INTERNATIONAL CIVIL AVIATION ORGANIZATION
ASIA AND PACIFIC OFFICE

REPORT

AUTOMATIC DEPENDENT SURVEILLANCE – BROADCAST (ADS-B) SEMINAR AND THE TWELFTH MEETING OF ADS-B STUDY AND IMPLEMENTATION TASK FORCE (ADS-B SITF/12)

15 – 18 April 2013
Kolkata, India

The views expressed in this Report should be taken as those of the Seminar and Meeting and not of the Organization.

Approved by the Meeting
and published by the ICAO Asia and Pacific Office, Bangkok

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1. Introduction

1.1 The Automatic Dependent Surveillance – Broadcast (ADS-B) Seminar and Twelfth Meeting of ADS-B Study and Implementation Task Force (ADS-B SITF/12) were held at Hotel Hyatt Regency Kolkata, India from 15 to 18 April 2013. The Seminar and the meeting, hosted by the Airports Authority of India (AAI) were inaugurated traditionally by lighting the lamp by the dignitaries.

1.2 Warm welcome was extended to all the participants by the following dignitaries from DGCA and AAI:

- Mr. V. Somasundaram, Member (ANS), AAI.
- Mr. J.S. Rawat, Joint Director General, Office of the DGCA India;
- Mr. Ravi Prakash, Executive Director (CNS), AAI
- Mr. V.K. Dutta, Executive Director (ATM), AAI;
- Dr. B.P. Sharma, NSCBI Airport Kolkata, AAI;
- Mr. M.L. Lehkra Regional Executive Director (Eastern Region) AAI;

1.3 In their opening remarks, they highlighted the importance of ADS-B for the development of air navigation system to meet the requirements of increasing air traffic demand. They expressed that India would continue to work together with other States to implement ADS-B in the Region.

1.4 In his opening remarks, Mr. Greg Dunstone, Chairman of the Task Force emphasized benefits that ADS-B technology can provide and highlighted the dates of ADS-B mandate in Australia from December 2013 for upper airspace and from February 2017 for the whole Australian FIR. He expressed his appreciation to India for hosting the Task Force meeting for the second time since the one held in New Delhi in 2006. He emphasized that it is time for the States, ANSPs and airspace users to work together to turn the commitments into reality.

1.5 On behalf of Mr. Mokhtar A. Awan, ICAO Regional Director, Mr. Li Peng, Regional Officer CNS extended greetings to all participants. He expressed gratitude and appreciation to Government of India and Airports Authority of India for supporting ICAO regional activities and hosting the events. He recalled the achievements of the Task Force since 2003. He emphasized greater need for cooperation and collaboration between States in order to ensure harmonious implementation of rule and procedures associated with ADS-B implementation in South China Sea and Bay of Bengal sub-regions. He also highlighted the outcomes of AN Conf/12 and APANPIRG/23 meetings, which urged States and administrations to expedite ADS-B implementation.

1.6 Mr. J.S. Rawat, on behalf of Director General of Civil Aviation welcomed the participants to India. He briefed the meeting from regulator's perspective and informed about the recent developments in the civil aviation in India including the new terminal at Kolkata airport which was opened on 15 March 2013.

1.7 While welcoming the participants, Mr. V. Somasundaram recalled his attendance at the first meeting of the Task Force held in Brisbane in 2003 when ADS-B was identified as an emerging technology and initiatives were just being taken to promote usage of the technology for the Region. Now some ten years later, many States, ANSPs and operators have turned the vision into reality. He pointed out that the ADS-B technology will facilitate achieving the seamless ATM. He also informed that AAI has taken initiatives to improve ANS by implementation of PBN and ADS-B. He added that the air traffic flow control centre will be operational in December 2013.

1.8 Mr. Ravi Prakash, Executive Director (CNS-OM) of AAI extended vote of thanks to the dignitaries and delegates for their support and co-operation.

2. Attendance

2.1 The Seminar was attended by 93 participants and the meeting was attended by 67 participants from Australia, Bangladesh, Brunei Darussalam, Cambodia, Hong Kong China, Macao China, India, Indonesia, Japan, Malaysia, Mongolia, Nepal, Republic of Korea, Singapore, Thailand CANSO, IATA and representatives from aviation industries. List of participants is at **Attachment 1.**

3. ADS-B Seminar

3.1 The ADS-B Seminar was organized in conjunction with the ADS-B SITF/12. The objective of the Seminar was to provide updated information to the participants on ADS-B planning and implementation, with a focus on the operational role of ADS-B avionics standards and equipment. Thirteen presentations were made, covering a comprehensive list of following topics on ADS-B:

- ADS-B in Context
- IATA view on ADS-B implementation
- Operator's perspective on ADS-B implementation (Jet Airways)
- ANSP's activities for implementation of ADS-B (AAI)
- Australian ADS-B rule
- USA FAA rule and future
- Industry's updates from SAAB Sensis, Thales and Comsoft
- Airbus updates on ADS-B
- Boeing updates on ADS-B (presentation made through webex)
- Rockwell Collins Avionics; and
- Honeywell Avionics

3.2 During the Seminar, a number of speakers from Regulators, Operators, IATA, ANSPs and aviation industries provided valuable information on the recent developments and status of ADS-B implementation. The ADS-B Seminar was well received by the participants.

4. Officers and Secretariat

4.1 Mr. Ravi Prakash, Executive Director (CNS-OM) from Airports Authority of India and Mr. Greg Dunstone, Surveillance Program Lead of Airservices Australia facilitated the Seminar. Mr. Greg Dunstone, Chairman of the Task Force chaired the Meeting. Mr. Li Peng, Regional Officer CNS and Mr. Shane Sumner, Regional Officer ATM, ICAO Asia and Pacific Office acted as Secretaries.

5. Organization, working arrangements and language

5.1 The Seminar and the Meeting met as a single body except on the third day of the Meeting four ad hoc working groups (South East Asia, Bay of Bengal, North Asia and Regulators) were established to progress proposals for sub-regional implementation plans. The working language was English inclusive of all documentation and this Report. List of Papers presented at the Seminar and the Meeting is at **Attachment 2.**

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Agenda Item 1: Adoption of Agenda

1.1 The meeting adopted the following agenda :

Agenda Item 1: Adoption of agenda

Agenda Item 2: Review the outcome of the APANPIRG/23 on ADS-B SITF/11 and SEA/BOB ADS-B WG/8 Meetings

Agenda Item 3: Review outcome of AN Conf/12 on ADS-B related issues

Agenda Item 4: Review Subject/Tasks List and action items including:

- Amendment to AIGD
- Blacklist discussion
- Exemption processing
- Commissioning checklist

Agenda Item 5: ADS-B performance monitoring

Agenda Item 6: Review States' activities and interregional issues on trials and implementation of ADS-B and multilateration

Agenda Item 7: Development of Asia/Pacific Regional ADS-B implementation plan and sub-regional ADS-B implementation plan

- Near-term implementation plan in Bay of Bengal
- Update on near-term implementation plan in South China Sea
- Identification of potential projects in eastern part of South China Sea area

Divide into working groups as follows and subsequently report conclusions to Plenary

- *South East Asia working group*
- *Bay of Bengal and South Asia working group;*
- *North Asia group*

Agenda Item 8: Any other business

Agenda Item 2: Review outcome of the APANPIRG/23 on ADS-B SITF/11 and SEA/BOB ADS-B WG/8 Meetings

2.1 Under this agenda item, the meeting reviewed the outcome of APANPIRG/23 meeting on matters relating to ADS-B.

APANPIRG/23 Outcome on ADS-B (WP/03)

2.2 APANPIRG/23 meeting held in September 2012 reviewed the work accomplished by the Eleventh Meeting of the ADS-B Study and Implementation Task Force. The report of the Task Force had also been reviewed by CNS/MET SG/16 and the ATM/AIS/SAR SG/22 meetings.

2.3 APANPIRG/23 appreciated the progress made by the ADS-B SITF and the SEA /BOB ADS-B WG and expressed its appreciation and gratitude to India for hosting the Seventh Meeting of the South East Asia and Bay of Bengal Sub-Regional ADS-B Implementation Working Group and to Republic of Korea for hosting the Eleventh Meeting of the ADS-B Study and Implementation Task Force.

2.4 The meeting noted the follow-up actions taken by the ICAO regional office and the guidance materials adopted by APANPIRG/23 which had been posted on the ICAO APAC website: http://www.icao.int/APAC/Pages/edocs.aspx

2.5 The meeting noted that APANPIRG Conclusion 23/33 regarding database of Blacklist Airframe broadcasting misleading ADS-B data was not supported by Australia. The reason was further explained in Working Paper 12 under Agenda Item 4.

Review outcome of SEA/BOB ADS-B WG/8 Meeting (WP/07)

2.6 The SEA/BOB ADS-B Working Group meeting was held from 5 to 7 December in Yangon, Myanmar. The whole report of the Working Group is also available on the ICAO APAC website: http://www.bangkok.icao.int/cns/meeting.do?method=MeetingDetail&meeting_id=247

2.7 The meeting took following actions on the outcome of the SEA/BOB ADS-B Working Group:

Need for ADS-B Station at Car Nicobar

2.8 While congratulating India on the smooth progress of deployment of 14 ADS-B installations, the Working Group meeting requested India to explore the possibility of an ADS-B installation at the military site at Car Nicobar, southeast of Port Blair to achieve better surveillance coverage of Bay of Bengal. It was recalled that discussions at previous ADS-B SITF/10 and Focus Group meetings had identified the need for an ADS-B station at the Nicobar Islands which would be beneficial towards enhancing flight safety, efficiency and airspace capacity over the eastern gateway of the Bay of Bengal Sub-region. The surveillance coverage would also be beneficial to States such as Malaysia and Indonesia. India agreed to explore the possibilities in this regard. In view of foregoing, the meeting endorsed following Decision formulated by the Working Group:

Decision 12/1 – Need for an ADS-B Ground Station on the Nicobar Islands

That, Task Force member from India is urged to explore the possibility of installation of an ADS-B Ground station at Nicobar Islands in order to enhance flight safety, efficiency and air space capacity over the eastern gateway of Bay of Bengal Sub-region.

2.9 The meeting noted the outcome of the discussion by the Working Group on potential ADS-B stations on the off-shore platforms. As an attractive option, many States would need guidance on how to engage with the platform operators. It was recommended that States should first initiate discussions with an offshore operating company to explore the possibility of ADS-B on offshore platforms. However, there would be difficulties for ANSPs in doing this work, as platform visits require significant specialized safety training. A possible deployment option would be to arrange an agreement with the platform operator to install and conduct Level 1 maintenance on the equipment, with the ANSP providing Level 2 and 3 maintenance support.

Co-ordination for Data Sharing

2.10 Discussion on ADS-B data sharing between States concerned including Myanmar and India was initiated at the eleventh meeting of APANPIRG ADS-B SITF in April 2012. The outcome of the initial discussion was further progressed at the ADS-B focus group meeting facilitated by CANSO on 3 and 4 July 2012 in Singapore. The discussion covered a draft ADS-B data sharing agreement, implementation issues, financing model, maintenance options and key project milestones between Airports Authority of India and DCA Myanmar.

ADS-B Equipage Requirement and Required lead time for Mandate

2.11 The meeting was informed that by the end of 2013, DCA Myanmar will issue a mandate for ADS-B equipage of aircraft flying above FL260 on ATS routes M770 and L759 with target date 2015.

2.12 IATA commented that 50NM RHS was already applicable on routes M770 and L759, with reduction to 30NM separation it will also be achievable. Surveillance based separation standards could be applied after operational implementation of ADS-B.

2.13 With the installation of 14+7 ground stations and some upgrades to ATM automation systems, India was also expected to develop harmonized ADS-B equipage mandate requirement.

2.14 Regarding the lead time required for mandate, IATA clarified at the WG meeting that while in normal circumstances they would need 4 to 5 years to plan for mandated equipage, they would be prepared to work towards accommodating a 2 to 3 year period. IATA reminded the meeting that non-IATA members including domestic operators may require more time to get ready for the mandate requirement.

Application of ADS-B based surveillance service

2.15 Singapore commented at WG meeting that there would be benefit in terms of priority of access to airspace on the basis of equipage i.e. best equipped, best served. IATA responded that the end benefit of radar or ADS-B surveillance is the implementation of surveillance separation standards.

ADS-B Data Sharing between India and Myanmar

2.16 India is committed to seamless ATM and has committed its willingness for resource sharing at ICAO meetings. In the SITF/11 and BOBASIO/2 meetings as well as in APANPIRG/22 & 23 India has expressed willingness to share ADS-B data with Myanmar, Maldives, Sri Lanka, Malaysia and Indonesia.

2.17 India requested if other States having current cross-boundary data sharing agreements India could consider sharing these agreements, excluding any sensitive information, for use as guidance for other States contemplating such agreements. These could also then be used as a benchmark to better inform the regulator and thereby expedite the approval process.

2.18 In addition to in-principle agreement on sharing data with Myanmar, India and Sri Lanka may also share the ADS-B data from Trivandrum (India) and Pidurutalagala in Sri Lanka. The Chennai Upper Airspace Harmonisation has already led to significant improvement in operational efficiency and the sharing of ADS-B data with Sri Lanka will yield north bound flights from the island State significant benefits. Sharing of ADS-B data between India and Maldives - Hanimadhoo and Male ADS-B (Maldives) and Trivandrum/Cochin (India) would also result in significant improvement in service quality in Indian Ocean region.

2.19 CANSO commended India for the leadership in ADS-B implementation in the Bay of Bengal area. CANSO proposed that if there were no bi-lateral or multilateral forums between India, Sri Lanka and Maldives then CANSO would be prepared to facilitate such a forum.

2.20 Australia commented that India's proposals for data sharing, including VHF, were excellent steps. Australia also commented on the use of filters to provide independence of ASTERIX Cat 21 versions, security protection by acting as a proxy server, and a filter to facilitate the sharing of only that data which is agreed by the parties. The filter would also serve to limit the bandwidth used by not sharing the data which was not included in the agreement.

2.21 It is obvious that full benefits of ADS-B will only be achieved by its harmonized implementation and seamless operations. The meeting reviewed the agreement on the milestones for ADS-B data sharing between States in Bay of Bengal area and endorsed following draft Conclusion formulated by the WG:

Draft Conclusion 12/2 - Milestone for Data-sharing between India and Myanmar

That, the milestones for data-sharing as provided in **Appendix A** be adopted.

2.22 The working group meeting further deliberated and agreed on a framework regarding avionics standards, optimal flight levels, and ATC and engineering handling procedures on routes M770, N895, P646 and L507 in the Bay of Bengal area. The recommended Harmonization Framework for ADS-B Implementation along ATS Routes M770, N895, P646 and L507 in Bay of Bengal considered by the WG meeting is provided in **Appendix B** to this report. States concerned were requested to work closely together to achieve agreement as shown in the Harmonization Framework for implementation of ADS-B based service in the Bay of Bengal Sub-region

Barometric and Geometric altitude Information in ADS-B message

2.23 Through a paper, Hong Kong China highlighted the technical difference between barometric altitude and geometric altitude, both of which are categorized as operationally desirable items in the APAC "Guidance Material on Generation, Processing and Sharing of ASTERIX Category 21 ADS-B Messages". These two items are down linked along with other ADS-B data from aircraft to ATM automation system. It is essential to understand the technical differences and make proper use of the altitude information available from ADS-B messages in various ATC applications. The meeting discussed the safety implications in processing and displaying geometric altitude information to air traffic controllers by ATM automation system. The meeting concluded that the geometric altitude information shall not be provided to air traffic controller. It was considered important for Administrations to be fully aware of this safety issue about processing and displaying altitude information in ADS-B messages. The meeting also considered it necessary to amend relevant guidance in the ADS-B Implementation Guidance Document (AIGD) which was further discussed under Agenda Item 4. As result of further discussions during the Task Force meeting, a revised draft Conclusion was endorsed as follows:

Draft Conclusion 12/3 – Processing altitude information in ADS-B Message

That, States/Administrations implementing ADS-B based surveillance services be urged to be fully aware of the safety implications and difference between geometric and barometric altitude. Geometric altitude information shall not be displayed on ATC displays used for provision of air traffic services. States may choose to use geometric altitude in ATM systems for other purposes.

Proposal for Amendment to Supplementary Procedures

2.24 A Proposal for Amendment (PfA) to Regional Supplementary Procedures (SUPPs – ICAO Doc 7030) on the operation of ADS-B transmitting equipment was developed in accordance with APANPIRG Conclusion 22/36. As part of the established procedure, the proposal was circulated on 18 December 2012 after coordination with ICAO Headquarters. Up to Mid. February 2013, 14 responses were received. The meeting was informed that revised PfA with editorial changes was circulated again to the States on 16 April 2013 with closing date for receipt of the comments on 3 May 2013.

European Aviation Safety Agency Notice of Proposed Amendment (NPA) 2012-19

2.25 The meeting noted that European Aviation Safety Agency (EASA) proposed through Notice of proposed amendment (NPA 2012-19) to remove requirement and provision of including part of AMC20-24. Regarding AMC 20-24, Certification Considerations for the Enhanced ATS in Non-Radar Areas using ADS-B Surveillance (ADS-B-NRA) Application via 1090 MHZ Extended Squitter has been recognized as one of regional equipage standards for implementation of ADS-B in the ASIA/PAC Region which has been included PfA to the SUPPs (Doc.7030). Chairman informed the meeting that he understood that EASA no longer proposes (or has postponed) to remove requirement including part of AMC20-24.

2.26 The Chairman noted the good work of the South-East Asia and Bay of Bengal Sub-regional ADS-B Implementation Working Group (SEA/BOB ADS-B WG/8).

Agenda Item 3: Review outcome of AN Conf/12 on ADS-B related issues

3.1 Under this agenda item, the meeting reviewed a paper presented by the Secretariat on the outcome of AN Conf/12 on ADS-B related recommendations. A number of recommendations of the Conference were identified relevant to the work of the ADS-B SITF including but not limited to Recommendation 1/7, 1/9, 1/11, 2/2, 4/2, 4/3, 4/5, 6/5 and 6/6. The meeting was informed about the work being carried out by the ATM Seamless planning group on priorities of ASBU module as identified for the ASIA/PAC region including ADS-B ground surveillance service.

3.2 Considering several ADS-B related elements having been included in the ASBU document adopted by the AN Conf/12 in November 2012, Chairman proposed to further identify those regional ANS priorities that ADS-B can support for implementation. Participants from Australia, Singapore & Hong Kong China volunteered to prepare (coordination by email) a working paper with list of practical ADS-B related initiatives that could be considered by the ATM seamless planning group.

Agenda Item 4: Review Subject/Tasks List and actions items

4.1 Under this agenda item, the meeting reviewed the action items of the ADS-B Study and Implementation Task Force and updated subjects and tasks to be undertaken by the Task Force. The consolidated Tasks List and Action items were reviewed and further updated during the meeting which is provided in the **Appendix C to** this report.

