ADS-B Certification Issue. It was informed that number of airliners transmitting ADS-B messages on 1090 MHz extended squitter is increasing based on the technical provisions of ICAO Annex 10 Amendment 77. It was considered largely as a result of airlines equipping to meet the requirements of the European Elementary/Enhanced Surveillance mandate. The impact is not limited to Europe - the FAA has detected over 3,500 airframes transmitting ADS-B signals in the USA.

12.1.1 The transponders currently broadcasting ADS-B signals and meeting appropriate standards have been provided by some vendors including ACSS, Honeywell, Rockwell Collins etc. The meeting noted the background material on the certification issues regarding ADS-B Avionics in Boeing and Airbus aircraft and minimum requirements for use of ADS-B for ATC surveillance provided in the attachments to the paper.

12.1.2 It was informed of the intention of Airservices Australia to use ADS-B information for the purposes of Air Traffic Control across the continent from 2006. IATA and many Airlines are supportive to use ADS-B in the Australian ADS-B Upper Airspace Project (UAP) instead of continuing to use procedural ATC methods. However, it has also been brought to the attention that Boeing have included the following text in the Airplane Flight Manuals (AFM) of aircraft transmitting ADS-B data:

“Extended Squitter transmissions have been demonstrated for proper operation and non-interference but have not been certified.”

12.1.3 In some States it may be difficult to convince regulators to approve “radar like services” using ADS-B as long as the Boeing AFM includes the “*has not been certified*” statement despite data collection showing that ADS-B data is of high quality and better than ATC radar. New avionics may be appropriate for forward fit and to meet new ADS-B applications, but maximum use of existing installations is highly desirable. The FAA-Eurocontrol RFG group is planning to approve an interoperability document in late 2005 (for RTCA & Eurocae) to define the absolute minimum requirements for “radar like services” and is expected to allow existing avionics.

12.1.4 The meeting considered it important to allow the use of the existing avionics. It was pointed out by IATA that the matter of certification is the responsibility of each administration/State to issue certificates and to stamp the flight manuals. FAA does not certify – it does issue TSOs. TSO-C166 issued by FAA is a standard of United States. Aircraft registered in USA flying to Europe are required to comply with European requirements.

12.1.5 To facilitate implementation of ADS-B, the meeting recommended that members encourage national regulators to certify existing avionics fitments without the need for retrofit or upgrade. This would be in the interests of all those wishing to get benefit from ADS-B radar like services. It would also be useful for avionics vendors to formally declare compliance with DO260 and/or DO260A for their products. It was noted that the FAA’s TSO-C166 allows compliance with DO260.

Cost/benefit study: Singapore-Sydney city pair

12.2 Indonesia and Singapore presented a paper and provided an update on the ADS-B Cost/Benefit Study for Singapore-Sydney city pair based on the outcome of a meeting between DGCA Indonesia and CAAS held in Singapore on 19-21 September 2005.

12.2.1 The study conducted was confined to the main routes along the city pair, namely A464 and A576. The analysis was computed on the assumption that the economic life span of the equipment support over a period of 10 years from 2007 to 2016, although the normal life span could be longer, e.g., 15 to 20 years.

12.2.2 Based on the theoretical SSR coverage of 250 NM for aircraft above FL 300, most of the route of both A464 and A576 were within radar coverage therefore DGCA Indonesia needs to install only a MSSR at Kupang so as to provide full radar coverage along the two routes up to the FIR boundary. However, Indonesia had indicated that the actual radar coverage is not as good as the theoretical one. There were radar gaps along the two routes. Implementing ADS-B to fill these radar gaps could be a cost effective solution. For the time being, the option of completely replacing the existing aging en-route SSRs with ADS-B was not considered as it will involve retrofit of a large number of the domestic fleet. DGCA Indonesia has thus proposed that two ADS-B stations be installed at Pangkalan Bun and Kupang in order to ensure maximum surveillance coverage for A464 and A576 in Indonesian FIR.

12.2.3 Cost/Benefit Analysis conducted based several assumptions was presented to the meeting. It was stated that the installation of 2 ADS-B stations would provide complete surveillance coverage for A464 and A576. As such, the separation along these 2 routes could be reduced from the current 80 NM (based on Mach Number Technique) to 50 NM (or even 30 NM). This would lead to increased capacity and reduced ground delay. Indonesia had indicated that they may recover capital investment on the ADS-B facilities via a review of the RANS charges, taking into consideration the improved slots and that aircraft would be flying closer to the optimum flight levels. Other benefits such as enhancements in safety and controller efficiency, passenger time savings and reduction in environmental costs through increased efficiency of aircraft operations are not considered in the study. Existing radar coverage in Indonesia as indicated in CNS Table 4 of FASID and estimated coverage of proposed ADS-B Stations at Pangkalan Bun and Kupang were also presented to the meeting. It was noted that the cost for ADS-B also includes an additional ATC system with 3 Controller positions in Kupang which no ATC system in place today.

12.2.4 Several queries were raised regarding the increase of Air Navigation Service charges. It was informed that there was requirement to follow a formula and need to seek users agreement for a better services provided. The ASPA expressed that Airlines are not willing to pay for those cost required for better service required by controllers;

Follow-up action on result of discussion on cost/benefit study

12.3 IATA informed the meeting that in following up the result of discussion on business case from NAV Canada at last meeting of the Task Force, a meeting was held between IATA and NAV Canada. IATA provided a paper using the result of calculations derived with assistance of Regional Officer Air transport of the ICAO Regional Office. Airlines and the Association will not support additional radar to be installed in Canada based on a cost benefit analysis for whole Canada done by IATA. IATA would support to replace Radar with ADS-B. However, NAV Canada tried to defend their position.

Estimates of registered aircraft numbers for 2005 and 2015

12.4 In considering the development of ADS-B cost benefit analysis for the region, the meeting agreed that it would be useful to review the numbers of aircraft that might be affected by ADS-B implementation, both now and in the future. Representatives were requested to provide estimates of registered aircraft numbers for 2005 and 2015, broken down into three groups: High Capacity, Commuter and General Aviation/others. The IATA representative reminded the meeting that some of the existing fleet data could be obtained from ICAO Aviation Statistics.

Agenda Item 13: Discuss issues observed during the trial and implementation of ADS-B

Use of Mode S Extended Squitter (ES) in automatic MET air-reporting

13.1 The Secretariat informed the meeting that the Ninth Meeting of the CNS/MET Sub-group of APANPIRG requested ADS-B Task Force to study the use of 1090 MHz extended squitter (ES) ADS-B for automatic MET air-reporting in the ASIA/PAC Region. It arose from APANPIRG Conclusion 14/44. The METLINKSG had been invited to consider the application of the Mode-S datalink in automatic air-reporting as an alternative to ADS over areas covered by surveillance radars and to consider ways to facilitate its implementation in the ASIA/PAC Region. This task was to address the problem of the lack of automated aircraft observations of MET elements – wind, temperature, turbulence (if available) and humidity (if available).

13.1.1 On the other hand, CNS/MET Sub-group noted that there was currently no intent to implement Mode S in the near term in the Region. It therefore appeared that in the ASIA/PAC Region, ADS-B (using 1090 MHz ES) would be more likely to become widely implemented, and for that reason, it might be more suitable for automated MET air-reporting. The CNS/MET SG/9 meeting agreed that it had always been the intent of using ADS-B for automated MET air-reporting but in view of the need to confirm the technical details on implementation, the following Decision was formulated:

Decision 9/41 – Use of 1090 MHz extended squitter (ES) ADS-B for automatic air-reporting

That, the Automatic Dependent Surveillance-Broadcast (ADS-B) Study and Implementation Task Force be requested to study the use of 1090 MHz extended squitter (ES) ADS-B for automatic MET air-reporting in the ASIA/PAC Region.