Proposed Amendment to AIGD (WP/02)

4.2 Hong Kong China re-capped that during the SEA/BOB ADS-B WG/8, it was considered necessary to set up a small working team consisting of States advanced in ADS-B implementation to conduct a comprehensive review and revamp the AIGD taking into account the latest ADS-B developments and technologies. Australia and Hong Kong China were tasked by the meeting to take lead to review the AIGD and report to ADS-B SITF/12. As a follow-up action, a major revamp and re-organisation of the entire AIGD was presented to the meeting in a form of a comprehensive amendment proposal. The proposed amendments provides much better logical flow covering various steps from engineering design & planning, operational implementation and harmonization, on-going integrity monitoring and blacklist reporting/processing, as well as avionics aspects.

4.3 The proposed comprehensive amendments to the AIGD incorporate the latest ADS-B developments and applications including:

- relevant Aviation System Block Upgrades (ASBU);
- new avionics standards;
- safety risk assessment guidance material;
- ADS-B regulations;
- safety implications of ADS-B geometric altitude;
- procedures for handling non-compliant aircraft and misleading ADS-B transmissions;
- a framework for harmonizing implementation;
- Guidance on the generation and sharing of ASTERIX Category 21 messages;
- Reference to Security considerations;
- Reference to Guidance on ATC automation functionalities to support ADS-B;
- Reference to regulatory guidance material;
- Checklist for commissioning of an airways facility;
- Spares and maintenance support; and
- Co-ordination with Military organisations about ADS-B data sharing.

4.4 The revised document provides a much streamlined, consolidated, up-to-date and comprehensive guidance document to assist States in planning and implementation of ADS-B. Hong Kong China also highlighted that ADS-B Out is one of the key Block 0 modules of the ICAO ASBU Framework with highest implementation priority for the ASIA/PAC Region. To reap full benefits and achieve better synergy, the meeting agreed that the AIGD for ASIA/PAC Region would be shared with other Regions as guidance material to facilitate global harmonization and interoperability of seamless ATM systems. ICAO Regional Office was requested to coordinate with ICAO HQs and other Regional Offices in this respect.

4.5 The meeting reviewed and agreed to the proposed changes. The meeting appreciated efforts made by Hong Kong China and Australia and formulated following Draft Conclusion:

Draft Conclusion 12/4 – Amendment to ADS-B Implementation Guidance Document (AIGD)

That, the revised AIGD provided in the **Appendix D** to the report be adopted.

4.6 The meeting also discussed the reference documents referred in the AIGD, and specifically discussed whether ICAO Circular 326 should be made available on the ICAO Asia/Pacific Regional Office website. While agreeing to investigate whether this could be done, the Secretariat reminded the meeting that the circular had already been made available on the ICAO Portal website (ICAO restricted NET) and urged participants to get the document through their designated ICAO focal point who has access to the ICAO Portal website.

4.7 The Secretariat advised the meeting that some anomalies had been identified in the ICAO Doc 4444 PANS/ATM requirements for the flight planning of ADS-B capability, which was referred to in the AIGD. After these anomalies are clarified, any resulting change to the AIGD in this regard would also be proposed for consideration by the ATM Sub-Group of APANPIRG.

Australia's Transition to an ADS-B Blacklist (WP/12)

4.8 The meeting was provided with information on Australia's successful transition from a "whitelist" of pre-approved ADS-B aircraft being provided with ADS-B services to a "blacklist" of non-compliant aircraft being excluded from the service.

4.9 The whitelist process had been developed in 2005 under a conservative approach in an environment where there was no regulatory basis for ADS-B avionics approval. Since that time ADS-B technology had been embraced by the world aviation community, and in 2007 the Australian Civil Aviation Safety Authority (CASA) had published regulations requiring domestic and foreign aircraft to disable ADS-B transmissions before flight if the avionics was not compliant.

4.10 The whitelist had been removed in September 2012, hence removing all involvement by the Airservices Australia in ADS-B fitment. The default assumption was that all operators have complied with regulations. All ADS-B data with acceptable quality indicators was now presented to ATC, except for a small number of aircraft which were listed in the blacklist. As a result there had been a significant increase in the numbers of aircraft being provided with ADS-B services.

4.11 Australia had reviewed ICAO State Letter AP-CNS0159/12, which requested that Australia establish a regional database for the blacklist of airframes broadcasting misleading ADS-B data to share between Administrations and ANSPs in the Asia/Pacific Region. Following some considerations, Australia had concluded that they did not support the proposal.

4.12 Hong Kong, China asked what criteria were used to identify aircraft placed in the blacklist. Australia responded that compliance with the regulation for operation of ADS-B equipment was the only criteria. Hong Kong China expressed that they had different interpretation on blacklisting criteria. They were of the opinion that there was no need to blacklist those aircraft that failed to meet avionics standards because by rule these aircraft should not be granted ADS-B operational approval and operators should have switched off misleading ADS-B transmission before flying into one's airspace according to the rule.

4.13 The meeting discussed this issue at length, and it was suggested that other States should commence performance monitoring activities to further build their own knowledge of the monitoring requirements and develop solutions to any problems detected, as part of building their capability in the preparation for ADS-B implementation.

4.14 The meeting was reminded that the use of a blacklist process was a second level response to erroneous or misleading data. The highest priority for ANSPs was the development of the first level process for responding to bad data; procedures for the immediate operational ATC response to erroneous ADS-B data included issuing instructions to pilots, managing ATM automation system aspects, and the safety and technical reporting of observed problems.

Agenda Item 5 – ADS-B performance monitoring

5.1 Under this agenda item, the meeting reviewed a number of working papers from Australia, India, Hong Kong China and Singapore regarding their practice, experience of ADS-B performance monitoring.

Performance Monitoring Update (WP/04)

5.2 Information was provided to the meeting on the ADS-B performance monitoring performed in Australia, including:

- Ground Station site-monitoring by use of ADS-B signals injected into the antenna;
- Remote control and monitoring of ground station performance and operating parameters;
- Logistics support monitoring, and subsequent regular reporting of ground station failures and service restoration times to the management.
- Avionics performance and statistics monitoring, using tools developed in-house to capture and report performance, including detection and reporting of new airframes and their avionics performance;
- Flight plan capture and matching against the airframe database to determine the percentage of airframes conducting operations with or without ADS-B;
- Monthly matching of the civil aircraft registry against the airframe database and flight plan to monitor and report the percentage of ADS-B equipped airframes and flights;
- The Airservices Systems Issue Database (ASID), incorporating a new category called “Surveillance Avionics” to capture, manage and report avionics problems; and
- Provision of feedback and reports to airlines, operators, manufacturers, industry and regulator.

5.3 The weekly data capture and reporting was a necessary activity in the lead up to the upper airspace mandate in December 2013. While currently being done manually, it was envisaged that this process would be automated to provide ongoing monitoring to support subsequent mandates.

5.4 While it was not possible to check Flight ID performance, the most effective reporting tool for Flight ID errors was operational ATC. Following the upper airspace mandate this would also provide effective monitoring and reporting of airframes outputting NUC = zero (disabled ADS-B).

Assessment of ADS-B Performance to Support ATS in India (WP/13)

5.5 India provided an insight into the assessment undertaken to compare the horizontal position accuracy of ADS-B tracks with radar tracks. This assessment was done to complement the ICAO Separation and Airspace Safety Panel (SASP) assessment, and to address specific local implementation requirements.

5.6 While SASP had concluded, after a comparative assessment of ADS-B and secondary surveillance radar (SSR) performance, that ADS-B can be used to support the PANS/ATM 5NM separation minimum, ICAO Circular 311 (now superseded by Circular 326) recommended a local implementation assessment.

5.7 India undertook a comparative assessment of the ADS-B and SSR horizontal position accuracy for aircraft using Mode S transponders to both reply to SSR interrogations and transmit ADS-B messages, with the objective of demonstrating that ADS-B surveillance could be used to provide 5NM horizontal separation in ADS-B only and mixed ADS-B/radar environments.

5.8 The meeting was provided with a comprehensive report of the assessment, including comparison information on radar and ADS-B track positions and barometric altitude reports for a number of flights operating in the Chennai and Trivandrum TMAs, and an analysis of ADS-B coverage from the Trivandrum ground station.

5.9 The assessment demonstrated that ADS-B tracking performance was better than or, at least, no worse than the reference SSR, and that ADS-B surveillance could be used to provide 5NM separation in en-route and terminal airspaces, whether as sole means or together with radar.

Performance Monitoring and Analysis of ADS-B Equipped Aircraft (WP/16)

5.10 Hong Kong, China provided an update on the use of an in-house developed system for ADS-B performance monitoring and analysis of aircraft in the Hong Kong FIR. It was recalled that APANPIRG/23 and 49th DGCA Conference formulated Conclusions/Actions encouraging States/Administrations that were ready to perform safety monitoring using ADS-B data to share their analyzed ADS-B data and monitoring results with other States/Administrations for the purpose of enhancing aviation safety.

5.11 As a proactive step to meet this objective, Hong Kong China has developed the trial system to commence proactive performance monitoring and analysis of ADS-B equipped aircraft flying within HKFIR based on a systematic algorithm to better prepare Hong Kong for their ADS-B mandate by end 2014 and enhance the aviation safety for the Region through a common “blacklist” scheme. Aircraft identified with erroneous ADS-B data, whether it is due to non-compliance to the mandated avionics requirements or temporary fault on avionics, will be put on a “blacklist” if prolonged transmission of erroneous ADS-B data persists after notification to the concerned aircraft operators.

5.12 Due to the shortage of other guidance on performance monitoring and analysis of ADS-B equipped aircraft, Hong Kong China has steered to propose a systematic algorithm based on independent surveillance source (e.g. radar) and flight plan information to monitor and analyse performance of ADS-B equipped aircraft, and a scheme for problem reporting and blacklisting. After deliberation, the meeting agreed to study the proposed algorithm and scheme in further details and would consider incorporating it as guidance material into the AIGD (Action Item).

5.13 The meeting also discussed what mechanism could be used to establish and share performance monitoring results. The meeting considered it necessary to develop a draft Conclusion for consideration by APANPIRG encouraging States/Administrations to exchange results and finding of their ADS-B Performance monitoring. The meeting considered worth to discuss further on common monitoring criteria to harmonize the monitoring process.

5.14 It was suggested that States should include monitoring of adequate NUC/NIC availability relevant to their FIR. In view of foregoing, the meeting formulated following draft Conclusion:

Draft Conclusion 12/5 - Exchange ADS-B performance monitoring result

That, States be encouraged to exchange findings/result of their ADS-B performance monitoring including experience gained in conducting the required performance monitoring.

ADS-B Station and Avionics Performance Monitoring (WP/17)

5.15 The meeting was updated on the performance monitoring system that Singapore has put into place to monitor the ADS-B stations and the ADS-B avionics of aircraft operating in Singapore Flight Information Region (FIR). A surveillance monitoring system (SMS) was installed to monitor the performance of the surveillance sensors. Although SMS was used primarily to monitor radar performance, it can be used to monitor performance of ADS-B station (e.g. probability of detection) and indirectly measure the performance of avionics (including probability of detection per flight and deviation between positions reported by radar and ADS-B). Singapore also informed the meeting that certain errors (e.g. split track and inability to couple), that could be due to poor avionics performance, were logged by the air traffic control automation system.

Agenda Item 6: Review States' activities and interregional issues on trials and implementation of ADS-B and multilateration

6.1 Under this agenda item, the meeting reviewed a number of papers on the States' ADS-B related activities.

The Need for Adequate Logistics and Spares Support for ADS-B Ground Stations (WP/05)

6.2 Australia provided information to both ADS-B Working Group and Task Force meetings emphasizing the need for ANSPs to have sufficient support systems to ensure high operational availability during the support phase of system life.

6.3 Dual ADS-B systems are required to achieve acceptable operational availability in the event of failure of one half of the duplicated system. It was noted that unduplicated operation was acceptable only for a short period while the faulty element was being repaired, as the probability of a second failure during a short time window was low. A long repair window would increase the risk of an unexpected service failure, with consequent safety impact and loss of operational efficiency.

6.4 To achieve short repair times and thus improve operational availability, the ANSP would usually provide a range of logistics including system design and support tools permitting quick replacement of faulty components, remote monitoring to identify faulty components, technical training, local maintenance depots to reduce response times, documented and standardized procedures, an in-country pool of spares to ensure timely availability, and a maintenance contract to repair faulty modules with specified turn-around times to replenish the spares pool quickly.

6.5 Difficulties in achieving short repair times would be experienced if States failed to establish a spares pool due to their inability to obtain funds or gain approval for overseas purchases or "sole source" purchases, or if there were delays in obtaining quotations or if the purchase was not expected by the supplier. Further, failure to establish a module repair contract would result in long repair times, unplanned expenditure and the inability of the supplier to repair modules due to uncertainty of funding.

6.6 ANSPs could establish an adequate buffer stock of spares to support the required repair times, the prime objective being reduction of the time of un-duplicated operation of the system. It would further allow decoupling of the restoration time from the module repair time. ANSPs could also enter into a maintenance repair contract requiring the supplier to replace and deliver failed modules within a specified time.

6.7 In response to a query on where spares should be held, Australia gave their own example of having 5 or 6 maintenance depots, with a stock of selected spares being held at these depots. High value spares such as radar turning gear (only one held) are held at a central store. Modules which fail more frequently are distributed amongst the maintenance depots.

6.8 Singapore fully supported the proposal in the paper and stated that Singapore has also kept maintenance contracts. After 5 – 8 years operation spares will be more difficult to be obtained from the market; and if no maintenance contract is there, the supplier can charge prohibitive prices. Hong Kong, China also shared their experience and suggested maintenance contracts should incorporate both hardware and software, including conversions, filtering points and ASTERIX version updates.

6.9 Australia advised that a purpose of the maintenance contract is to set a price for a set period. The contract may include price increases over time, but these are known and agreed. Nominally, a maintenance contract could be for 15 years, with the customer having the right to terminate after 5 or 7 years or at any time in the event of poor performance.

6.10 The meeting recognized the importance of adequate support for the provision and repair of modules for the availability and reliability of ADS-B services. The meeting noted that the use of a spares pool and the module repair contract as part of the system acquisition purchase were efficient ways to ensure that adequate number of modules were always available. Such arrangements would improve certainty of funding for both supplier and ANSPs to ensure continuity of service.

6.11 States were therefore advised to consider including requirements for a spares pool and maintenance support contract in all ADS-B system acquisition. Accordingly, the meeting endorsed following draft Conclusion formulated by the Working Group:

Draft Conclusion 12/6 - Need for adequate Logistics and Spares Support for ADS-B service

That, States consider making maintenance arrangements including requirements for a spares pool and/or maintenance contract for all ADS-B system acquisitions and existing systems already in operation if these arrangements do not yet exist.

6.12 The meeting was informed that logistics considerations should also include supporting systems such as power and air-conditioning. The meeting discussed the inclusion of software upgrades in maintenance contracts, and the consequent difficulty involved in establishing a contract which included unknown future requirements.

6.13 The meeting also agreed to reflect the principles highlighted in the paper in the revised AIGD.

Use of a Commissioning Checklist for ADS-B Ground Stations (WP/06)

6.14 Australia provided information on the process taken in the commissioning of an ADS-B ground station and the use of a commissioning checklist to ensure a rigorous check and review of system readiness. The documented checklist process ensured that performance, safety, maintainability and other aspects were in place. Individuals with delegated engineering, technical and operational responsibility would sign the commissioning checklist, and the commissioning certificate would then be signed by accountable individuals when all is ready.

6.15 The commissioning process was part of Airservices Australia's Safety Management System. Both the Commissioning Checklist and Commissioning Certificate were filled in from templates with the appropriate level of detail for the particular change being proposed. The meeting considered the Commissioning Checklist and a Commissioning Certificate presented to the meeting very useful for reference by other Administrations sample commissioning certificate is provided in **Appendix E** to this Report which has also been included in the revised AIGD.

6.16 The process was applied for the introduction of new ADS-B ground stations and/or upgrade of ADS-B sites to provide a consistent approach to change and configuration management. The use of Commissioning Checklist and Commissioning certificate process for ADS-B had a number of benefits in that they provided a consistent, compliant, consulted and documented process, and a formalized checklist for the introduction of an ADS-B service from remote ADS-B ground stations.

6.17 Hong Kong China stated that they have a similar arrangement like Australia for the commission checklist and certification process as part of their commissioning document.

Meeting challenges of ADS-B Implementation (WP/14)

6.18 India presented a paper on the challenges that are being faced during the process of implementing ADS-B operations and suggested possible solutions. India also brought out various options for deliberation by the meeting. Several concerned issues raised in the paper were clarified or explained during meeting. It was observed that some of these issues should be rectified before equipment delivery.

6.19 IATA noted the challenges involved in integrating ADS-B into the many different ATM systems in use in India. One among these challenges was training. While pilot training was relatively simple, the State making the ANS change needed to ensure the education of the regulator and industry. Regarding incorrect ADS-B data, and on the assumption that industry is not likely to know, the most appropriate tool was through the State's regulator for alerting the particular operator, followed by blacklisting if the condition persisted.

6.20 It was noted that general practice was that the specification of appropriate systems was a key consideration, and the ANSP has to specify the requirements for manufacturer to meet. Robust procedures for ATC operation and reaction in the event of avionics malfunction were also required.

Safety Assessment experience (WP/18)

6.21 Singapore shared with the Task Force progress made on their safety assessment for ADS-B operations in Singapore FIR as well as the challenges faced in producing the safety case. During the initial phase of the implementation of ADS-B services, Singapore will only provide ADS-B exclusive services over the defined areas which are effectively ADS-B-NRA. However, in the draft safety assessment, the entire FIR is covered, including ADS-B-RAD and the non-radar areas currently not yet covered by ADS-B. A consultant performed a review of the safety assessment against ED-126 and ED-161. In view that ED-161 advised against the use of DO-260 in ADS-B RAD, Singapore would be looking into the safety impact of introducing ADS-B tracks into multi-surveillance tracker of the air traffic control automation system, without any reduction of separation under multi-sensor environment.

6.22 In this connection, the meeting discussed the issue how to assess ADS-B against the reference SSR system in Non-Radar Airspace (NRA). It was considered not necessary to conduct this assessment for every ADS-B ground station, although initial comparison in RAD airspace may be required. While differing from the prevailing view in Europe and North America, there should be no difference between NRA and Radar (RAD) airspace. The meeting further agreed that there was no difference between ADS-B performances in en-route or TMA environments, or between high-density and low-density airspace. Rather, it was more important to consider what separation standard was being used. This point of view was also supported in the appendices to ICAO Circular 326.

Progress on deployment – Myanmar

6.23 Myanmar updated the Working Group meeting on the progress of implementation and co-ordination activities of ADS-B deployment to enhance flight safety and efficiency in Myanmar. ADS-B ground stations will be installed at Coco Island, Sittwe and Lashio Airport to fill up the surveillance gap between and/or overlap the current radar coverage. The deployment is divided into two phases. In the first phase, two ground stations will be installed at Coco Island and Sittwe by the end of 2013 which would fill the surveillance gap covering the Bay of Bengal major air routes over Bay of Bengal airspace. In the second phase, three ADS-B ground stations will be installed at Myeik, Yangon International airport and Lashio. Lashio station will fill the surveillance coverage gap in the north east part of Yangon FIR. The other two stations will provide backup to the present radar systems for existing surveillance coverage. Contract for the first phase was signed in December 2011.

ADS-B Development and Deployment Plan in the Republic of Korea

6.24 There have been multiple demands in Republic of Korea for the air safety improvement by filling radar coverage gap and surveillance performance upgrade. Republic of Korea (ROK) highlighted the ADS-B development status as follows:

6.25 The ADS-B R&D group consists of 1 research, 3 academics and 3 industries. The R&D group had completed the ADS-B system requirement analysis, preliminary design and critical designs. The prototype fabrication stage of the research started in August 2012. Demonstration and verification test will be conducted at Gimpo International Airport. Verification test will be conducted by August 2013 followed by an operational field test in September 2013. The prototypes ADS-S ground station is expected to be capable of a multi-link surveillance of 1090ES and UAT. For every second, it can transmit up to 1000 TIS-B and ADS-B messages and receives more than 400 targets. Introduction on TIS-B server, monitoring system and testing procedure were also given.

6.26 UAT datalink, using frequency modulation, is designed to enhance receiver sensitivity and be robust against multipath fading. The UAT design scope also covers the weather and flight information service for light aircraft. UAT was being evaluated under a program of R&D, and the policy decision was yet to be made. Korea has mountainous terrain, and UAT was being considered for use as a surveillance technology for deployment in these areas. Korea's general aviation fleet currently numbered more than 300 aircraft.

6.27 In the first phase of deployment by 2014, ADS-B ground prototypes will be installed at Gimpo International Airport, and UAT ground stations will be installed at airports. In the second phase from 2015 to 2016, ADS-B ground systems will be used as a supplement to the conventional radar system which has been used for terminal control. ADS-B system will also be used for extension of the surveillance coverage by filling radar coverage gap and for redundancy purpose. For the last phase of the development from 2017 to 2020, ADS-B will be deployed for entire Incheon FIR.

Australian ADS-B Update (IP/02)

6.28 Information was provided to the Task Force about the significant progress achieved in Australia's surveillance program during the past year.

6.29 Airservices was in the middle of a large capital program to deliver new surveillance infrastructure, including 9 Mode S terminal area radars plus a fully operational transportable unit, conversion of the Brisbane en-route radar to primary + secondary installation, and the commissioning of the first 2 radars under the en-route radar replacement project. Mode S radar related projects were planned for deployment of 16 new permanent and transportable radars over the next few years, in addition to those deployed since 2008.

6.30 29 ADS-B sites were currently operational, plus ADS-B data from operational Wide Area Multilateration (WAM) systems. A number of new sites were being considered for ADS-B deployment. ADS-B was used operationally across the Australian continent, and from December 2013 ADS-B equipage would be mandatory at and above F290. Further mandates would result in equipage mandates for all IFR aircraft in all airspace by February 2017. ADS-B data was used to provide monitoring of RVSM.

6.31 The Tasmanian WAM system (TASWAM) had been operational since early 2010, Sydney WAM was operational and supporting a 3NM separation standard in the terminal area and the Parallel Runway Monitor (PRM) application. Australia had no plans to deploy more WAM systems.

6.32 Advanced Surface Movement Guidance and Control Systems (A-SMGCS) was operational at three major international airports, with a fourth in the deployment phase.

Australian FAQ (IP/03)

6.33 Information was provided on the regular meetings of key stakeholders in Australian air traffic management planning in an organisation called ASTRA. The Surveillance Technology Working Group (STWG) prepared advice to ASTRA on issues related to ADS-B and other surveillance technologies.

6.34 STWG members had recently prepared an ADS-B-related Frequently Asked Questions (FAQ) document for the general aviation community. The document was available on the websites of multiple organizations. Hyperlinks were provided for the meeting.

- http://www.airservicesaustralia.com/wp-content/uploads/FAQ-ADS-B-Final-1-0-01NOV12_AIRSERVICES.pdf

- http://www.aopa.com.au/assets/327/FAQ_ADS-B_1-02.pdf

- http://www.aea.net/ads-b/pdf/FAQ_ADS-B_1-01_30OCT12-1.pdf

ADS-B Pilot's Guide (IP04)

6.35 Australia's civil aviation regulator, the Civil Aviation Safety Authority (CASA), had updated its Pilot's Guide on ADS-B. The guide was in booklet form, and was available on the CASA website: http://www.casa.gov.au/wcmswr/_assets/main/pilots/download/ads-b.pdf

The Question of the Entry of Non-ADS-B Fitted Aircraft into Mandated ADS-B Airspace (IP/05)

6.36 The meeting was reminded that the first Australian mandate for ADS-B carriage, applicable to all aircraft operating at or above F290, would commence on 12 December 2013. While operators had already had more than 4 years notice of the ADS-B fitment requirement, analysis of aircraft fitment rates indicated that there would be a number of turbojet aircraft on the Australian register that would not meet the compliance date. The issue of management of non-complying aircraft after the December 2013 date had been the subject of discussion between CASA and the ANSP, Airservices Australia.

6.37 The Australian ADS-B rules provided for CASA to give written authorization to an aircraft to operate without ADS-B, subject to submission of a safety impact assessment as well as other supporting reasons. The safety assessment would have to set out what provisions would apply for safe operation without ADS-B in mandated airspace. Once an exemption or short-term approval was obtained clearance to operate above F290 would be subject to ATC traffic management considerations. ADS-B equipped aircraft would receive priority. The ANSP, Airservices Australia, had requested that any exemptions should be subject to conditional requirements relating to non-guarantee of the availability of ATC clearance, flight planning to operate below F290 to ensure sufficient fuel if clearance above F290 was not available, flight plan indication of the exemption, and the proposed installation modification plan and timeframe for compliance with the mandate. These conditions would be legally binding regulatory requirements, and were currently subject to further discussion.

6.38 Information was also provided on the Australian ADS-B rule provision for flight if the ADS-B equipment was unserviceable.

Update on Australian Mandates for Aircraft GNSS and ADS-B Equipment (IP/06)

6.39 This paper provided information on rulemaking undertaken in 2012 by CASA to support the future air traffic management system, establishing aircraft avionics mandates for satellite based navigation, and the interoperability with Mode S SSR and ADS-B based surveillance systems.

6.40 In addition to the existing mandate for ADS-B equipage effective on 12 December 2013, equipment mandates were established for GNSS navigation under the IFR, fitment of Mode S transponders with ADS-B OUT capability, further forward-fit and retro-fit of ADS-B out equipment.

6.41 As some of these mandates did not apply to foreign registered aircraft, further rulemaking would be undertaken in the next year to additionally require ADS-B fitment to IFR flights below FL290 commencing in 2017

ADS-B Implementation Plan in Bangladesh

6.42 Bangladesh informed the meeting that as Regulator and the Air Navigation Service Provider, Civil Aviation Authority of Bangladesh (CAAB) provides CNS/ATM services. ADS-B is recognized as the new surveillance technology supporting Radar like separation standards to enhance the flight safety and efficiency in Bangladesh. Bangladesh has a plan to install ADS-B ground stations throughout the country as back up to the present radar systems and as a means of filling the gap in radar coverage over Bay of Bengal area.

6.43 One of objectives of ADS-B implementation is to provide surveillance coverage over Bay of Bengal up to the FIR boundary of Dhaka, Kolkata and Yangon. Bangladesh is willing to share ADS-B data and VHF communications with neighboring States to enhance the surveillance capability in the Sub-region.

6.44 The near term ADS-B implementation plan include installation of ADS-B ground stations at the following two locations:

a) Hazrat Shahjalal International Airport, Dhaka.to provide supplementary surveillance coverage and as standby to radar systems ;

b) Cox's Bazar Airport to provide surveillance coverage over Bay of Bengal up to the FIR boundary of Dhaka, Kolkata and Yangon and as standby to radar system at Shah Amanat Intl Airport, Chittagon which is going to be installed in the near future.

6.45 ADS-B ground stations will be integrated with the new ATC Automation system to be installed at Dhaka.

Update from Hong Kong China for ADS-B implementation in Hong Kong (for ADS-B SITF/12)

6.46 Hong Kong China updated the meeting that their ADS-B Ground Station infrastructure is being built and will be completed towards the second half of 2013. Sharing of ADS-B signal from Sanya FIR to Hong Kong FIR commenced in end 2009 for early trials. Sharing of radar and VHF signals from Sanya FIR to Hong Kong FIR commenced in 2005 Overall integration and fusion of these ADS-B signals with radar data on new ATM automation system is being implemented.

6.47 Technical studies/assessment on use of ADS-B to cover low-level surveillance for GA and helicopters due to terrains in Hong Kong has been completed. A strategy for mandatory carriage of ADS-B for GA and helicopters to enhance surveillance capability, ensure aviation safety and alleviate controller workload is being formulated.

Report of FAA ADS-B Activities (IP/07)

6.48 USA provided information on the status of FAA ADS-B implementation and an overview and development of the related activities including regulatory activities, Surveillance and Broadcast Series (SBS) programme, Service delivery approach and current implementation status, SBS monitor.

6.49 The meeting noted that as of 6 March 2013, 450 radio sites of about 700 planned sites (ITT is the service provider) had been declared operational by FAA. The latest implementation map can be found at: http://www.faa.gov/nextgen/flashmap

6.50 The overall FAA ADS-B development strategy through 2017 was also described in the information paper (IP/07). General introduction to Pilot "Advisory Service (ADS-R, TIS-B and FIS-B) and pilot applications including traffic situation awareness with alerts (TSAA), Oceanic ITP and Interval Management (IM) was provided. The meeting noted that FAA was working with partners who were early adopters of ADS-B to upgrade their avionics (Version 1, DO-260A/DO-282A) to the avionics standards (Version 2, DO-260B/DO-282B) required by U.S. ADS-B Final Rule.

6.51 It was noted that a highlight of the FAA activities was the TCAS – ACAS-X program to improve TCAS by using ADS-B IN and improving the system logic to avoid false alerts.

6.52 A presentation prepared by FAA Flight standards was provided which included extensive details of United States Aircraft Certification Standards and Guidance.

Progress on deployment – India (IP/08)

6.53 India provided an update on ADS-B implementation status. The site acceptance test (SAT) has been completed at all the fourteen stations i.e. Agartala, Amritsar, Jaipur, Lucknow, Varanasi, Ahmedabad, Nagpur, Guwahati, Calicut, Cochin, Coimbatore, Mangalore, Port Blair and Trivandrum.

6.54 In addition to the 14 ground stations, India plans to install 7 ADS-B ground stations, by Mid. 2013, at Patna, Bhubaneswar, Jaisalmer, Srinagar, Trichy, Vijayawada and Dibrugarh. This plan is consistent with the Upper Airspace Harmonisation plan of Kolkata and Delhi FIRs, and to supplement surveillance coverage in the Kolkata and Chennai FIRs.

6.55 The ATC Automations systems at 12 major ACCs are capable of processing ADS-B data and providing the information on Situation Data Displays either as standalone ADS-B tracks or reinforced position symbols (fused with radar tracks).

6.56 The ADS-B ground station at Port Blair will provide surveillance coverage over Bay of Bengal at the FIR boundary of Chennai/Kuala Lumpur, Chennai/Kolkata/Yangon. The Port Blair ADS-B information has been integrated into Chennai ATC Automation System and it will be integrated with the ATS Automation system being installed at Kolkata. India is also contemplating ADS-B on off-shore platforms which may eventually lead to uninterrupted surveillance coverage in the BOB region. India would like to learn from the experience of other States which are considering offshore platform deployment before further developing their plans.

6.57 The meeting discussed the timeframe for India's planned ADS-B mandate, and its publication. Due to several reasons, DGCA had not yet been able to respond to the requested publication date. IATA recalled that normally 4 to 5 years' prior notification was required for industry to meet an equipage mandate, but in certain known circumstances such as the Bay of Bengal, which would benefit from the impending mandate in Australia, Singapore and Hong Kong, China, a 2 to 3 year timeframe could be met.

Updates on Surveillance Activities in Japan regarding OCTPASS (IP/09)

6.58 ADS-B WG meeting was informed about the current surveillance activities and future plan for surveillance system in Japan. The CARATS (Collaborative Actions for Renovation of Air Traffic Systems) roadmap included a future plan for implementation of WAM (Wide Area Multilateration) and ADS-B nationwide, with SSR coverage within the Fukuoka FIR, with a target of 2019 for the first commissioned en-route WAM with ADS-B capability.

6.59 Japan also informed the meeting about an advanced airport surface surveillance MLAT system which is called "OCTPASS (Optically Connected Passive Surveillance System)" developed by the Electronic Navigation Research Institute and Japan Radio CO. ,LTD. The OCTPASS installed at an airport in Japan as a trial system can provide improved surveillance performance at a low cost as compared with conventional MLAT systems. The OCTPASS has a superior ability for positioning aircraft with small and simpler components and it has a compatibility with ADS-B. This paper provides a summary of the OCTPASS and concept of its operation. Clarifications were provided to the questions raised for the system during the meeting.

CNS/ATM Matrix updates (WP/09)

6.60 The meeting reviewed and updated the CNS/ATM implementation and planning matrix presented by the Secretariat. The updated matrix is provided in **Appendix F** to this report.

Agenda Item 7: Development of Asia/Pacific Regional ADS-B implementation plan and sub-regional ADS-B implementation plan

Report of CANSO Focus Group meetings

7.1 CANSO presented reports to both the WG and TF meetings regarding the focus group meetings held in Singapore in July 2012. In following up the outcome of the ADS-B SITF/11 meeting, CANSO facilitated two focus group meetings in Singapore in July 12 for the relevant parties to focus on specific project deliverables and milestones using the framework/model developed for the initial phase of the South China Sea project. The meeting for BOB was attended by CAAs/ANSPs/organization from Singapore, India, Myanmar, CANSO and IATA. The meeting for SEA was attended by CAAS, CAAP and CANSO.

7.2 The meeting noted the outcome of the two focus group meeting as provided in the report. It was recalled that India and Myanmar agreed to target date 1st half 2013 for data sharing agreement between India and Myanmar. The meeting was informed that draft agreement on data sharing had been prepared and it was forwarded to India by Myanmar for consideration on 13 March 2013. India informed the meeting that it is under process for internal coordination and approval from Ministries concerned. India reconfirmed that the target date for two administrations to sign the data sharing agreement in the 2nd half 2013.

7.3 CANSO sought progress status report on the ADS-B data sharing in the eastern part of South China Sea area i.e. between Singapore and Brunei; Singapore and the Philippines. It was updated that further progress is subject to the progress of CNS/ATM project in the Philippines including the installation of proposed ADS-B station. Brunei was strongly recommended to explore the possibility of installation of an ADS-B ground station and sharing the ADS-B data and DCPC facilities with Singapore.

7.4 The meeting discussed the use of data sharing agreements to cover the technical requirements for the exchange of data between States with potentially differing regulations. Guidance material on data sharing agreements had been developed and was available on the ICAO Asia/Pacific Office website.

Asia/Pacific Seamless ATM Plan Requirements for ADS-B Surveillance (WP/15)

7.5 The Secretariat presented information on the Asia/Pacific Region Seamless ATM Plan, and the requirements for ADS-B facilities to support the plan.

7.6 Recognizing that with the rapid growth in air traffic in the diverse Asia/Pacific Region there was a need for seamless ATM to ensure safe, efficient and sustainable air transport operations and greater airspace capacity, the 46th Directors General of Civil Aviation (DGCA) Conference (Osaka, Japan, October 2009) had requested APANPIRG to take a lead role in the development of a seamless ATM plan in the Asia/Pacific. The Asia/Pacific Seamless ATM Planning Group (APSAPG) had subsequently been formed. The Seamless ATM Plan was now in the mature stage of its drafting, and was expected to be finalized at the 4th and final meeting of APSAPG in June.

7.7 The South Asia/Indian Ocean ATM Coordination Group (SAIOCG) and the South-East Asia Coordination Group (SEACG) had formed small working groups (SWG) to assess current status of planning of implementation of surveillance, identify barriers to implementation, make recommendations to assist harmonized ATM procedures, and make recommendations that assisted implementation in accordance with, *inter alia*, Asia/Pacific Seamless ATM initiatives, for Air Traffic Flow Management, Communications and ATS Surveillance.

7.8 The draft Seamless ATM plan categorized airspace by reference to its communications, navigation and surveillance capability. Category S airspace was that serviced, or potentially serviced, by direct ATS communications and surveillance. It was pointed out to the meeting that these airspace categories were formulated for the purpose of seamless ATM planning, and did not change other existing airspace descriptors such as the ICAO airspace classification.

7.9 The draft plan included Preferred Airspace and Route Specifications (PARS). Under PARS Phase I, effective 12 November 2015, all Category S controlled airspace F195 and above should be designated as non-exclusive ADS-B airspace, i.e. ADS-B equipped aircraft would be afforded priority over non-equipped aircraft. The airspace would require operation of ADS-B using 1090 MHz extended squitter (1090ES) technology complying with RTCA DO-260, 260A or 260B standards. A number of high density FIRS supporting the busiest Asia/Pacific traffic flows were identified for priority implementation. **Figure 1** illustrates the high density FIRs.

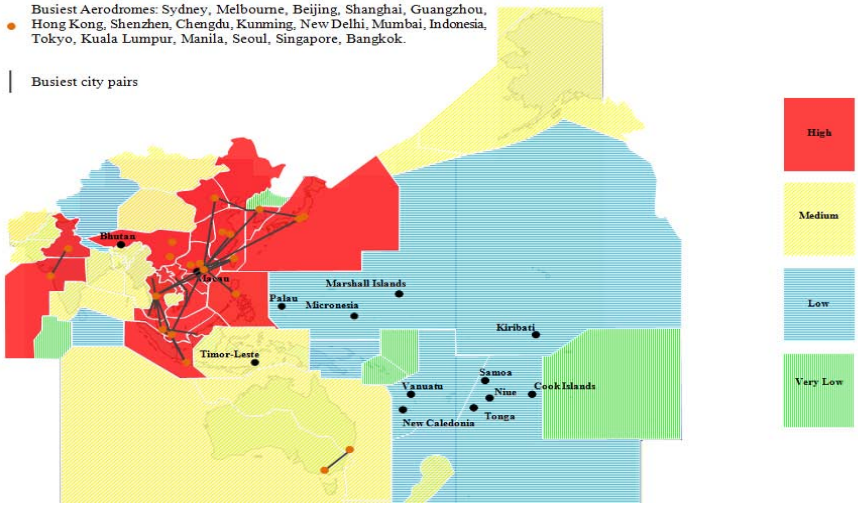

Figure 1: High Density FIRs

7.10 Under PARS Phase II, effective 9 November 2018, the mandatory carriage of ADS-B out would be prescribed in areas where ADS-B-based separation services were provided.