13.1.2 There was a general discussion on this issue. One observation was that if the MET air-report information is able delivered by ADS-C, ADS-B should also be able used for down linking such information. However, general concern expressed was where such MET data would affect the normal transmission of the other data used for separation purpose. Additional cost that would be evolved on the avionics is another point of doubt. Because of lack of detailed information at the meeting, Chairman of the Task Force agreed to prepare a short paper on MET use of 1090 MHz ES for discussion at next meeting.

Regional Strategy for Surveillance System

13.2 The meeting noted that CNS/MET SG/9 developed several Strategies for aeronautical communications and GNSS navigation for the Asia and Pacific Region including a **Strategy for implementation of the air-Ground data link**, **Strategy for Implementation of ATN and the Strategy for the implementation of GNSS Navigation Capability**. All these strategies were adopted by APANPIRG/16. It was informed, however that no regional strategy on surveillance system had been developed so far. As result of discussion, the meeting agreed to develop a regional strategy for surveillance system and have it listed in the Tasks list. Task Force members from Australia, Mongolia and New Zealand were requested to take initiatives in drafting such a strategy for review by the next Task Force meeting. Accordingly the meeting made a following decision:

Decision 4/6 - Regional Strategy for surveillance system

That, Members of the Task Force from Australia, Mongolia, New Zealand, Singapore and Thailand be tasked to take initiative in drafting a regional strategy for surveillance system for discussion at the next meeting of the Task Force., taking into account the development of ADS-B.

Use of ADS-B down linked data for flight identification correlation

13.3 Thailand presented a paper that highlights the capability of Automatic Dependent Surveillance-Broadcast (ADS-B) and proposes the use of its down linked parameters for direct correlation with flight plan data. It was informed that a similar paper from Thailand was presented to APANPIRG/16 that highlighted the constraints on the automation system from the lack of unambiguous correlation between the filed flight plan and SSR Mode A returns. It proposed the use of Aircraft Identification (Flight ID) as an additional unique 'key' for correlation. Noting the importance of the unique 'key' and its role in the development of a seamless automated Air Traffic Flow Management Systems in the future, APANPIRG/16 tasked CNS/MET and ATM/AIS/SAR Sub-groups to further study this issue and formulated the following decision:

Decision 16/60 - Correlation of Aircraft Identification

That, ATM/AIS/SAR and CNS/MET Sub-groups study the use of "aircraft identification" as an unique 'key' for correlation between flight plan data and surveillance information, considering operational and technical aspects for implementation. The result of study be presented for consideration at APANPIRG/17.

13.3.1 The paper highlighted the capability of ADS-B and proposed the use of its down linked parameters for direct correlation with flight plan data. It was noted that aircraft with ADS-B capable transponder periodically transmit aircraft air-air and air-ground parameters including aircraft identification as one of the main down linked data. It was recommended to use of aircraft identification down linked by ADS-B for direct correlation with flight plan data in addition to SSR Mode S.

13.3.2 The meeting appreciated the information provided by Thailand. The meeting agreed to bring it to the attention of ATM/AIS/SAR and CNS/MET Sub-groups the capability of ADS-B in the down linked parameters providing aircraft identification. The meeting also agreed to include the use of ADS-B as an additional unique key for direct correlation with flight plan data. Accordingly, the meeting formulated the following decision:

Decision 4/7 - ADS-B for correlation of Aircraft Identification

That, ATM/AIS/SAR and CNS/MET Sub-groups be informed of the capability of ADS-B in providing aircraft identifications and recommend to include the use of ADS-B air-ground surveillance service as an additional unique key for correlation with flight plan data.