7.11 The plan specified that ADS-B (1090ES), multilateration or radar surveillance systems should be used to provide coverage of all Category S-capable airspace as far as practicable.

7.12 The plan further specified Preferred ATM Service Levels (PASL). For en-route operations under PASL Phase I, effective 12 November 2015, the plan stated that subject to Annex 11 State safety assessment requirements, the minimum ATC horizontal separation standard of between 5NM and 10NM should be applied during normal operations.

7.13 The SAIOCG and SEACG SWGs (Surveillance) had conducted a study of current surveillance gaps in South Asia and South-East Asia, based on planned ADS-B implementation. Particularly in the case of the South China Sea, there was a significant gap in the combined SSR and ADS-B coverage of airspace which was becoming increasingly congested, and was identified as Category S airspace in the Seamless ATM Plan. Management of the airspace required large non-surveillance separation standards supported by a Flight Level Allocation Scheme.

7.14 Surveillance analysis and planning conducted by SAIOCG and SEACG SWGs was based on generic circular 250NM radius coverage estimates, which were highly inaccurate and could lead to unrealistic expectations of planned surveillance capability. There was a pressing need for high integrity coverage predictions to be made available for this purpose. The meeting discussed the need for accurate predictions and their benefits, and agreed to include a statement regarding the need for accurate coverage modelling in the Asia/Pacific Region ADS-B Implementation Guidance Document.

7.15 The meeting was reminded that ICAO Doc 4444 (PANS/ATM) specified that the horizontal separation minimum based on radar and/or ADS-B was 5.0 NM. The Asia/Pacific Air Navigation Concept of Operations included the principle that, in areas where the provision of direct ATS surveillance was possible, ATC separation must be based on these surveillance systems. Hong Kong China recapped their comments made during APSAPG/3 that States should continue to adopt the existing arrangement, ie: "Subject to mutual agreement between the States concerned to agree on the applicable ATC separation standard at the transfer point". Airspace capacity in many Asia/Pacific States was being limited by the use of large separation standards between surveillance-identified aircraft, sometimes used inappropriately in place of properly developed Air Traffic Flow Management (ATFM) processes.

7.16 Noting the above, there may be cases during early implementation stages where the PANS/ATM specified surveillance separation standard may not be applicable in ADS-B coverage, particularly in cases where ADS-B coverage had been provided and the data integrated into the ATM automation system, but the service continuity requirements for 5NM separation had not yet been achieved, or the necessary safety case had not yet been completed. In these circumstances the use of ADS-B data to monitor existing procedural separation standards would provide benefits including improved ATC and pilot familiarity with the technology, improved ATC situational awareness, extension of ATM automation system safety net alerts, automated update of the flight plan, and the decrease in voice position reports from identified aircraft. As an interim measure States could consider a phased implementation of ADS-B services similar to the following:

i) Monitor Procedural Separation:

- Existing time or distance based procedural separation monitored by ATC.
- No requirement for pilot voice reports of position for identified aircraft.

ii) 5.0 NM ADS-B based horizontal separation.

7.17 The meeting discussed the applicability of ADS-B equipage mandates outside territorial airspace and recalled APANPIRG/22 in 2011 adopted Conclusion 22/8 − ADS-B Airspace Mandate, according to which States intending to implement ADS-B based surveillance services may designate portions of airspace within their area of responsibility:

a) mandate the carriage and use of ADS-B equipment; or

b) provide priority for access to such airspace for aircraft with operative ADS-B as equipment over those aircraft not operating ADS-B equipment.

South China Sea ADS-B Project Updates (WP/19)

7.18 On behalf of Indonesia and Viet Nam, Singapore presented updates on the progress of the collaborative efforts of three States for South China Sea project since the last Task Force meeting. As in the previous update, the ADS-B stations in both Matak and Natuna are installed. Singapore had received ADS-B data from the Indonesian islands of Matak and Natuna while Indonesia had also received ADS-B data from Singapore. It was also updated that Singapore and Viet Nam had signed an ADS-B collaboration agreement. The VHF radio sets for both Matak and Natuna are being installed and the testing of some of these sets has commenced. They are expected to be fully tested by 1st half of 2013. The VSAT communication links for the VHF radio are currently being established and tested between Singapore and the Indonesian islands.

7.19 The ADS-B station in Con Son was installed in November 2012. The data is currently being sent to Singapore for technical evaluation. The VHF station at Con Son is currently being installed and is expected to be ready for operational use by 2nd half of 2013. Flight calibration will be conducted to determine the coverage of the station. The ATM teams from both States have begun the initial round of discussions to improve traffic management for the ATS routes under the ADS-B coverage area of the South China Sea. Affected ANSPs (Hong Kong, China and Sanya) along the two major ATS routes (i.e. L642 and M771) will also be involved in future discussions to improve the capacity of the affected ATS routes.

7.20 CANSO observed that the information in this paper underlining the point about the ATM aspect was very important, as the real outcome was to be found in increased capacity and cost benefits.

Review of South East Asia (SEA), Bay of Bengal (BOB) Sub-regional and East Asia Projects

7.21 The meeting reviewed the updates on the Sub-regional ADS-B implementation projects as presented by the Ad hoc working groups at ADS-B SITF/12 meeting. The discussions were based on the outcome of previous meetings, ADS-B SITF/11 and SEA/BOB ADS-B WG/8. The outcome of discussions of the Ad Hoc working groups is provided in **Appendix G** to this report.

Agenda Item 8: Any other business

Regional Surveillance Strategy (WP/11)

8.1. The meeting reviewed the Surveillance Strategy for the Asia and Pacific Region presented by the Secretariat. The meeting identified that ADS-B IN may be required to be included in the strategy and additional statement on the recommendations from AN Conf/12 may also be included into the consideration part of the Strategy. The recommended changes are reflected in the **Appendix H** to this report and following draft Conclusion was formulated for consideration by the CNS SG of APANPIRG.

Draft Conclusion 12/7 – Revised Surveillance Strategy for the Asia/Pacific Region

That, the revised Surveillance Strategy for the Asia/Pacific Region provided in **Appendix H** to this report be adopted.

Discussion on transition to 260B

8.2 The meeting discussed whether the Task Force need to consider how to transition to RTCA DO260B recognizing that DO 260B is being adopted by ICAO as Version 2 and is being adopted as global standard and considering the need to align with the direction being taken by Europe and United States. It was decided that the regional strategy on equipage requirement for DO 260B (Version 2) should be developed. The Chair commented that this should be supported, and the best way would be a forward fit from a specified date. The difficulty would be in requiring those aircraft already equipped with DO-260 or -260A avionics to retrofit. The question would be when to discontinue support for DO-260/260A. Australia, Hong Kong China and Singapore agreed to work together to formulate a proposal for consideration by the Task Force.

Note of appreciation

8.3 The meeting expressed its appreciation and gratitude to the Airports Authority of India for hosting the ADS-B Seminar and the meeting and the excellent arrangements made for the meeting including all associated activities.

8.4 The meeting also expressed its appreciation to the Department of Civil Aviation, Myanmar for hosting the Working Group meeting and all activities organized during meeting.

8.5 As 10th anniversary of the ADS-B SITF since 2003, the meeting recorded its appreciation to Mr. Greg Dunstone, Chairman of the Task Force for his continuous efforts, dedication and contribution to regional ADS-B planning and implementation activities. ICAO APAC Regional Office presented him a plaque marking his achievements.

Time and Venue of Next Meeting

8.6 The meeting discussed proposed dates for next meeting of the Task Force and the SEA/BOB ADS-B Working Group meeting. The SEA/BOB working group meeting was scheduled to be held in (12-14) November 2013. The members of the ADS-B Working Group will be informed well in advance of venue and exact dates of the meetings after consultation with the concerned.

8.7 Hong Kong China reconfirmed to host the next meeting of ADS-B Study and Implementation Task Force from 22 to 25 April 2014 at their new CAD Headquarters complex in Hong Kong, China.

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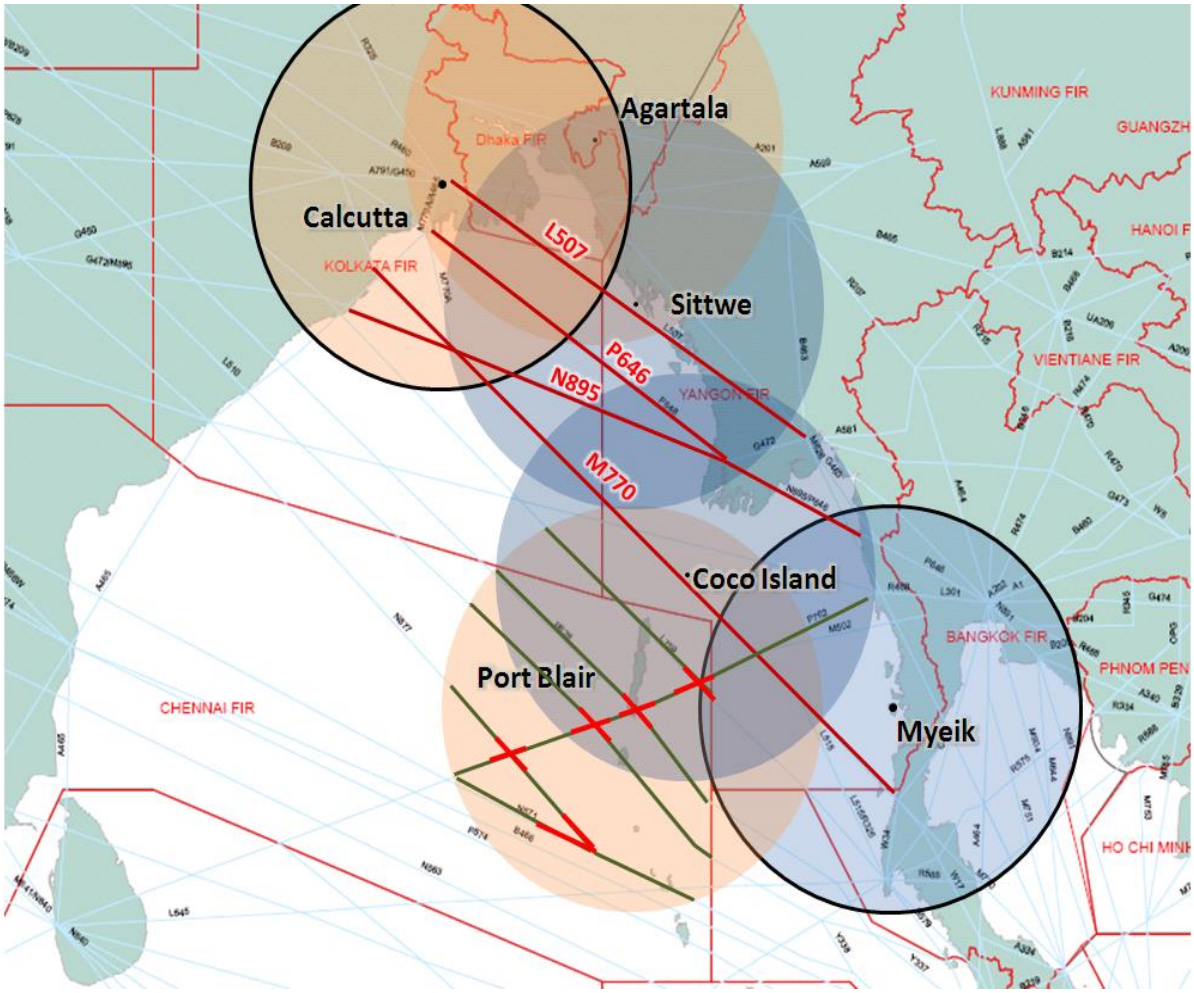
Milestone on ADS-B Data sharing in the BOB Sub-region

(Between India and Myanmar)

Milestone / Issues	India	Myanmar
Agree in principle to share data from sites	Agreed during SEA/BOB ADS-B WG/7	Agreed during SEA/BOB ADS-B WG/7
Nominated sites	Agartala & Port Blair	Sittwe & Coco Island
Objectives	• Reduce separation through enhanced surveillance / communication coverage • Enhance safety and capacity over crossing routes • Back-up surveillance / communication coverage • Enhancement of surveillance coverage at lower altitude	
Benefits	• End-to-end coverage on M770 and other trunk routes (refer to chart).	
Date to sign data sharing agreement	1H 2013	1H 2013
Date to issue NOTAM/AIC for ADS-B mandate	Publish in 1H 2013 Effective from 1H 2015	Publish in 1H 2013 Effective from 1H 2015
Date to sign operational Letter of Agreement	2H 2013	2H 2013
Date to test inter-FIR VSAT link	1H 2014	1H 2014
Date to commission VSAT link	1H 2014	1H 2014
Date to commission ADS-B ground stations	2H 2012	1H 2013
Date to commence testing of ADS-B data from other FIR	1H 2014	1H 2014
Date to complete installation of VHF radio for the other party	1H 2014	1H 2014
Date to commence testing of VHF radio	2H 2014	2H 2014
Date to commence testing of VHF by the other party	2H 2014	2H 2014
Date to commission ADS-B & VHF service	2H 2014	2H 2014


Agartala
Calcutta
Sittwe
Coco Island
Port Blair
Myeik
L507
P646
N895
M770
Dhaka FIR
KOLKATA FIR
YANGON FIR
CHENNAI FIR
KUNMING FIR
VIENTIANE FIR
BANGKOK FIR
PHNOM PEN
HO CHI MINH

Harmonization Framework for ADS-B Implementation along ATS Routes M770, N895, P646 and L507 in Bay of Bengal

Harmonization Framework for ADS-B Implementation along ATS Routes M770, N895, P646 & L507 in Bay of Bengal			
No.	**What to harmonize**	**What was agreed**	**Issue / what needs to be further discussed**
1	Mandate Effective	India : 1H 2015 Myanmar : 1H 2015	
2	ATC Operating Procedures	No need to harmonize (Both India and Myanmar agreed they will publish mandate in 1H 2013)	Refer to SAIOACG for consideration of the impact of expanding ADS-B surveillance on ATC Operating Procedures including Large Scale Weather procedures.
3	Mandate Publish Date	No need to harmonize	To publish equipment requirements as early as possible.
4	Date of Operational Approval	No need to harmonize	
5	Flight Level	India and Myanmar - At or Above FL260 (ADS-B airspace) - Below FL260 (Non-ADS-B airspace)	

6	Avionics Standard (CASA/AMC2024)	India & Mynamar CASA or AMC2024 or FAA AC No. 20-165	ADS-B Task Force agreed that DO260B will be accepted as well. India and Myanmar to discuss whether their ADS-B GS will accept DO260, DO260A and DO260B.
7	Flight Planning	On or after 15 Nov 2012, as per new flight plan format	
8	Aircraft Approval		
8a)	Procedures if Aircraft Not Approved or Aircraft without a Serviceable ADS-B Transmitting Equipment before Flight	India and Myanmar: FL250 and Below	
8b)	Aircraft Approved but Transmitting Bad Data (Blacklisted Aircraft)	For known aircraft, treat as non ADS-B aircraft.	Share blacklisted aircraft among concerned States/Administration
9	Contingency Plan		
9a)	Systemic Failure such as Ground System / GPS Failure	Revert back to current procedure.	

9b)	Avionics Failure or Approved Aircraft Transmitting Bad Data in Flight	Provide other form of separation, subject to bilateral agreement. From radar/ADS-B environment to ADS-B only environment, ATC coordination may be able to provide early notification of ADS-B failure.	Address the procedure for aircraft transiting from radar to ADS-B airspace and from ADS-B to ADS-B airspace.
10	Commonly Agreed Route Spacing	SAIOCG	Need for commonly agreed minimal in-trail spacing throughout.

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UPDATED ADS-B SUBJECT/TASKS LIST FOR THE TASK FORCE

Serial No.	His No.	Subject/Tasks List	Associated with Strategic Objective	Associated GPI	Deliverables	Target Date	Status and Action to be taken and led by
1	18	Develop and implement regional collaboration project for ADS-B Out operational use including data sharing in South East Asia and report on implementation progress.	D. Efficiency	GPI01/05/06/09/ 14/16/17/21/22	Sub-regional ADS-B collaboration project has been developed.	Dec-13	SEA/BOB WG - On going
2	19	Develop and implement regional collaboration project for ADS-B out operational use including data sharing in South Pacific and report on implementation progress.	D. Efficiency	GPI01/05/06/09/ 14/16/17/21/22	Develop and implement sub-regional ADS-B collaboration project.	Dec-13	South Pacific States On-going
3	21	Study application of ADS-B and mutilate for precision runway monitoring.	D. Efficiency	GPI01/05/06/09/ 14/16/17/21/22	Guidance material for implementation	April-14	All Members On-going
4	22	Perform data collection and data analysis of ADS-B messages to examine GPS performance in different geographic areas.	D. Efficiency	GPI01/05/06/09/ 14/16/17/21/22	Report of data collected and analyzed - continuous	April-14	All Members On-going
5	23	Develop and implement regional collaboration project for ADS-B out operational use including data sharing in Bay of Bengal area and report on implementation progress.	D. Efficiency	GPI01/05/06/09/ 14/16/17/21/22	Develop and implement sub-regional ADS-B collaboration project.	April-09/ December-13	Bay of Bengal States
6	30	To exam existing air-ground communication and surveillance capability in the boarder area between China and Myanmar and identify the need and possibility for sharing ADS-B data from potential ADS-B ground station at Lashio.	D. Efficiency	GPI01/05/06/09/ 14/16/17/21/22	Report status and position	April-13	China and Myanmar On-going
7	36	States to advise when their ground stations can be upgraded to receive ADS-B DO260B compliant ADS-B data.	D. Efficiency	GPI01/05/06/09/ 14/16/17/21/22	Report status at the Task Force meetings	April-14	All Members

Serial No.	His No.	Subject/Tasks List	Associated with Strategic Objective	Associated GPI	Deliverables	Target Date	Status and Action to be taken and led by
8	38	Bring attention of States concerned to the integrity requirement as specified in the ICAO Document (Circular 326) and the risk that ADS-B data without integrity (such as NUC=0) should not be used to support either separation or situation awareness.	A. Safety	GPI01/05/06/09/ 14/16/17/21/22	Through SUPPs amendment	July-13	Regional Office
9	39	Report experience in using ADS-B data for performing safety monitoring including RVSM aircraft-height keeping performance monitoring	A. Safety	GPI01/05/06/09/ 14/16/17/21/22	Working papers	April-14	Australia and USA

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LIST OF ACTION ITMES (COMPLETED ACTION ITEMS HAVE BEEN REMOVED)

No.	Subject	Forum Raised	Status / Target Date	Remarks / follow-up	Action Party
1.	Prepare a paper on the plans for and status of ADS-B data sharing between Indonesia-Malaysia	SEA ADS-B WG/4	Updated in ADS-B SITF/8 ; SEA/BOB WG/9	On-going	Malaysia
2.	Increase awareness of Airlines' responsibility to get operational and airworthiness approval from State of registry and the urgency required to meet various regional 2013 mandates.	SEA ADS-B WG/6	Reminders sent to States several times. CLOSED	Reminder to airlines and feedback to TF	IATA
3.	To examine existing air-ground communication and surveillance capability in the boarder area between China and Myanmar and identify the need and possibility for sharing ADS-B data from potential ADS-B ground station at Lashio.	SEA ADS-B WG/6	On going ADS-B WG/9 and ADS-B SITF/13, Lashio and Gengma have plans for ADS-B ground stations installation	Report status and position (ADS-B GS to be installed at Lashio has been identified)	China & Myanmar
4.	To exam possibility of sharing ADS-B data from potential ADS-B ground station from Coco and Sittwe.	SEA ADS-B WG/6	**Completed** Exam. has been made and will sign letter of agreement for data sharing ADS-B SITF/12	Report status and possibility	Myanmar & India
5.	ATS operational letter of agreements between neighboring FIRs among South China Sea States for radar-like surveillance service	SEA ADS-B WG/6	Ongoing – Reports at each meeting of the WG and Task Force as well.	Report progress	China, Hong Kong China, Viet Nam and Singapore
6.	India to coordinate with Myanmar, Bangladesh Maldives and Sri Lanka for ADS-B data sharing	SEA ADS-B WG/7	SEA ADS-B WG/8 On-going revised target SEA/BOB	Coordination	India

LIST OF ACTION ITMES (COMPLETED ACTION ITEMS HAVE BEEN REMOVED)

No.	Subject	Forum Raised	Status / Target Date	Remarks / follow-up	Action Party
			WG/9		
7.	A survey be conducted for ADS-B certificate/operational approval issued by Administrations	SEA ADS-B WG/7	**COMPLETED** ADS-B SITF/12	Survey result reported to ADS-B SITF/12	ICAO Regional Office
8.	Comprehensive updates AIGD to current	SEA/BOB ADS-B WG/8	ADS-B SITF/12	Review and Update	Australia, Hong Kong China
9.	Harmonize process of detection bad TX for inclusion into "Blacklist"	SEA/BOB ADS-B WG/8	**COMPLETED** at ADS-B SITF/12	Review and prepare a paper	Singapore & Hong Kong China
10.	ADS-B data sharing agreement for BOB	SEA/BOB ADS-B WG/8	Draft agreement from Myanmar to India on 16 March 2013 under reviewed by India ADS-B TF/12	Report progress	Myanmar, India
11.	Update "harmonization Framework Document" for BOB	SEA/BOB ADS-B WG/8	ADS-B SITF/12 (31 Dec. 2012)	Report progress	India, Myanmar
12.	Explore possibility for installation of an ADS-B ground station on the Nicobar Islands to cover eastern gateway of BOB Sub-region	SEA/BOB ADS-B WG/8	ADS-B SITF/13	Report result of study	India
13.	Review ADS-B deployment plan in Bangladesh with consideration of comments received during the WG/8 meeting	SEA/BOB ADS-B WG/8	COMPLETED Revised plan presented to ADS-B SITF/12.	Report result of deployment plan review	Bangladesh
14.	Include ADS-B avionics performance monitoring as separate agenda item for ADS-B SITF/12	SEA/BOB ADS-B WG/8	COMPLETED (ai5) ADS-B SITF/12	Add as separate Agenda Item	Secretariat

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INTERNATIONAL CIVIL AVIATIN ORGANIZATION
ASIA AND PACIFIC OFFICE

ADS-B IMPLEMENTATION AND OPERATIONS GUIDANCE DOCUMENT

Edition ~~5~~6.0 - ~~September~~June ~~2012~~2013

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TABLE OF CONTENTS

1. INTRODUCTION .....

The Eleventh ICAO Air Navigation Conference held in 2003 recommended that States recognize ADS-B as an enabler of the global ATM concept bringing substantial safety and capacity benefits; support the cost-effective early implementation of it; and ensuring it is harmonized, compatible and interoperable with operational procedures, data linking and ATM applications.

The Twelve ICAO Air Navigation Conference held in 2012 endorsed the Aviation System Block Upgrades (ASBU) to provide a framework for global harmonization and interoperability of seamless ATM systems. Among the Block Upgrades, the Block 0 module "Initial Capability for Ground Surveillance" recommends States to implement ADS-B which provides an economical alternative to acquire surveillance capabilities especially for areas where it is technically infeasible or commercially unviable to install radars.

This ADS-B Implementation and Operations Guidance Document (AIGD) provides guidance material for the planning, implementation and operational application of ADS-B technology in the Asia and Pacific Regions.

The procedures and requirements for ADS-B operations are detailed in the relevant States' AIP. The AIGD is intended to provide key information on ADS-B performance, integration, principles, procedures and collaboration mechanisms.

The content is based upon the work to date of the APANPIRG ADS-B Study and Implementation Task Force (SITF) and various ANC Panels developing provisions for the operational use of ADS-B. ~~It should be noted that this edition of the document has been produced ahead of anticipated amendments to PANS-ATM (Doc 4444) and Annexes 2, 4, 11 and 15 to the convention. It is therefore likely that some a~~Amendment to the guidance material will be required as new/revised SARPs and PANS are published.

1.1 ARRANGEMENT OF THE AIGD

The AIGD consists of the following Parts:

Section 1	Introduction ~~and Document Management~~
Section 2	Acronyms and Glossary of Terms
Section 3	Reference Documents
Section 4~~3~~	~~System Integrity and Monitoring~~ADS-B Data
Section 5~~4~~	ADS-B ~~Data Message Set~~Implementation
Section 6~~5~~	~~ADS-B Procedures~~Template of Harmonization Framework for ADS-B Implementation
Section 7~~6~~	~~Emergency and Non-Routine Procedures~~System Integrity and Monitoring
~~Section 7~~	~~ADS-B Implementation~~
Section 8	~~Endnotes~~Reliability and Availability Considerations
Section 9	ADS-B Regulations and Procedures
Section 10	Security Issues Associated with ADS-B

1.2 DOCUMENT HISTORY AND MANAGEMENT

This document is managed by the APANPIRG. It was introduced as draft to the first Working Group meeting of the ADS-B SITF in Singapore in October 2004, at which it was agreed to develop the draft to an approved working document that provides implementation guidance for States. The first edition was presented to APANPIRG for adoption in August 2005. It is intended to supplement SARPs, PANS and

relevant provisions contained in ICAO documentation and it will be regularly updated to reflect evolving provisions.

1.3 COPIES

Paper copies of this AIGD are not distributed. Controlled and endorsed copies can be found at the following web site: http://www.bangkok.icao.int/edocs/index.html~~http://www.icao.int//apac/edocs/~~

Copy may be freely downloaded from the web site, or by emailing APANPIRG through the ICAO Asia and Pacific Regional Office who will send a copy by return email.

1.4 CHANGES TO THE AIGD

Whenever a user identifies a need for a change to this document, a ~~request~~ Request for Change (RFC) Form (see Section 1.6 below) should be completed and submitted to the ICAO Asia and Pacific Regional Office. The Regional Office will collate RFCs for consideration by the ADS-B Study and Implementation Task Force.

When an amendment has been agreed by a meeting of the ADS-B Study and Implementation Task Force then a new version of the AIGD will be prepared, with the changes marked by an "|" in the margin, and an endnote indicating the relevant RFC, so a reader can see the origin of the change. If the change is in a table cell, the outside edges of the table will be highlighted; e.g.:

Final approval for publication of an amendment to the AIGD will be the responsibility of APANPIRG.

1.5 EDITING CONVENTIONS

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1.6 AIGD REQUEST FOR CHANGE FORM

RFC Nr:	

Please use this form when requesting a change to any part of this AIGD. This form may be photocopied as required, emailed, faxed or e-mailed to ICAO Asia and Pacific Regional Office +66 (2) 537-8199 or icao_apac@bangkok.icao.int

1. SUBJECT:
2. REASON FOR CHANGE:
3. DESCRIPTION OF PROPOSAL: [expand / attach additional pages if necessary]

4. REFERENCE(S):			
5. PERSON INITIATING:		**DATE:**	
ORGANISATION:			
TEL/FA/X/E-MAIL:			
6. CONSULTATION	**RESPONSE DUE BY DATE:**		
Organization	**Name**	**Agree/Disagree**	**Date**
7. ACTION REQUIRE :			
8. AIGD EDITOR		**DATE REC'D :**	
9. FEEDBACK PASSED		**DATE :**	

1.7 AMENDMENT RECORD

Amendment Number	Date	Amended by	Comments
0.1	24 December 2004	W. Blythe H. Anderson	Modified draft following contributions from ADS-B SITF Working Group members. Incorporated to TF/3 Working Paper #3.
0.2 (1.0)	24 March 2005	H. Anderson	Final draft prepared at ADS-B SITF WG/3
0.3 (1.1)	03 June 2005	Nick King	Amendments following SASP WG/WHL meeting of May 2005
0.4	15 July 2005	CNS/MET SG/9	Editorial changes made
1.0	26 August 2005	APANPIRG/16	Adopted as the first Edition
2.0	25 August 2006	Proposed by ADS-B SITF/5 and adopted by APANPIRG/17	Adopted as the second Edition
3.0	7 September 2007	Proposed by ADS-B SITF/6 and adopted by APANPIRG/18	Adopted as the second amendment (3rd edition)
4.0	5 September 2011	Proposed by ADS-B SITF/10 and adopted by APANPIRG/22	Adopted amendment on consequential change to the Flight Plan and additional material on the reliability and availability for ADS-B ground system~~.~~
5.0	14 September 2012	Proposed by ADS-B SITF/11 and adopted by APANPIRG/23	Included sample template on harmonization framework~~.~~
6.0	June 2013	Proposed by ADS-B SITF/12 and adopted by APANPIRG/24	Revamped to include the latest ADS-B developments and references to guidance materials on ADS-B implementation

2. ACRONYM LIST & GLOSSARY OF TERMS

2.1 ACRONYM LIST

ACID	Aircraft Identification
ADS-C	Automatic Dependent Surveillance - Contract
ADS-B	Automatic Dependent Surveillance - Broadcast
AIGD	ADS-B Implementation and Operations Guidance Document
AIP	Aeronautical Information Publication
AIT	ADS-B Implementation Team
AMSL	Above Mean Sea Level
APANPIRG	Asia/Pacific Air Navigation Planning and Implementation Regional Group
ARINC	Aeronautical Radio Incorporate
ATC	Air Traffic Control (or Air Traffic Controller)
ATM	Air Traffic Management
ATS	Air Traffic Services
ATSP	ATS Provider
ATSU	ATS unit
CNS	Communications, Navigation, Surveillance
CRC	Cyclic Redundancy Check
CDTI	Cockpit Display Traffic Information
DAIW	Danger Area Infringement Warning
FIR	Flight Information Region
FLTID	Flight Identification
FMS	Flight Management System
FOM	Figure of Merit used in ASTERIX messaging
GPS	Global Positioning System (USA)
HPL	Horizontal Protection Level
ICAO	International Civil Aviation Organization
MSAW	Minimum Safe Altitude Warning
MTBF	Mean Time Between Failures
MTCA	Medium Term Conflict Alert
MTTR	Mean Time To Restore
NAC	Navigation Accuracy Category
NIC	Navigation Integrity Category
PRS	Problem Reporting System
RAI	Restricted Area Intrusion
RAM	Route Adherence Monitoring
RAIM	Receiver Autonomous Integrity Monitoring
RFC	Request for Change
RNP	Required Navigation Performance
SIL	Surveillance Integrity Level
SITF	Study and Implementation Task Force
STCA	Short Term Conflict Alert

2.2 GLOSSARY OF TERMS

ADS-B In	An ADS-B system feature that enables the display of real time ADS-B tracks on a situation display in the aircraft cockpit.
ADS-B Out	An ADS-B system feature that enables the frequent broadcast of accurate aircraft position and vector data together with other information.
Asterix 21	Eurocontrol standard format for data message exchange
FOM (Figure of Merit)	A numeric value that is used to determine the accuracy and integrity of associated position data.
HPL (Horizontal Position Limit)	The containment radius within which the true position of the aircraft will be found for 95% of the time (See DO229c).
NAC (Navigational Accuracy Category)	Subfield used to announce the 95% accuracy limits for the horizontal position data being broadcast.
NIC (Navigational Integrity Category)	Subfield used to specify the containment radius integrity associated with horizontal position data.
NUCp (Navigation Uncertainty Category)	A numeric value that announces the integrity of the associated horizontal position data being broadcast.
SIL (Surveillance Integrity Level)	Subfield used to specify the probability of the true position lying outside the containment radius defined by NIC without being alerted.

3. REFERENCE DOCUMENTS

Id	Name of the document	Reference	Date	Origin	Domain
1	Annex 2: Rules of the Air	Tenth Edition Including Amendment 43 dated 16/7/12	July 2005	ICAO	
2	Annex 4: Aeronautical Chart	~~Tenth~~ Eleventh Edition including A~~a~~mendment 5~~3~~6 dated ~~25~~12/7~~11~~/~~04~~10	July ~~2001~~2009	ICAO	
3	Annex 10: Aeronautical Telecommunications, Vol. IV – Surveillance Radar and Collision Avoidance Systems	~~Third~~ Fourth Edition Including A~~a~~mendment ~~77~~87 ~~dated~~dated ~~28~~12/~~11~~7/~~02~~10	July 200~~2~~7	ICAO	
4	Annex 11: Air Traffic Services	Thirteenth Edition including Amendment 4~~3~~8 ~~dated~~ dated ~~24~~16/~~11~~7/~~05~~12	July 2001	ICAO	
5	Annex 15: Aeronautical Information Services	~~Twelfth~~ Thirteen Edition	July ~~2004~~2010	ICAO	
6	PAN-ATM (Doc 4444/ATM501)	~~Fourteenth~~ Fifteen Edition including ~~latest~~ Amendment~~s~~ 4 applicable on 15/11/12	20070~~1~~	ICAO	
7	Manual on Airspace Planning Methodology for the Determination of Separation Minima (Doc 9689/AN953)	First Edition including Amendment 1 dated 30/8/02	1998	ICAO	
8	Doc 9859 Safety Management Manual (SMM)	Third Edition	2012	ICAO	
9	ICAO Circular 326 AN/188 "Assessment of ADS-B and Multilateration Surveillance to Support Air Traffic Services and Guidelines for Implementation".	First Edition	2012	ICAO	
10	Regional Supplementary Procedures (Doc 7030)	Fifth Edition including Amendment 5 dated 22/7/11	2008	ICAO	

4. ADS-B DATA

~~The Eleventh ICAO Air Navigation Planning Conference recommended that States recognize ADS-B as an enabler of the global ATM concept bringing substantial safety and capacity benefits; support the cost-effective early implementation of it; and ensuring it is harmonized, compatible and interoperable with operational procedures, data linking and ATM applications.~~

APANPIRG has decided to use 1090MHz Extended Squitter data link for ADS-B data exchange in the Asia and Pacific Regions. In the longer term an additional link type may be required.

~~ADS-B data requirements for aircraft transmissions are contained in Annex 10 Vol IV. ADS-B data requirements for ground-ground messaging shall be determined by States. International exchange of ground-ground messaging should use ASTERIX 21 Version 0.23 format.~~To ensure interoperability of ADS-B ground stations in the Asia Pacific (ASIA/PAC) Regions, during the 16th APANPIRG Meeting held in August 2005, the ASTERIX Category 21 version 0.23 (V0.23) which had incorporated DO260 standard was adopted as the baselined ADS-B data format for deployment of ADS-B ground stations and sharing of ADS-B data in the ASIA/PAC Regions. At this time, DO260A and DO260B standards were not defined.

This baselined version provides adequate information so that useful ATC operational services, including aircraft separation, can be provided. V0.23 can be used with DO260, DO260A and DO260B ADS-B avionics/ground stations to provide basic ATC operational services. However, V0.23 cannot fully support the more advanced capabilities offered by DO260A and DO260B.

States intending to implement ADS-B surveillance and share ADS-B data with others might consider to adopt a more updated version of ASTERIX in order to make use of the advanced capabilities offered by DO260A and DO260B compliant avionics.

A guidance material on generation, processing and sharing of ASTERIX Cat. 21 ADS-B messages is provided on the ICAO APAC website “http://www.bangkok.icao.int/edocs/index.html” for reference by States.

In this guidance material, the ADS-B data contained inside ASTERIX Cat 21 are classified as Group 1 (mandatory), Group 2 (Desirable) and Group 3 (Optional). It is required to transmit all data that are operationally desirable (Group 2), when such data are received from the aircraft, in addition to the data that are mandatory (Group 1) in ASTERIX messages. Whether Group 3 optional data will need to be transmitted or not should be configurable on item-by-item basis within the ADS-B ground station depending on specific operational needs.

It is considered necessary that all data that are mandatory in ASTERIX messages (i.e. Group 1 data items) and operationally desirable (i.e. Group 2 data items) when such data are received from aircraft, should be included in data sharing. In the event that the data have to be filtered, the list of optional data items (i.e. Group 3 data items) needs to be shared will be subject to mutual agreement between the two data sharing parties concerned.

5. ADS-B IMPLEMENTATION

5.1 INTRODUCTION

5.1.1 Planning

There are a range of activities needed to progress ADS-B implementation from initial concept level to operational use. This section addresses the issues of collaborative decision making, system compatibility and integration, while the second section of this chapter provides a checklist to assist States with the management of ADS-B implementation activities.

5.1.2 Implementation team to ensure international coordination

5.1.2.1 Any decision to implement ADS-B by a State should include consultation with the wider ATM community. Moreover, where ADS-B procedures or requirements will affect traffic transiting between states, the implementation should also be coordinated between States and Regions, in order to achieve maximum benefits for airspace users and service providers.

5.1.2.2 An effective means of coordinating the various demands of the affected organizations is to establish an implementation team. Team composition may vary by State or Region, but the core group responsible for ADS-B implementation planning should include members with multidiscipline operational expertise from affected aviation disciplines, with access to other specialists where required.

5.1.2.3 Ideally, such a team should comprise representatives from the ATS providers, regulators and airspace users, as well as other stakeholders likely to be influenced by the introduction of ADS-B, such as manufacturers and military authorities. All identified stakeholders should participate as early as possible in this process so that their requirements can be identified prior to the making of schedules or contracts.