Detected aircraft

13.4 Australia informed the meeting of the number of aircraft detected by two Upper Airspace Project (UAP) ground stations installed at Melbourne Airport and Bundaberg which are being used for technical evaluation and training. Raw ADS-B reports from aircraft have been recorded in the UAP ground station since May 2005. These reports were collected and lumped into one large file per calendar month. The collected data was processed to identify new airframes that were detected each month. Once the airframe was first time detected, details information of the aircraft parameters were recorded. If an airframe was "updated" after the first time it was detected, the printouts would not show the updated capabilities. The main parameters detected were:

- 24 bit ICAO address
- Aircraft model – extracted from Australian register (not available if not Australian)
- Flight ID received in first detected flight
- DF : Whether the aircraft is transmitting DF17 or DF18
- NUC: Navigational Uncertainty category. If the value is greater than 4, then the data will be acceptable for provision of separation services.
- BARO : Barometric altitude is available;
- GEO Geometric altitude is available; If not, probably
- Velocity : Velocity vector information is available
- Site : Where the aircraft was first detected
- When first detected

13.4.1 A table containing details of the different number of detected aircraft was presented to the meeting.

13.4.2 It was informed that only position data with $NUC_p \geq 5$ was considered suitable for use for aircraft separation and aircraft broadcasting flight ID only are most likely those upgraded for Elementary Surveillance. Those aircraft transmitting position data and with a $NUC > 4$ are presented to the meeting in a graph chart.

Site monitor processing

13.5 Australia informed the meeting that ADS-B site monitors are an integral part of the Australian ADS-B Upper Airspace Project. The site monitor deployed at UAP sites comprises separate equipment that only generates an “identity” message with Flight ID=“THALES”. This signal is transmitted and connected to the ADS-B receiver’s antenna via a “coupling port”. At a typical ADS-B site there are two ADS-B ground stations, both operating and transmitting messages to the ATC centre. Each ground station has a site monitor, i.e. there are two site monitors per site. When the ADS-B ground station receives this identity message, it reads additional information from an in-built high performance GPS engine to allow it to generate an “Asterix” target report sent to TAAATS ATC system. The Asterix message includes: GPS position, Geometric altitude (GPS altitude) and a “FOM” value derived from the GPS engine HPL value. Two site monitors are installed at every ground station site.

13.5.1 The ground station GPS engine is capable of calculation of HPL. It is also able to perform Fault Detection and Exclusion (FDE). Furthermore, it is able to be managed by remote control using ADS-B ground station Remote Control and Monitoring System (RCMS). The GPS engine used is a Thales/Ashtech DG16.

13.5.2 The TAAATS Eurocat ATC system receives Asterix message from the site monitors of all ADS-B ground stations. A site monitor message is discarded if the FOM value (derived from HPL) is below a <parameter> value. The ATC system then monitors the “site monitors” for each site. An alert is presented to controllers abnormal conditions occur. The system remote monitoring and control system (RCMS) receives additional information directly from the ground station as follows:

- Routine GPS status reports every <parameter> seconds
- Additional data is collected whenever the GPS engine encounters any of the following
 - HPL value exceeds <parameter>
 - Satellite ranging error detected & corrected
 - Satellite ranging error, correction not possible
 - Satellite ranging error detection not available (lack of satellites or poor geometry)
 - Other satellite error detected

The additional data is logged every <parameter> seconds and includes:

- Number of satellites used in HPL computation
- Satellites being tracked
- HPL value
- Pairs of excluded satellites
- An indication of the GPS problem encountered

13.5.3 The site monitor transmits an identity message. The ADS-B ground station checks that the received signal strength is within a defined threshold. If the antenna is damaged or if RF components have degraded, the received signal would diminish and an RCMS error will be raised. This gives a level of confidence that the RF reception path has not been degraded.

13.5.4 If the signal is not present, no site monitor message is sent to Eurocat ATC System and controllers are alerted. In fact if any element between RF transmission and Eurocat fails to operate correctly an alert will be generated. This gives confidence that the complete processing chain is working

13.5.5 The performance of the GPS constellation is monitored by the ADS-B ground stations. If the GPS reported position exceeds a threshold from expectation an alert is raised. This function also confirms that the GPS altitude (geometric altitude) is within a defined band. If the received value is outside the band an alert is raised.