5.1.2.4 The role of the implementation team is to consult widely with stakeholders, identify operational needs, resolve conflicting demands and make recommendations to the various stakeholders managing the implementation. To this end, the implementation team should have appropriate access to the decision-makers.

5.1.3 System compatibility

5.1.3.1 ADS-B has potential use in almost all environments and operations and is likely to become a mainstay of the future ATM system. In addition to traditional radar-like services, it is likely that ADS-B will also be used for niche application where radar surveillance is not available or possible. The isolated use of ADS-B has the potential to foster a variety of standards and practices that, once expanded to a wider environment, may prove to be incompatible with neighbouring areas.

5.1.3.2 Given the international nature of aviation, special efforts should be taken to ensure harmonization though compliance with ICAO Standards and Recommended Practices (SARPs). The choice of systems to support ADS-B should consider not only the required performance of individual components, but also their compatibility with other CNS systems.

5.1.3.3 The future concept of ATM encompasses the advantages of interoperable and seamless transition across flight information region (FIR) boundaries and, where necessary, ADS-B implementation teams should conduct simulations, trials and cost/benefit analysis to support these objectives.

5.1.4 Integration

5.1.4.1 ADS-B implementation plans should include the development of both business and safety cases. The adoption of any new CNS system has major implications for service providers, regulators and airspace users and special planning should be considered for the integration of ADS-B into the existing and foreseen CNS/ATM system. The following briefly discusses each element.

5.1.4.2 Communication system

5.1.4.2.1 The communication system is an essential element within CNS. An air traffic controller can now monitor an aircraft position in real time using ADS-B where previously only voice position reports were available. However, a communication system that will support the new services that result from the improved surveillance may be necessary. Consequently, there is an impact of the ongoing ADS-B related work on the communication infrastructure developments.

5.1.4.3 Navigation system infrastructure

5.1.4.3.1 ADS-B is dependent upon the data obtained from a navigation system (typically GNSS), in order to enable its functions and performance. Therefore, the navigation infrastructure should fulfill the corresponding requirements of the ADS-B application, in terms of:

a) Data items; and

b) Performance (e.g. accuracy, integrity, availability etc.).

5.1.4.3.2 This has an obvious impact on the navigation system development, which evolves in parallel with the development of the surveillance system.

5.1.4.4 Other surveillance infrastructure

5.1.4.4.1 ADS-B may be used to supplement existing surveillance systems or as the principal source of surveillance data. Ideally, surveillance systems will incorporate data from ADS-B and other sources to provide a coherent picture that improves both the amount and utility of surveillance data to the user. The choice of the optimal mix of data sources will be defined on the basis of operational demands, available technology, safety and cost-benefit considerations.

5.1.4.4.2 A guidance material on issues to be considered in ATC multi-sensor fusion processing including integration of ADS-B data is provided on the ICAO website http://www.bangkok.icao.int/edocs/index.html" for reference by States.

5.1.4.4.3 A guidance material on processing and displaying of ADS-B data at air traffic controller positions is provided on the ICAO website http://www.bangkok.icao.int/edocs/index.html" for reference by States.

5.1.5 Coverage Predictions

5.1.5.1 Reliable and robust analysis and planning of ADS-B coverage to support seamless ATM initiative requires accurate and reliable coverage modelling. States should ensure that surveillance engineering/technical teams are provided with modelling tools to provide accurate and reliable coverage predictions for ATM planning and analysis.

5.2 IMPLEMENTATION CHECKLIST

5.2.1 Introduction

The purpose of this implementation checklist is to document the range of activities that needs to be completed to bring an ADS-B application from an initial concept to operational use. This checklist may form the basis of the terms of reference for an ADS-B implementation team, although some activities may be specific to individual stakeholders. An example of the checklist used by AirServices Australia is given at Appendix 1.

5.2.2 Activity Sequence

The activities are listed in an approximate sequential order. However, each activity does not have to be completed prior to starting the next activity. In many cases, a parallel and iterative process should be used to feed data and experience from one activity to another. It should be noted that not all activities will be required for all applications.

5.2.3 Concept Phase

a) construct operational concept:

1) purpose;
2) operational environment;
3) ATM functions; and
4) infrastructure;

b) identify benefits:

1) safety enhancements;
2) efficiency;
3) capacity;
4) environmental;
5) cost reductions;
6) access; and
7) other metrics (e.g. predictability, flexibility, usefulness);

c) identify constraints:

1) pair-wise equipage;
2) compatibility with non-equipped aircraft;
3) need for exclusive airspace;
4) required ground infrastructure;
5) RF spectrum;
6) integration with existing technology; and
7) technology availability;

d) prepare business case:

1) cost benefit analysis; and
2) demand and justification.

5.2.4 Design Phase

a) identify operational requirements:

1) security; and
2) systems interoperability;

b) identify human factors issues:

1) human-machine interfaces;
2) training development and validation;
3) workload demands;
4) role of automation vs. role of human;
5) crew coordination/pilot decision-making interactions; and
6) ATM collaborative decision-making;

c) identify technical requirements:

1) standards development;
2) data required;
3) functional processing;
4) functional performance; and
5) required certification levels;

d) equipment development, test, and evaluation:

1) prototype systems built to existing or draft standards/specifications;
2) developmental bench and flight tests; and
3) acceptance test parameters; and
4) select and procure technology;

e) develop procedures:

1) pilot and controller actions and responsibilities;
2) phraseologies;
3) separation/spacing criteria and requirements;
4) controller's responsibility to maintain a monitoring function, if appropriate;
5) contingency procedures;
6) emergency procedures; and
7) develop AIP and Information documentation

f) prepare design phase safety case:

1) safety rationale;
2) safety budget and allocation; and
3) functional hazard assessment.

5.2.5 Implementation phase

a) prepare implementation phase safety case;

b) conduct operational test and evaluation:

1) flight deck and ATC validation simulations; and

2) flight tests and operational trials;

c) obtain systems certification:

1) aircraft equipment; and
2) ground systems;

d) obtain regulatory approvals:

1) flight operations; and
2) air traffic certification of use;

e) implementation transition:

1) Promulgate procedures and deliver training
2) continue data collection and analysis;
3) resolve any unforeseen issues; and
4) continue feedback into standards development processes;

f) performance monitoring to ensure that the agreed performance is maintained.

5.2.5.1 Once the implementation project is complete, ongoing maintenance and upgrading of both ADS-B operations and infrastructure should continue to be monitored, through the appropriate forums.

6. ~~Template of~~ HARMONIZATION FRAMEWORK FOR ADS-B IMPLEMENTATION

6.1 BACKGROUND

6.1.1 It is obvious that full benefits of ADS-B will only be achieved by its harmonized implementation and seamless operations. During the 6th meeting of ADS-B SEA/WG in February 2011, Hong Kong, China initiated to strengthen collaboration among concerned States/Administrations for harmonized ADS-B implementation and seamless operations along two ATS routes L642 and M771 with major traffic flow (MTF). An ad-hoc workgroup comprising concerned CAAs/ANSPs from Hong Kong, China, Mainland China, Vietnam and Singapore was subsequently formed to elaborate and agree on a framework regarding implementation timelines, avionics standards, optimal flight levels, and ATC and engineering handling procedures. As a coherent effort, ADS-B implementation along ATS routes L642 and M771 has been harmonized while Hong Kong, China and Singapore have published respective Aeronautical Information Circulars and Airworthiness Notices on ADS-B mandates for these two routes with effect on 12 December 2013.

6.1.2 It is considered that the above implementation framework for ATS routes L642/M771 would serve as a useful template for extension to other high density routes to harmonize ADS-B implementation. Paragraph 6.2 shows the detailed framework.

6.2 TEMPLATE OF HARMONIZATION FRAMEWORK FOR ADS-B IMPLEMENTATION

Harmonization Framework for ADS-B Implementation along ATS Routes L642 and M771			
No.	**What to harmonize**	**What was agreed**	**Issue / what needs to be further discussed**
1	Mandate Effective	Singapore (SG), ~~C,~~ Hong Kong (HK), China (Sanya)~~N~~ : 12 Dec 2013 Vietnam (VN)~~—~~ :~~———~~ to be confirmed	
2	ATC Operating Procedures	No need to harmonize	Refer to SEACG for consideration of the impact of expanding ADS-B surveillance on ATC Operating Procedures including Large Scale Weather procedures.
3	Mandate Publish Date	No need to harmonize	To publish equipment requirements as early as possible.
4	Date of Operational Approval	No need to harmonize	

5	Flight Level	SG, HK, CN : - At or Above FL290 (ADS-B airspace) - Below FL290 (Non-ADS-B airspace) VN to be confirmed	
6	Avionics Standard (CASA/AMC2024)	SG - CASA or AMC2024 or FAA AC No. 20-165 HK - CASA or AMC2024 or FAA AC No. 20-165 VN - CASA or AMC2024 or FAA AC No. 20-165 CN - CASA or AMC2024 or FAA AC No. 20-165	ADS-B Task Force agreed that DO260B will be accepted as well. SG, HK, and CN agreed their ADS-B GS will accept DO260, DO260A and DO260B by 1 July 2014 (Note 1)
7	Flight Planning	Before 15 Nov 2012, as per AIDG On or after 15 Nov 2012, as per new flight plan format	
8	Aircraft Approval		
8a)	Procedures if Aircraft Not Approved or Aircraft without a Serviceable ADS-B Transmitting Equipment before Flight	SG, HK, CN : FL280 and Below VN to be confirmed	

8b)	Aircraft Approved but Transmitting Bad Data (Blacklisted Aircraft)	For known aircraft, treat as non ADS-B aircraft.	Share blacklisted aircraft among concerned States/Administration
9	Contingency Plan		
9a)	Systemic Failure such as Ground System / GPS Failure	Revert back to current procedure.	
9b)	Avionics Failure or Approved Aircraft Transmitting Bad Data in Flight	Provide other form of separation, subject to bilateral agreement. From radar/ADS-B environment to ADS-B only environment, ATC coordination may be able to provide early notification of ADS-B failure.	Address the procedure for aircraft transiting from radar to ADS-B airspace and from ADS-B to ADS-B airspace.
10	Commonly Agreed Route Spacing	SEACG	Need for commonly agreed minimal in-trail spacing throughout.

Note 1: Also included two ADS-B GS supplied by Indonesia at Matak and Natuna

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7. SYSTEM INTEGRITY AND MONITORING

7.1 INTRODUCTION

The Communications, Navigation, Surveillance and Air Traffic Management (CNS/ATM) environment is an integrated system including physical systems (hardware, software, and communication networks), human elements (pilots ~~and~~ , controllers and engineers), and the operational procedures for its applications~~use by pilots and controllers~~. ADS-B is a surveillance system that may be integrated with other surveillance technologies or may also operate as an independent source for surveillance monitoring within the CNS/ATM system.

Because of the integrated nature of such system and the degree of interaction among its components, comprehensive system monitoring is recommended. The procedures described in this section aim to ensure system integrity by validation, identification, reporting and tracking of possible problems revealed during system monitoring with appropriate follow-up actions.

These procedures do not replace the ATS incident reporting procedures and requirements, as specified in PANS-ATM (Doc 4444), Appendix 4; ICAO's Air Traffic Services Planning Manual (Doc 9426), Chapter 3; or applicable State regulations, affecting the reporting responsibilities of parties directly involved in a potential ATS incident.

7.2 PERSONNEL LICENSING AND TRAINING

Prior to operating any element of the ADS-B system, operational and technical ~~—~~personnel shall undertake appropriate training as determined by the States, including compliance with the Convention on International Civil Aviation where applicable.

Notwithstanding the above requirement and for the purposes of undertaking limited trials of the ADS-B system, special arrangements may be agreed between the operator and an Air Traffic Services Unit (ATSU).

7.3 SYSTEM PERFORMANCE CRITERIA FOR AN ATC SEPARATION SERVICE

A number of States have started to introduce ADS-B for the provision of Air Traffic Services, including 'radar-like' separation. The ICAO Separation and Airspace Safety Panel (SASP) has completed ~~been~~ assessment ~~ing~~ on the suitability of ADS-B for various applications including provision of aircraft separation based on comparison of technical characteristics between ADS-B and monopulse secondary surveillance radar. It is concluded that~~using a comparative assessment methodology and, together with the ICAO Operational Data Link Panel (OPLINKP), is drawing on the experience of early implementers to develop operational provisions~~ that ADS-B surveillance is better or at least no worse than the referenced radar, and can be used to provide separation minima as described in PANS-ATM (Doc 4444) whether ADS-B is used as a sole means of ATC surveillance or used together with radar, subject to certain conditions to be met. The assessment result is detailed in the ICAO Circular 326 AN/188 "Assessment of ADS-B and Multilateration Surveillance to Support Air Traffic Services and Guidelines for Implementation"~~. It is anticipated that PANS-ATM (Doc 4444) will be amended to include ADS-B separation minima in 2007~~.

States intending to introduce ADS-B separation minima shall comply with ~~not published in~~ provisions of PANS-ATM, ~~or~~ Regional Supplementary Procedures (Doc 7030) ~~should comply with the provisions of~~ and Annex 11 paragraph 3.4.1. States should adopt the guidelines contained in this document unless conformance with PANS-ATM specifications requires change.

7.4 ATC SYSTEM VALIDATION

7.4.1 Safety Assessment Guidelines

To meet system integrity requirements, States should conduct a validation process that confirms the integrity of their equipment and procedures. Such processes shall include:

a) A system safety assessment for new implementations is the basis for definitions of system performance requirements. Where existing systems are being modified to utilize additional services, the assessment demonstrates that the ATS Provider's system will meet safety objectives;

b) Integration test results confirming interoperability for operational use of airborne and ground systems; and

c) Confirmation that the ATS Operation Manuals are compatible with those of adjacent providers where the system is used across a common boundary.

7.4.2 System safety assessment

The objective of the system safety assessment is to ensure the State that introduction and operation of ADS-B is safe. This can be achieved through application of the provisions of Annex 11 paragraph 2.2~~6~~7 and PANS-ATM Chapter 2. The safety assessment should be conducted for initial implementation as well as any future enhancements and should include:

a) Identifying failure conditions;

b) Assigning levels of criticality;

c) Determining risks/ probabilities for occurrence;

d) Identifying mitigating measures and fallback arrangements;

e) Categorising the degree of acceptability of risks; and

f) Operational hazard ID process.

Following the safety assessment, States should institute measures to offset any identified failure conditions that are not already categorized as acceptable. This should be done to reduce the probability of their occurrence to a level as low as reasonably practicable~~n acceptable level~~. This could be accomplished through system automation or manual procedures.

Guidance material on building a safety case for delivery of an ADS-B separation service is provided on the ICAO APAC website "http://www.bangkok.icao.int/edocs/index.html" for reference by States.

7.4.3 Integration test

States should conduct trials with suitably equipped aircraft to ensure they meet the operational and technical requirements to provide an ATS. Alternatively, they may be satisfied by test results and analysis conducted by another State or organization deemed competent to provide such service. Where this process is followed, the tests conducted by another State or organization should be comparable (i.e. using similar equipment under similar conditions).

Refer also to the *Manual on Airspace Planning Methodology for the Determination of Separation Minima* (Doc9689).

7.4.4 ATS Operation Manuals

States should coordinate with adjacent States to confirm that their ATS Operation Manuals contain standard operating procedures to ensure harmonization of procedures that impact across common boundaries.

7.4.5 ATS System Integrity

With automated ATM ~~control~~ systems, data changes, software upgrades, and system failures can affect adjacent units. States shall ensure that:

a) A conservative approach is taken to manage any changes to the system;

b) Aircrew, aircraft operating companies and adjacent ATSU(s) are notified of any planned system changes in advance, where that system is used across a common boundary;

c) ATSUs have verification procedures in place to ensure that following any system changes, displayed data is both correct and accurate;

d) In cases of system failures or where upgrades (or downgrades) or other changes may impact surrounding ATS units, ATSUs should have a procedure in place for timely notification to adjacent units. Such notification procedures will normally be detailed in Letters of Agreement between adjacent units; and

e) ADS-B surveillance data is provided with equal to or better level of protection and security than existing surveillance radar data.

7.5 SYSTEM MONITORING

During the initial period of implementation of ADS-B technology, routine collection of data is necessary in order to ensure that the system continues to meet or exceed its performance, safety and interoperability requirements, and that operational service delivery and procedures are working as intended. The monitoring program is a two-fold process. Firstly, summarised statistical data should be produced periodically showing the performance of the system. This is accomplished through ADS-B Periodic Status Reports. ~~In addition~~Secondly, as problems or abnormalities arise, they should be identified, tracked, analyzed and corrected and information disseminated as required, utilizing the ADS-B Problem Report.

7.5.1 Problem Reporting System (PRS)

The Problem Reporting System is tasked with the collection, storage and regular dissemination of data based on reports received from ADS-B SITF members. The PRS tracks problem reports and publish information from those reports to ADS-B SITF members. Problem resolution is the responsibility of the appropriate ADS-B SITF members.

The PRS Administrator shall:

a) prepare consolidated problem report summaries for each ADS-B SITF meeting;

b) collect and consolidate ADS-B Problem Reports; and

c) maintain a functional website (with controlled access) to manage the problem reporting function.

7.5.2 The monitoring process

When problems or abnormalities are discovered, the initial analysis should be performed by the organization(s) identifying the problem. In addition, a copy of the problem report should be entered in to the PRS which will assign a tracking number. As some problems or abnormalities may involve more than one organization, the originator should be responsible for follow-up action to rectify the problem and forward the information to the PRS. It is essential that all information relating to the problem is documented and recorded and resolved in a timely manner.

The following groups should be involved in the monitoring process and problem tracking to ensure a comprehensive review and analysis of the collected data:

a) ATS Providers;

b) Organizations responsible for ATS system maintenance (where different from the ATS provider);

c) Relevant State regulatory authorities;

d) Communication Service Providers being used;

e) Aircraft operators; and

f) Aircraft and avionics manufacturers.

7.5.3 Distribution of confidential information

It is important that information that may have an operational impact on other parties be distributed by the authorised investigator to all authorised groups that are likely to be affected, as soon as possible. In this way, each party is made aware of problems already encountered by others, and may be able to contribute further information to aid in the solution of these problems. The default position is that all states agree to provide the data which will be de-identified for reporting and record keeping purposes.

7.5.4 ADS-B problem reports

Problem reports may originate from many sources, but most will fall within two categories; reports based on observation of one or more specific events, or reports generated from the routine analysis of data. The user would document the problem, resolve it with the appropriate party and forward a copy of the report to the PRS for tracking and distribution. While one occurrence may appear to be an isolated case, the receipt of numerous similar reports by the PRS could indicate that an area needs more detailed analysis.

To effectively resolve problems and track progress, the problem reports should be sent to the nominated point of contact at the appropriate organization and the PRS. The resolution of the identified problems may require:

a) Re-training of system operators, or revision of training procedures to ensure compliance with existing procedures;

b) Change to operating procedures;

c) Change to system requirements, including performance and interoperability; or

d) Change to system design.