13.5.6 The GPS engine RCMS monitoring provides alerts when any malfunctioning GPS satellite is detected. This includes the case when inadequate satellites are available to calculate HPL or perform RAIM. If there are not sufficient satellites visible to any site monitor to enable it to generate HPL, that will be indicated to the RCMS as a warning. If an individual satellite outputs false ranging information, ADS-B site monitor GPS engines will detect the fault using their FDE logic. In the event of satellite system problems, post event investigation will be supported by the logging information stored in the RCMS systems.

Difficulties faced by a State

13.6 Mongolia provided a paper which was initially presented to a workshop conducted during the DGCA/42 Conference held in Gold Coast, Australia in late September 2005. The paper raised several questions regarding the features of the existing and future technology solutions, which may be creating difficulties. The paper also identified few difficulties faced by a contracting State in choosing a new technology from many optional ICAO SARPs. The paper also provided a brief introduction of the successes, costs, priorities and lessons learned in implementing CNS/ATM system. It was emphasized that safety is number one priority while maintenance of income is the second and recovery of investment is the next. While talking lessons learned, the paper urged States to make sure the new technology selected is acceptable to all stakeholders before committing and encouraged States to be on the leading edge in selecting new technology but not to be on the bleeding edge.

13.7 The meeting had a lengthy discussion on the points raised in the paper. The meeting also discussed the general strategy and policy considered by each individual State and international organization to implement surveillance systems and selection between ADS-B and radar. It was informed that the paper was well received by DGCA Conference. Therefore no further action is required to be taken by the meeting.

Agenda Item 14: Discuss the need to consider ADS-B air-to-air surveillance service for use in the Asia/Pacific regions

Addition of ADS-B Air-air applications to the Task Force programme

14.1 Australia presented a paper on ADS-B Air-Air Applications. It was informed that considerable works are being undertaken worldwide on ADS-B Air-Air applications.

14.1.1 The meeting noted that the Requirements Focus Group is advancing well regarding a number of air-air applications as follows:

- a) Visual Separation on Approach (VSA)
- b) In-Trail Procedure in Oceanic and Remote Airspace (ITP)
- c) Enhanced Sequencing and Merging Operations (S&M)
- d) Enhanced Traffic Situational Awareness on the Airport Surface (SURF)

14.1.2 It was further noted that the RFG is producing a set of draft documents in compliance with RTCA DO-264 and Eurocae ED78A, for each application comprising:

- a) Operational Service & Environment Definition (OSD)
- b) Operational Performance Assessment (OPA)
- c) Operational Safety Assessment (OSA)
- d) Safety Performance Requirements (SPR)
- e) Interoperability Document (INTEROP)

14.1.3 Some applications may provide benefits in the near term to equipped aircraft in Asia Pacific. However, ATC procedures and rules for use will be required. Recognizing the needs to address the initial applications to be considered by APANPIRG for use in the Asia and Pacific Regions, the meeting agreed to propose adding the following to the ADS-B Task Force work programme and amend the Term of Reference accordingly.

- “Examine and report on the usefulness of Air-Air ADS-B applications in the Asia Pacific region including any considerations regarding
- Cost Benefit
 - Safety impact
 - Efficiency impact

Position on Separation Assistance System (ASAS)

14.2 Thales ATM provided an information paper on the common position of Air Traffic Alliance (a group of EADS, Airbus, Thales) and Boeing on ASAS. The position is to support and work within the aviation industry to promote timely planning and implementation of associated operational applications including a roadmap. It was informed that the requirements and design standards development continues to progress and ADS-B-out equipage implemented in the wake of European Mode S mandates. It was noted that Airbus and Boeing aircraft can support ground surveillance functions once standards and certification basis are established. Implementation of ground surveillance applications is beginning to progress but current implementation plans are limited. Airborne use of ADS-B will depend on integration into ATM system and availability of operational benefits.

14.2.1 It was stated that Mode S currently is best solution for global interoperability. The industry was encouraged to seek ways to utilize existing equipage to achieve operational benefit. Common guidelines should lead to global certification standards. International harmonized standards are essential to global interoperability.

14.2.2 Regarding ADS-B-out, the meeting was informed that it is included in new aircraft equipage and retrofit solutions are available. Ground surveillance applications are being adopted. The paper also highlighted the roadmap to ATSAW including in-trail procedures, advanced ASAS applications e.g. Sequencing & Merging and Traffic display at airports.

14.3 As a result of discussions, the meeting agreed to initiate progress of the ITP (air-air) applications, looking at operational technical aspects including encouraging other forums to discuss it.

Agenda Item 15: Any Other Business

15.1 The Outcome of important points agreed at the end of the meeting is summarized and provided in Appendix D to this report. The updated work items of the ADS-B working Group is provided in Appendix E to this report.

Note of appreciation

15.2 The meeting expressed its appreciation and gratitude to the Airports Fiji Limited for hosting the ADS-B Seminar, the excellent arrangements made for the meeting and for the opportunity provided to visit Nadi ATM Centre.

15.3 The meeting also expressed thanks to SENSIS and THALES ATM Pty Ltd, MTECH Systems, COMSOFT GmbH and the ERA AS for the social events organized during the meeting.

ADS-B Demonstration

15.4 The meeting appreciated the demonstrations on ADS-B provided by ERA AS during the Seminar.

Time and Venue of Next Meeting

15.5 The next meeting of ADS-B Study and Implementation Task Force will be held in New Delhi in the second half of March 2006. It was agreed that the next Task Force meeting be preceded by two day Seminar. Exact date of the meeting will be notified by the Secretariat to the members of the Task Force immediately after coordination with India.

15.6 The meeting was also informed that Republic of Korea will host an ADS-B Task Force meeting in 2007.

15.7 Recognizing the need to have GPS and AIR-AIR Surveillance experts present at next seminar and meeting including pilots and controllers, the meeting considered necessary to encourage avionics and operational experts to attend the both seminar and meeting. Chairman of the Task Force agreed to coordinate with industry. IATA agreed to emphasize importance for flight operational experts from member airlines to attend the next meeting.

TOR of ADS-B STUDY AND IMPLEMENTATION TASK FORCE

TERMS OF REFERENCE

Complete an industry wide ADS-B cost/benefit study for the near term use of ADS-B throughout the ASIA/PAC region.

Develop an implementation plan for near term ADS-B applications in Asia Pacific including target dates taking into account available equipment standards and readiness of airspace users and ATS providers.

Study and identify applicable air to air applications of ADS-B in the Asia and Pacific Region.

Note:

1. The Task Force, while undertaking the task, should take into account of the work being undertaken by OPLINK, SAS, SCRS and AC Panels with a view to avoid duplication.
2. The Task Force should report to the APANPIRG ~~meeting to be held in 2004 and subsequent meetings.~~

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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) Guidance package based on OPLINKP Concept of use and other ICAO Docs for ADS-B air-ground surveillance service (AIGD).	2006 Completed
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	Completed
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.	On-going/Australia
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)	Completed

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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 (Sydney-Singapore made progress in 2005 and rest cities pairs in 2006); 2) Inform ICAO regional office names of designated focal point of contact.	2006/States concerned Completed
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	2006
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)	On-going

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**List of Designated Contact Persons
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AGREEMENTS

1	ASIA/PAC use Asterix Cat 21 VERSION 0.23
2	Add Air-Air to TOR
3	Add Wide area MLAT to FASID
	Like to ASIA/PAC to start progressing the ITP (air-air) application looking at operational technical aspects) including encouraging other forums to discuss it.