7.5.5 ADS-B periodic status report

The ATS Providers should complete the ADS-B Periodic Status Report annually and deliver the report to the regional meeting of the ADS-B SITF*[D1]*. The Periodic Status Report should give an indication of system performance and identify any trend in system deficiencies, the resultant operational implications, and the proposed resolution, if applicable.

Communications Service Providers, if used, are also expected to submit Periodic Status Reports on the performance of the networks carrying ADS-B data at the annual regional meeting of the ADS-B SITF. These reports could also contain the details of planned or current upgrades to the network.

7.5.6 Processing of Reports

Each group in the monitoring process should nominate a single point of contact for receipt of problem reports and coordination with the other parties. This list will be distributed by the PRS Administrator to all parties to the monitoring process.
Each State should establish mechanisms within its ATS Provider and regulatory authority to:

a) Assess problem reports and refer them to the appropriate technical or operational expertise for investigation and resolution;

b) Coordinate with aircraft operators;

c) Develop interim operational procedures to mitigate the effects of problems until such time as the problem is resolved;

d) Monitor the progress of problem resolution;
e) Prepare a report on problems encountered and their operational implications and forward these to the PRS;

f) Prepare the ADS-B periodic status report at pre-determined times and forward these to the Secretary of the annual meeting of the ADS-B SITF; and

g) Coordinate with any Communication Service Providers used.

7.6 APANPIRG

APANPIRG, with the assistance of its contributory bodies, shall oversee the monitoring process to ensure the ADS-B system continues to meet its performance and safety requirements, and that operational procedures are working as intended. The APANPIRG'S objectives are to:

a) review Periodic Status Reports and any significant Problem Reports;

b) highlight successful problem resolutions to ADS-B SITF members;

c) monitor the progress of outstanding problem resolutions;

d) prepare summaries of problems encountered and their operational implications; and

e) assess system performance based on information in the PRS and Periodic Status Reports.

7.7 LOCAL DATA RECORDING AND ANALYSIS

7.7.1 Data recording

It is recommended that ATS Providers and Communication Service Providers retain the records defined below for at least 30 days to allow for accident/incident investigation processes. These records should be made available on request to the relevant State safety authority. Where data is sought from an adjacent State, the usual State to State channels should be used.

These recordings shall be in a form that permits a replay of the situation and identification of the messages that were received by the ATS system.

7.7.2 Local data collection

ATS providers and communications service providers should identify and record ADS-B system component failures that have the potential to negatively impact the safety of controlled flights or compromise service continuity.

7.7.3 ~~Local~~ Avionics problem identification and correction

ATS providers need to develop systems to :

a) detect ADS-B avionics anomalies and faults

b) advise the regulators and where~~n~~ appropriate the aircraft operators on the detected ADS-B avionics anomalies and faults

c) devise mechanisms and procedures to address identified faults

Regulators need to develop and maintain systems to ensure that appropriate corrective actions are~~is~~ taken to address identified faults.

7.8 ADS-B PROBLEM REPORT

7.8.1 Report Form			**PRS #**
Date UTC		**Time UTC**	
Registration		**Aircraft ID**	
Flight ID		**ICAO 24 Bit Code**	
Aircraft Type			
Flight Sector/ Location			
ATS Unit			
Description / additional information			
Originator		**Originator Reference number**	
Organization			

7.8.2 Description of Fields

Field	Meaning
Number	A unique identification number assigned by the PRS Administrator to this problem report. Organizations writing problem reports are encouraged to maintain their own internal list of these problems for tracking purposes. Once the problems have been reported to the PRS and incorporated in the database, a number will be assigned by the PRS and used for tracking by the ADS-B SITF.
Date UTC	UTC date when the event occurred.
Time UTC	UTC time (or range of times) at which the event occurred.
Registration	Registration number (tail number) of the aircraft involved.
Aircraft ID (ACID)	Coded equivalent of voice call sign as entered in FPL Field 7.
ICAO 24 Bit Code	Unique aircraft address expressed in Hexadecimal form (e.g. 7432DB)
Flight ID (FLTID)	The identification transmitted by ADS-B for display on a controller situation display or a CDTI.
Flight Sector/Location	The departure airport and destination airport for the sector being flown by the aircraft involved in the event. These should be the ICAO identifiers of those airports. Or if more descriptive, the location of the aircraft during the event.
Originator	Point of contact at the originating organization for this report (usually the author).
Aircraft Type	The aircraft model involved.
Organization	The name of the organization (airline, ATS provider or communications service provider) that created the report.
ATS Unit	ICAO identifier of the ATC Center or Tower controlling the aircraft at the time of the event.
Description	This should provide as complete a description of the situation leading up to the problem as is possible. Where the organization reporting the problem is not able to provide all the information (e.g. the controller may not know everything that happens on the aircraft), it would be helpful if they would coordinate with the other parties to obtain the necessary information. The description should include: • A complete description of the problem that is being reported • The route contained in the FMS and flight plan • Any flight deck indications • Any indications provided to the controller when the problem occurred • Any additional information that the originator of the problem report considers might be helpful but is not included on the list above If necessary to contain all the information, additional pages may be added. if the originator considers it might be helpful, diagrams and other additional information (such as printouts of message logs) may be appended to the report.

7.9 ADS-B PERFORMANCE REPORT FORM			
Originating Organization			
Date of submission		**Originator**	
Report Period			
TECHNICAL ISSUES			
OPERATIONAL ISSUES			
GENERAL COMMENTS			

8. RELIABILITY & AVAILABILITY CONSIDERATIONS

Reliability and Availability of ADS-B systems should normally be equivalent or better than the reliability and availability of radar systems.

Guidance material on Reliability and Availability standards for ADS-B systems and supporting voice communications systems are included in the document "Baseline ADS-B Service Performance Parameters" which is available on the ICAO APAC website at: http://www.bangkok.icao.int/edocs/cns/adsb_serviceper.pdf

The "Baseline ADS-B Performance Parameters" document contains three Tiers of service performance parameters with different reliability and availability standards for each Tier. The appropriate Tier should be selected for the type of ADS-B service intended:

(a) Tier 1 standards are for a high performance ~~5NM~~ traffic separation service;

(b) Tier 2 standards are for a traffic situational awareness service with procedural separation; and

(c) Tier 3 standards are for a traffic advisory service (flight information service)

To achieve high operational availability of ADS-B systems to support aircraft separation services, it is necessary to operate with duplicated/redundant systems. If one system fails, the service continues using an unduplicated system. This is acceptable for a short period, whilst the faulty system is being repaired, because the probability of a second failure during the short time window of repairing is low.

However, it is necessary to ensure that the repair does not take too long. A long repair time increases the risk of an unexpected failure (loss of service continuity); which in turn, introduces potential loss of service (low availability) and loss of aircraft operational efficiency and/or safety impacts.

8.1 Reliability

8.1.1 Reliability is a measure of how often a system fails and is usually measured as Mean Time Between Failure (MTBF) expressed in hours. Continuity is a measure equivalent to reliability, but expressed as the probability of system failure over a defined period. In the context of this document, failure means inability to deliver ADS-B data to the ATC centre. Ie: Failure of the ADS-B system rather than an equipment or component failure.

8.1.2 Poor system MTBF has a safety impact because typically it causes unexpected transition from one operating mode to another. For example, aircraft within surveillance coverage that are safely separated by a surveillance standard distance (say, 5 NM) are unexpectedly no longer separated by a procedural standard distance (say 15 mins), due to an unplanned surveillance outage.

8.1.3 In general, reliability is determined by design (see para 8~~9~~.3 B below)

8.2 Av**ailability**

8.2.1 Availability is a measure of how often the system is available for operational use. It is usually expressed as a percentage of the time that the system is available.

8.2.2 Poor availability usually results in loss of economic benefit because efficiencies are not available when the ATC system is operating in a degraded mode (eg using procedural

control instead of say 5 NM separation).

8.2.3 Planned outages are often included as outages because the efficiencies provided to the Industry are lost, no matter what the cause of the outage. However, some organisations do not include planned outages because it is assumed that planned outages only occur when the facility is not required.

8.2.4 Availability is calculated as

Availability (Ao) = MTBF/(MTBF+MDT)

where MTBF= Mean Time Between SYSTEM Failure
MDT = Mean Down Time for the SYSTEM

The MDT includes Mean Time To Repair (MTTR), Turn Around Time (TAT) for spares, and Mean Logistic Delay Time (MLDT)
NB: This relates to the failure of the system to provide a service, rather than the time between individual equipment failures. Some organisations use Mean Time Between Outage (MTBO) rather than MTBF.

8.2.5 Availability is directly a function of how quickly the SYSTEM can be repaired. Ie: directly a function of MDT. Thus availability is highly dependent on the ability & speed of the support organisation to get the system back on-line.

8.3 Recommendations for high reliability/availability ADS-B systems

A : System design can keep system failure rate low with long MTBF. Typical techniques are :

- to duplicate each element and minimise single points of failure. Automatic changeover or parallel operation of both channels keeps system failure rates low. Ie: the system keeps operating despite individual failures. Examples are :
  - Separate communication channels between ADS-B ground station and ATC centre preferably using different technologies or service providers eg one terrestrial and one satellite
- Consideration of Human factors in design can reduce the number of system failures due to human error. E.g. inadvertent switch off, incorrect software load, incorrect maintenance operation.
- Take great care with earthing, cable runs and lightning protection to minimise the risks of system damage
- Take great care to protect against water ingress to cables and systems
- Establish a system baseline that documents the achieved performance of the site that can be later be used as a reference. This can shorten troubleshooting in future.
- System design can also improve the MDT by quickly identifying problems and alerting maintenance staff. Eg Built in equipment test (BITE) can significantly contribute to lowering MDT.

B: **Logistics strategy** aims to keep MDT very low. Low MDT depends on logistic support providing short repair times. To achieve short repair times, ANSPs usually provide a range of logistics, including the following, to ensure that the outage is less than a few days :

- ensure the procured system is designed to allow for quick replacement of faulty modules to restore operations
- provide remote monitoring to allow maintainers to identify the faulty modules for transport to site
- provide support tools to allow technicians to repair faulty modules or to configure/setup replacement modules
- provide technicians training to identify & repair the faulty module~~(s)~~
- provide local maintenance depots to reduce the time it takes to ~~get~~ access to the site
- provide documentation and procedures to "standardise" the process
- use an in-country spares pool to ensure that replacement modules are available within reasonable times
- use a maintenance contract to repair faulty modules within a specified turnaround time. I.e.: to replenish the spares pool quickly.

Whilst technical training and remote monitoring are usually considered by ANSPs, sometimes there is less focus on spares support.

Difficulties can be experienced if States :

a) Fail to establish a spares pool – because procurement of spares at the time of failure can bring extensive delays due to :
b) obtaining funds
c) obtaining approval to purchase overseas
d) obtaining approval to purchase from a "sole source"
e) difficulties and delays in obtaining a quotation
f) delays in delivery because the purchase was unexpected by the supplier
g) Fail to establish a module repair contract resulting in :
   - long repair times
   - unplanned expenditure
   - inability for a supplier to repair modules because the supplier did not have adequate certainty of funding of the work

Spares pool

ANSPs can establish, preferably as part of their acquisition purchase, adequate spares buffer stock to support the required repair times. The prime objective is to reduce the time period that the system operates un-duplicated. It allows decoupling of the restoration time from the module repair time.

Module repair contract

ANSPs can also enter into a maintenance repair contract, preferably as part of their acquisition purchase, to require the supplier to repair or replace and deliver failed modules within a specified time – preferably with contractual incentives/penalties for compliance. Such support contracts are best negotiated as part of the acquisition contract when competition between vendors is at play to keep costs down. Sometimes it is appropriate to demand that the support contractor also keep a certain level of buffer stock of spares "in country".

It is strongly recommended that maintenance support is purchased under the same contract as

the acquisition contract.

The advantages of a module repair contract are :

- The price can be determined whilst in the competitive phase of acquisition – hence avoids excessive costs
- The contract can include the supplier bearing all shipping costs
- Can be funded by a define amount per year, which support the budget processes. If the costs are fixed, the supplier is encouraged to develop a reliable system minimising module repairs.
- It avoids delays and funding issues at the time of the module failure

Other t~~T~~ypical strategies are:

- Establish availability and reliability objectives that are agreed organization wide. In particular agree System response times (SRT) for faults and system failure to ensure that MDT is achieved. An agreed SRT can help organizations to decide on the required logistics strategy including number, location and skills of staff to support the system.
- ~~Having appropriate maintenance support contracts in place so that faulty modules are repaired within contractually defined times preferably with contractual incentives/penalties for compliance. Such support contracts are best negotiated as part of the acquisition contract when competition between vendors is at play to keep costs down. Sometimes it is appropriate to demand that the support contractor also keep a certain level of buffer stock of spares "in country".~~
  ~~**It is strongly recommended that maintenance support is purchased under the same contract as the acquisition contract.**~~

- Establish baseline preventative maintenance regimes including procedures and performance inspections in conjunction with manufacturer recommendations for all subsystems

- Use remote control & monitoring systems to identify faulty modules before travel to site. This can avoid multiple trips to site and reduce the repair time

- Have handbooks, procedures, tools available at the site or a nearby depot so that travel time does not adversely affect down time

- Have adequate spares and test equipment ready at a maintenance depot near the site or at the site itself. Vendors can be required to perform analysis of the number of spares required to achieve low probability of spare "stock out"

- Have appropriate plans to cope with system and component obsolescence. It is possible to contractually require suppliers to regularly report on the ability to support the system and supply components.

- Have ongoing training programs and competency testing to ensure that staff are able to perform the required role

The detailed set of operational and technical arrangements in place and actions required to maintain a system through the lifecycle are often documented in a Integrated Logistics Support Plan.

C: Configuration Management aims to ensure that the configuration of the ground stations is maintained with integrity. Erroneous configuration can cause unnecessary outages. Normally

configuration management is achieved by :

- Having clear organizational & individual responsibilities and accountabilities for system configuration.

- Having clear procedures in place which define who has authority to change configuration and records of the changes made including, inter alia

    - The nature of the change including the reason
    - Impact of the change & safety assessment
    - An appropriate transition or cutover plan
    - Who approved the change
    - When the change was authorized and when the change was implemented

- Having appropriate test and analysis capabilities to confirm that new configurations are acceptable before operational deployment.

- Having appropriate methods to deploy the approved configuration (Logistics of configuration distribution). Suggested methods;

    - Approved configuration published on intranet web pages
    - Approved configuration distributed on approved media

D: Training & Competency plans aim to ensure that staff has the skills to safety repairs Normally this is achieved by:

- Conduct of appropriate Training Needs Analysis (TNA) to identify the gap between trainee skill/knowledge and the required skill/knowledge.

- Development and delivery of appropriate training to maintainers

- Competency based testing of trainees

- Ongoing refresher training to ensure that skills are maintained even when fault rates are low

E: Data collection & Review :

Regular and scheduled review should be undertaken to determine whether reliability/availability objectives are being met. These reviews need to consider :

- Reports of actual achieved availability & reliability

- Data regarding system failures including “down time” needs to be captured and analysed so the ANSP actually knows what is being (or not being) achieved.

- Any failure trends that need to be assessed. This requires data capture of the root cause of failures

- Any environmental impacts on system performance, such coverage obstructions such as trees, planned building developments, corrosion, RFI etc. Changes in infrastructure may also be relevant including air conditioning (temperature/humidity etc) and power system changes.

- System problem reports especially those that relate to software deficiencies (design)
- System and component obsolescence
- Staff skills and need for refresher training

9. ADS-B REGULATIONS AND PROCEDURES

9.1 INTRODUCTION

ADS-B involves the transmission of specific data messages from aircraft and vehicle systems. These data messages are broadcast at approximately 0.5 second intervals and received at compatible ground stations that relay these messages to ATSU(s) for presentation on ATS situation displays. The following procedures relate to the use of ADS-B data in ATS ground surveillance applications.

The implementation of the ADS-B system will support the provision of high performance surveillance, enhancing flight safety, facilitating the reduction of separation minima and supporting user demands such as user-preferred trajectories.

9.2 ADS-B REGULATIONS

As agreed at APANPRIG 22/8, States intending to implement ADS-B based surveillance services may designate portions of airspace within their area of responsibility by:

(a) mandating the carriage and use of ADS-B equipment; or

(b) providing priority for access to such airspace for aircraft with operative ADS-B ~~as~~ equipment over those aircraft not operating ADS-B equipment.

In publishing ADS-B mandate/regulations, States should consider to :

- define the ADS-B standards applicable to the State. For interoperability and harmonization, such regulations need to define both the standards applicable for the aircraft ADS-B position source and the ADS-B transmitter.

- define the airspace affected by the regulations and the category of aircraft that the regulation applies to.

- define the timing of the regulations allowing sufficient time for operators to equip. Experience in Asia Pacific Regions is that major international carriers are having high equippage rates of ADS-B avionics. However the equippage rates of ADS-B avionics for some regional fleets, business jets and general aviation are currently low and more time will be required to achieve high equippage rates.

- e~~E~~stablish the technical and operational standards for the ground stations and air traffic management procedures used for ADS-B separation services, including the associated voice communications services.

States may refer to the APANPIRG Conclusion 22/36 on the template for ADS-B mandate/regulations on provision of ADS-B based ground surveillance. Some States listed below have published their ADS-B mandate/regulations on their web sites that could be used for reference.

(a) Civil Aviation Safety Authority (CASA) of Australia
Civil Aviation Order 20.18 Amendment Order (No. 1) 2009, Civil Aviation Order 82.1 Amendment Order (No. 1) 2009, Civil Aviation Order 82.3 Amendment Order (No. 2) 2009, Civil Aviation Order 82.5 Amendment Order (No. 2) 2009 and Miscellaneous Instrument CASA 41/09 – Direction – use of ADS-B in foreign aircraft engaged in private operations in Australian territory
"http://www.comlaw.gov.au/Details/F2012C00103/Download"

(b) Civil Aviation Department (CAD) of Hong Kong, China
Aeronautical Information Circular (AIC) No. 09/11 dated 24 May 2011
"http://www.hkatc.gov.hk/HK_AIP/aic/AIC09-11.pdf"

(c) Civil Aviation Authority of Singapore (CAAS)
Aeronautical Information Circular (AIC) No. 14/10 dated 28 December 2010
"http://www.caas.gov.sg/caasWeb2010/export/sites/caas/en/Regulations/Aeronautical_Information/AIC/AIC_PDFs/AIC_14_2010.pdf"

(d) Federal Aviation Administration (FAA)
ADS–B Out Performance Requirements To Support Air Traffic Control (ATC) Service, Final Rule
"http://www.gpo.gov/fdsys/pkg/FR-2010-05-28/pdf/2010-12645.pdf"

9.32 FACTORS TO BE CONSIDERED WHEN USING ADS-B

9.32.1 Use of ADS-B Level data

The accuracy and integrity of pressure altitude derived level information provided by ADS-B are equivalent to Mode C level data provided through an SSR sensor and subject to the same operational procedures as those used in an SSR environment. Where the ATM system converts ADS-B level data to display metric equivalent level data, the displayed data should not be used to determine vertical separation until the data is verified by comparison with a pilot reported metric level.