ACTIONS

	Next Seminar
1	Have a GPS expert present at next seminar
2	Invite air-air experts to next meeting (& Airlines, controllers)
	Need to encourage avionics experts to attend
	Include ADS-B equipment-systems-functionality (eg STCA)
	City Pair co-ordinators
3	Co-ordinate with each other and chairman to develop and complete a template/table of benefits for each city pair team/project
4	Prepare a sub- regional plan (at least at the “dot point” level) for each city pair team
	Next Meeting
5	Provide Australian ASTRA GNSS Implementation Team (GIT) GPS papers at next meeting
6	Prepare regional surveillance strategy paper (Nick) – includes ModeS, 4 digit codes, ADS-B ...)
7	Prepare a draft sample CBA from Airline perspective (Greg)
8	Provide Airline perspective of ADS-B benefits (Neil)
9	Prepare paper on MET use of 1090Es (Greg)
10	Prepare proforma for data collection reporting (Chairman)
11	Advise on availability of data analysis tool (New Zealand) for common reporting purposes
12	Provide details (papers) on your country’s ADS-B data sharing policy.
13	Write again to Stan Jones sjones@mitre.org (Mitre) to obtain Lee/Moody paper (Greg)
14	Provide focal point contact if not already listed
15	Provide problem report details of identified issues (New Zealand)
16	Clarify target dates listed in SCRSP paper (Li Peng)
17	Advise SCRSP of concern regarding overly stringent specifications for ground stations noting that there is no radar station ICAO spec. (Normally signals in space)
18	List Regional documents that need updating to match OPLINK work regarding naming of ADS-C, ADS-B and ADS. (Li Peng)
19	Provide FASID updates
20	Provide a FAQ site (Greg) in response to questions sent to Greg Dunstone
	Neil will emphasise importance of flight ops at next meeting to encourage airlines to attend

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Note
Trial by Thailand in 2006. Sensis system ordered
Indonesian trial in 2006. (DGAC/ Sita/ Airservices)
North Korea decision on ADS-B sites in 2006
Indian plan for ADS-B demo Nov 05 and plan for 3 ADS-B sites as a “radar filler”
Mongolia plan for additional 2 ADS-B GS VDL4+1090ES in 2006
Mode S is being used in region (New Zealand, Japan, Australia, ...
IATA support for Mandate by 2010
Noumea ADS-B expected 2007

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UPDATED ACTION ITEMS

Serial No.	Work Items	Action to be taken by	Target Date
1	Ascertain timing with FAA for the issue of DO260A based TSO	USA	Completed
2	Research maximum traffic densities now & expected in 2015	All members	On – going – 2006
3	Report organizational policy on ADS-B data sharing with neighbors	All members	2006
4	Distribute analyses on use of GPS TSO129 vs TSO145/6 avionics for ADS-B (Lee & Moody papers)	Australia to seek updates	2006
6	Prices: • GS prices (any ground station provider); • Communication and ATC automation costs (each State); • Big Aircraft & regional aircraft avionics prices; • Small GA aircraft avionics prices.	Industry All members IATA Australia	Completed Completed Completed Completed
7	Coordinate examination of sites for city pairs (existing route structure: aim for capacity increase): • Australia - Singapore • Hong Kong, China - Tokyo • Singapore - Delhi	Singapore Japan India	Continuing Continuing Continuing

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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 members and Australia	Completed
10	Draft regional procedure to amend SUPPs –Doc7030 - for use of ADS-B from aircraft greater than 12 NM offshore.	Australia	On-going
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 Decision 1/7	New Zealand/ USA	Completed
12	Identify an existing ICAO definition of low-density airspace.	Thailand	Completed
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	Completed
14	Prepare a Business case matrix or template (checklist) Singapore Decision 1/4	Singapore and New Zealand	Completed
15	Develop specific appropriate ADS-B implementation project proposals for which benefits and costs can be calculated. Singapore Decision 1/5	City Pair coordinators	2006
16	Continue a survey of fitment plans and will report at the next TF meeting.	IATA	Completed
17	Encourage airlines to attend the next Seminar.	IATA	Completed
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	Completed

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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	2006
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	Completed
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 members	Completed

**THE ADS-B SEMINAR AND THE FOURTH MEETING OF ADS-B STUDY AND
IMPLEMENTATION TASK FORCE (ADS-B SITF/4)**

Nadi, Fiji, 24-28 October 2005

Attachment 1 to the Report

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International Civil Aviation Organization

ADS-B SEMIANR AND THE FOURTH MEETING OF ADS-B STUDY AND IMPLEMENTATION TASK FORCE (ADS-B SITE/4)

Nadi, Fiji, 24-28 October 2005

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3	4	TOR, Subject/Tasks List and List of Action Items	Secretariat
4	4	Focal Point of Contact Responsible for Coordinating, Planning and Implementation of ADS-B	Secretariat
5	14	Addition of ADS-B Air-air Applications to ADS-B Task force Work Programme	Greg Dunstone Airservices Australia
6	11	Status of Regional Plan for CNS/ATM System and Further Updates to CNS Table 4 of FASID	Secretariat
7	4	Key Priorities for CNS/ATM Implementation in the Asia/Pacific Region	Secretariat
8	13	Use of Automatic Dependent Surveillance – Broadcast (ADS-B) Down Linked Data for Aircraft Radar Returns and Flight Data Correlation	Thailand
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4	13	Detected Aircraft	Greg Dunstone, Airservices Australia
5	7	RFG Avionics Survey Responses	Greg Dunstone, Airservices Australia
6	6, 12	Cross Industry Business Case Study in Australia	Greg Dunstone, Airservices Australia
7	6	Upper Airspace Programme Transition Plan	Greg Dunstone, Airservices Australia
8	13	Site Monitor Processing	Greg Dunstone, Airservices Australia
9	6	Australia's ADS-B Programme	Greg Dunstone, Airservices Australia
10	7	RFG ADS-B Air-Ground Applications Update	Greg Dunstone, Airservices Australia
11	8	Problem Reporting Database Update	Greg Dunstone, Airservices Australia
12	12	ADS-B Certification Issue	Greg Dunstone, Airservices Australia
13	13	Position on Separation Assistance System (ASAS)	Michel P. Gorsky, Thales ATM
14	5	Crystal Toulouse	Michel P. Gorsky, Thales ATM
15	13	1 st Meeting of the Operational Data Link Panel (OPLINKP/1)	Nick King, Australia
16	3	Progress of the Separation and Airspace Safety Panel on ADS-B	Nick King, Australia
17	6	ADS-B Regulatory Activity in Australia	Nick King, Australia
18	13	The Difficulties Faced by a State which has an Active Aviation Industry and which is trying to Bridge Technical Gaps	Mongolia
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20	6	Automatic Dependent Surveillance-Broadcast Systems in Mongolia	Mongolia
21	14	SCRS Panel update on Requirements for Air-air Applications	Kojo Owusu and Greg Dunstone, Airservices Australia
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2	ADS-B Related Developments by AN Conf/11 & APANPIRG & Objective of and Progress by ADS-B Task Force	Li Peng, Secretariat
3	ADS-B Applications	Greg Dunstone, Airservices Australia
4	ADS-B Performance	Greg Dunstone, Airservices Australia
5	Sensis Corporation at a Glance	Mike Gahan, Sensis
6	DSS 1090: The Compact Mode S-ES ADS-B Ground Station	Vladimir Mandai, ERA Radar Technology
7	Quadrant Dependent Surveillance with Integrity	Robin Garrity, QinetiQ
8	ADS-B Ground Station: Simple, Reliable Maintainable and Affordable	Matthew Parry, Thales ATM
9	IATA Statement of ADS-B	Neil Jonassan, IATA
10	Implementing on ADS-B from an Operator's View	Matthew Parry, Thales ATM
11	Automation & Ancillary Systems	Greg Dunstone, Airservices Australia

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12	ADS-B Avionics	Greg Dunstone, Airservices Australia
13	ADS-B Activities and Implementation Plan for Thailand	Choosit Kuptaviwat, Thailand
14	DGAC Indonesia ADS-B Trial	Indonesia-SITA- Australia
15	ADS-B Quiz	
16	ADS-B Regulation Aspect	Nick King, Australia
17	New Zealand – ADS-B Technical Trial	Howard Anderson, New Zealand
18	UAP & ATLAS Updates	Greg Dunstone, Airservices Australia
19	Planning Activities of ADS-B in Fiji	Petero Delai, Fiji