9.232 Position Reporting Performance

The ADS-B data from the aircraft will include a NUC/NIC/SIL categorization of the accuracy and integrity of the horizontal position data. This figure is determined from NIC/ NAC/ SIL values for DO260A/B compliant avionics and NUC values for DO260/ED102 compliant avionics.

In general, for 5NM separation, if the NUC is less than 54 (or NIC is less than 46, or SIL is less than 22) the data is unlikely to be of comparable quality to that provided by a single monopulse SSR. ADS-B data should not be used for separation unless a suitable means of determining data integrity is used. In general, for 5NM separation, if the HPL value used to generate ADS-B quality indicators (NUC or ,NIC) is greater than 2 nautical miles the data is unlikely to be of comparable quality to that provided by a single monopulse SSR. ADS-B data should not be used for separation unless a suitable means of determining data integrity is used.

The key minimum performance requirements for an ADS-B system to enable the use of a 3 NM or 5 NM separation minimum in the provision of air traffic control is provided in the ICAO Circular 326 (especially Appendix C).

ADS-B reports with low integrity may be presented on situation displays, provided the controller is alerted (e.g. by a change in symbology and/or visual alert) to the change and the implications for the provision of separation. An ANS Provider may elect not to display ADS-B tracks that fail to meet a given position reporting performance criterion.

9.233 GNSS Integrity Prediction Service

Early implementations of ADS-B are expected to use GNSS for position determination. As such, availability of GNSS data has a direct influence on the provision of a surveillance service.

ATS Providers may elect to use a GNSS integrity prediction service to assist in determining the future availability of useable ADS-B data. The integrity prediction service alerts users to potential future loss or degradation of the ADS-B service in defined areas. When these alerts are displayed, the system is indicating to its users that at some time in the future the ADS-B positional data may be inadequate to support the application of ADS-B separation. It is recommended that the prediction service is made available to each ATSU that is employing ADS-B to provide a separation service, to ensure that air traffic controllers are alerted in advance of any predicted degradation of the GNSS service and the associated reduction in their ability to provide ADS-B separation to flights that are within the affected area. This is similar to having advance warning of a planned radar outage for maintenance.

ADS-B should not be used to provide separation between aircraft that will be affected by an expected period of inadequate position reporting integrity.

If an unpredicted loss of integrity occurs (including a RAIM warning report from aircrew) then;

(a) ADS-B separation should not be applied by ATC to the particular aircraft reporting until the integrity has been assured; and

(b) The controller should check with other aircraft in the vicinity of the aircraft reporting the RAIM warning, to determine if they have also been affected and establish alternative forms of separation if necessary.

9.~~2~~3.4 Sharing of ADS-B Data

ADS-B Data-sharing for ATC Operations

Member States should consider the benefits of sharing ADS-B data received from aircraft operating in the proximity of their international airspace boundaries with adjacent States that have compatible technology in an effort to maximize the service benefits and promote operational safety.

Data sharing may involve the use of the data to provide separation services if all the requirements for delivery of separation services are satisfied, In some cases, States may choose to use a lower standard that supports surveillance safety nets and situational awareness whilst operations are conducted using procedural separation standards.

Any agreement on the sharing of surveillance data should be incorporated in Letters of Agreement between the States concerned. Such agreements may also include the sharing of VHF communication facilities.

A template for ADS-B data-sharing agreement is provided on the ICAO APAC website "http://www.bangkok.icao.int/edocs/index.html" for reference by States.

ADS-B Data-sharing for Safety Monitoring

With endorsement of the methodology by both the ICAO Separation and Airspace Safety Panel (SASP) and the Regional Monitoring Agencies Coordination Group (RMACG), ADS-B data can be used for calculating the altimetry system error (ASE) which is a measure of the height-keeping performance of an aircraft. It is an ICAO requirement that aircraft operating in RVSM

airspace must undergo periodic monitoring on height-keeping performance. The existing methods to estimate aircraft ASE include use of a portable device, the Enhanced GPS Monitoring Unit, and ground-based systems called Height Monitoring Unit/Aircraft Geometric Height Measurement Element. The use of ADS-B data for height-keeping performance monitoring, on top of providing enhanced and alternative means of surveillance, will provide a cost-effective option for aircraft operators. States are encouraged to share ADS-B data to support the height-keeping performance monitoring of airframe.

Civil/Military ADS-B Data-sharing

Civil/military data sharing arrangements, including aircraft surveillance, were a key part of civil/military cooperation in terms of tactical operational responses and increasing trust between civil and military units.

Aircraft operating ADS-B technology transmit their position, altitude and identity to all listeners, conveying information from co-operative aircraft that have chosen to equip and publicly broadcast ADS-B messages. Thus there should be no defence or national security issues with the use and sharing of such data.

Some military transponders may support ADS-B using encrypted DF19 messages, but these data are normally not decoded or used at all by civil systems. In most cases today, tactical military aircraft are not ADS-B equipped or could choose to disable transmissions. In future, increasing numbers of military aircraft will be ADS-B capable, with the ability to disable these transmissions. ADS-B data sharing should not influence the decision by military authorities to equip or not equip with ADS-B. Moreover, it is possible for States to install ADS-B filters that prevent data from sensitive flights being shared. These filters can be based on a number of criteria and typically use geographical parameters to only provide ADS-B data to an external party if aircraft are near the boundary.

A guidance material on advice to military authorities regarding ADS-B data sharing is provided on the ICAO APAC website “http://www.bangkok.icao.int/edocs/index.html” for reference by States.

9.4~~3~~ Reporting Rates

9.4~~3~~.1 General

The ADS-B system shall maintain a reporting rate that ensures at least an equivalent degree of accuracy, integrity and availability as for a radar system that is used to provide a similar ATC service. The standard reporting rate is approximately 0.5 second from the aircraft, but the rate of update provided to the ATM system (for the situation display) may be less frequent (e.g. 5 seconds), provided the equivalency with radar is preserved.

9.5~~4~~ SEPARATION

9.5~~4~~.1 General

ADS-B data may be used in combination with data obtained by other means of surveillance (such as radar, flight plan track, ADS-C) for the application of separation provided appropriate minima as determined by the State are applied. It should be noted that the quality of communications will have a bearing on the determination of appropriate minima.

All safety net features (MSAW, STCA, MTCA, RAM and DAIW/ RAI etc) should possess the same responsiveness as equivalent radar safety net features.

9.54.2 Identification Methods

Some of the methods approved by ICAO for establishing identification with radar, may be employed with ADS-B (see PANS-ATM chapter 8). One or more of the following identification procedures are suggested:

a) direct recognition of the aircraft identification in an ADS-B label on a situation display;

b) transfer of ADS-B identification;

c) observation of compliance with an instruction to TRANSMIT ADS-B IDENT.

Note: In automated systems, the "IDENT" feature may be presented in different ways, e.g. as a flashing of all or part of the position indication and associated label.

9.54.3 ADS-B Separation

ADS-B Separation minima ~~will be promulgated~~has been incorporated by ICAO in PANS-ATM (Doc 4444), ~~or~~and in Regional Supplementary Procedures (Doc 7030).

In a mixed surveillance environment, States should use the larger separation standard applicable between aircraft in the conflict pair being considered.

9.54.4 Vertical separation

9.54.4.1 Introduction

The ADS-B level data presented on the controllers situation display shall normally be derived from barometric pressure altitude. In the event that barometric ~~geometric~~ altitude~~ data~~ is absent, geometric altitude shall not be ~~presented~~displayed on ~~the~~ATC ~~situation display~~displays used for provision of air traffic services. ~~, the controller should be alerted to the fact that this data should not be used for vertical separation.~~Geometric altitude may be used in ATM systems for other purposes.

9.54.4.2 Vertical tolerance standard

The vertical tolerances for ADS-B level information should be consistent with those applied to Mode C level information.

9.54.4.3 Verification of ADS-B level information

The verification procedures for ADS-B level information shall be the same as those employed for the verification of Mode C level data in a radar environment.

9.65 AIR TRAFFIC CONTROL CLEARANCE MONITORING

9.65.1 General

ADS-B track data can be used to monitor flight path conformance with air traffic control clearances.

9.65.2 Deviations from ATC clearances

The ATC requirements relating to monitoring of ADS-B traffic on the situation display should be similar to those contained in PANS-ATM Ch.8.

9.76 ALERTING SERVICE

For ADS-B equipped aircraft, the provision of an alerting service should be based on the same criteria as applied within a radar environment.

9.87 POSITION REPORTING

9.87.1 Pilot position reporting requirements in ADS-B coverage

States should establish voice and/or CPDLC position reporting procedures consistent with those applicable with radar for aircraft that have been identified by ATC.

9.87.2 Meteorological reporting requirements in ADS-B airspace

ATSUs may promulgate in the AIP meteorological reporting requirements that apply within the nominated FIR. The meteorological reporting data required and the transmission methods to be used by aircrew shall be specified in AIP.

9.98 PHRASEOLOGY

9.98.1 Phraseology Standard

States should note the requirement for ADS-B specific phraseology equivalent to radar specific phraseology as well as the opportunity to use generic phraseology applicable to multiple systems.

States shall refer to ~~Until such time as~~ PANS ATM Chapter 12 ~~is amended to include ADS-B provisions, the following phraseology is recommended for consideration by States~~for ADS-B phraseology:

ADS-B EQUIPMENT DEGRADATION
ADS-B OUT OF SERVICE (appropriate information as necessary).

TO REQUEST THE CAPABILITY OF THE ADS-B EQUIPMENT

a) ADVISE ADS-B CAPABILITY;
*b) ADS-B TRANSMITTER (data link);
*c) ADS-B RECEIVER (data link);
*d) NEGATIVE ADS-B.
* Denotes pilot transmission.

TO REQUEST RESELECTION OF AIRCRAFT IDENTIFICATION
REENTER [ADS-B or MODE S] AIRCRAFT IDENTIFICATION.

TERMINATION OF RADAR AND/OR ADS-B SERVICE
IDENTIFICATION LOST [reasons] (instructions).

TO REQUEST THE OPERATION OF THE ADS-B IDENT FEATURE
TRANSMIT ADS-B IDENT.

TO REQUEST TERMINATION OF SSR TRANSPONDER AND/OR ADS-B TRANSMITTER OPERATION
a) STOP SQUAWK. [TRANSMIT ADS-B ONLY];
b) STOP ADS-B TRANSMISSION [SQUAWK (code) ONLY].
Note: In some cases the ADS-B transmitter cannot be operated independently of the SSR transponder and the loss of SSR and ACAS surveillance derived from the operation of the SSR transponder should be considered.

9.9~~8~~.2 Operations of Mode S Transponder and ADS-B

It should be noted that independent operations of Mode S transponder and ADS-B may not be possible in all aircraft (e.g. where ADS-B is solely provided by 1090 MHz extended squitter emitted from the transponder). Additionally, some desirable but optional features of ADS-B transmitters may not be fitted in some aircraft. Controller training on this issue, as it relates to the following examples of radio telephony and/or CPDLC phraseology is recommended.

9.9~~8~~.2.1 STOP ADSB TRANSMISSION or STOP SQUAWK

Issue: In most commercial aircraft a common "transponder control head" is used for SSR transponder, ACAS and ADS-B functionality. In this case, a pilot who complies with the instruction to stop operation of one system will also need to stop operation of the other systems – resulting in a loss of surveillance not intended or expected by the controller.

ATC need to be aware that an instruction to "Stop ADS-B Transmission" may require the pilot to switch off their transponder that will then stop all other functions associated with the transponder operations (such as ACARs etc). Pilots need to be aware of their aircraft's equipment limitations, the consequences of complying with this ATC instruction, and be aware of their company policy in regard to this. As with any ATC instruction issued, the pilot should advise ATC if they are unable to comply.

Recommendation: It is recommended that the concatenated phrases STOP ADSB TRANSMISSION, SQUAWK (code) ONLY or STOP SQUAWK, TRANSMIT ADSB ONLY are used. It is recommended that controller training highlights the possible consequences of **issuing** these instructions and that pilot training highlights the consequences of **complying** with this instruction. It is also recommended that aircraft operators have a clearly stated policy on procedures for this situation. Should a pilot respond with UNABLE then the controller should consider alternative solutions to the problem that do not remove the safety defences of the other surveillance technologies. This might include manual changes to flight data, coordination with other controllers and/or change of assigned codes or callsigns.

9.9~~8~~.2.2 STOP ADSB ALTITUDE TRANSMISSION [WRONG INDICATION or reason] and TRANSMIT ADSB ALTITUDE

Issue: Some aircraft may not have separate control of ADSB altitude transmission. In such cases compliance with the instruction may require the pilot to stop transmission of all ADSB data – resulting in a loss of surveillance not intended or expected by the controller.

Recommendation: It is recommended that, should the pilot respond with UNABLE, the controller should consider alternative solutions to the problem that do not remove the safety defences of other

surveillance data. This might include a procedure that continues the display of incorrect level information but uses pilot reported levels with manual changes to flight data and coordination with other controllers.

9.9~~8~~.2.3 TRANSMIT ADS-B IDENT

Issue: Some aircraft may not be capable or the ADSB SPI IDENT control may be shared with the SSR SPI IDENT function.

Recommendation: It is recommended that controllers are made aware that some pilots are unable to comply with this instruction. An alternative means of identification that does not rely on the ADSB SPI IDENT function should be used.

9.10~~9~~ FLIGHT PLANNING

9.10~~9~~.1 ADS-B Flight Planning Requirement – Flight Identity

The aircraft identification (ACID) must be accurately recorded in section 7 of the ICAO Flight Plan form as per the following instructions:

Aircraft Identification, not exceeding 7 characters is to be entered both in item 7 of the flight plan and replicated exactly when set in the aircraft (for transmission as Flight ID) as follows:
Either,

a) The ICAO three-letter designator for the aircraft operating agency followed by the flight identification (e.g. KLM511, BAW213, JTR25), when:

in radiotelephony the callsign used consists of the ICAO telephony designator for the operating agency followed by the flight identification (e.g. KLM 511, SPEEDBIRD 213, HERBIE 25).

Or,

b) The registration marking of the aircraft (e.g. EIAKO, 4XBCD, OOTEK), when:

1) in radiotelephony the callsign used consists of the registration marking alone (e.g. EIAKO), or preceded by the ICAO telephony designator for the operating agency (e.g. SVENAIR EIAKO),

2) the aircraft is not equipped with radio.

Note 1: No zeros, hyphens, dashes or spaces are to be added when the Aircraft Identification consists of less than 7 characters.

Note 2: Appendix 2 to PANS-ATM refers. ICAO designators and telephony designators for aircraft operating agencies are contained in ICAO Doc 8585.

~~**5.9.2 ADS-B Flight Planning Requirements**~~

~~**ADS-B Flight Planning Requirements (Before transition to new DOC4444 format in 2012)**~~

~~Until the new ICAO flight plan, which incorporates ADS-B designators, is in use in 2012, the following shall apply:~~

~~**5.9.2.1 Flight Notification**~~

~~A remark shall be entered in section 18 of the fight plan to indicate that the flight is capable of transmitting ADS-B messages via the Mode S Extended Squitter data link. The format of the remark should be:~~

~~**RMK/ADSB**~~

~~*Note: Only flights with ADS-C capability should use the surveillance equipment indicator "D" and only flights with CPDLC capability should use the equipment indicator "J".*~~

~~**5.9.2.2 Aircraft Address (24 Bit Code)**~~

~~Where required, the aircraft address (in hexadecimal format) may be recorded in section 18 of the ICAO flight plan as per the following example:~~

~~**CODE/7C432B**~~

~~States should note that use of hexadecimal code may be prone to human error and is less flexible in regard to airframe changes for a notified flight.~~

9.109.23 ADS-B Flight Planning Requirements ~~(After transition to new DOC4444 format in 2012)~~

~~After transition to the new flight plan format in 2012, the following shall apply:~~

9.109.32.1 ~~Flight Notification~~ICAO Flight Plan Item 10 – Surveillance Equipment and Capabilities

An appropriate ADS-B designator shall be entered in ~~section~~item 10 of the flight plan to indicate that the flight is capable of transmitting ADS-B messages.

For information, these include:

B1 ADS-B with dedicated 1090 MHz ADS-B "out" capability
B2 ADS-B with dedicated 1090 MHz ADS-B "out" and "in" capability
U1 ADS-B "out" capability using UAT
U2 ADS-B "out" and "in" capability using UAT
V1 ADS-B "out" capability using VDL Mode 4
V2 ADS-B "out" and "in" capability using VDL Mode 4

9.109.23.2 ~~Aircraft Address (24 Bit Code)~~ICAO Flight Plan Item 18 – Other Information

~~Where required, the aircraft address (in hexadecimal format) may be recorded in section 18 of the ICAO flight plan as per the following example:~~Where required by the appropriate authority the ICAO Aircraft Address (24 Bit Code) may be recorded in Item 18 of the ICAO flight plan, in hexadecimal format as per the following example:

CODE/7C432B

States should note that use of hexadecimal code may be prone to human error and is less flexible in regard to airframe changes for a notified flight.

9.109.23.3 ~~SSR Mode S~~Transponder Capabilities

When an aircraft is equipped with a mode S transponder, that transmits ADS-B messages, an appropriate Mode S designator should also be entered in ~~field~~item 10; i.e.: either

- E Transponder — Mode S, including aircraft identification, pressure-altitude and extended squitter (ADS-B) capability, or
- L Transponder — Mode S, including aircraft identification, pressure-altitude, extended squitter (ADS-B) and enhanced surveillance capability.

9.10.3 Setting Flight Identification in Cockpits

(a) Flight ID Principles

The aircraft identification (sometimes called the flight identification or FLTID) is the equivalent of the aircraft callsign and is used in both ADS-B and Mode S SSR technology. Up to seven characters long, it is usually set in airline aircraft by the flight crew via a cockpit interface. It enables air traffic controllers to identify and aircraft on a display and to correlate a radar or ADS-B track with the flight plan date. Aircraft identification is critical, so it must be entered carefully. Punching in the wrong characters can lead to ATC confusing once aircraft with another.

It is important that the identification exactly matches the aircraft identification (ASID) entered in the flight notification.

Intuitive correlation between an aircraft's identification and radio callsign enhances situational awareness and communication. Airline aircraft typically use a three letter ICAO airline code used in flight plans, NOT the two letter IATA codes.

(b) Setting Flight ID

The callsign dictates the applicable option below for setting ADS-B or Mode S Flight ID:

(i) the flight number using the ICAO three-letter designator for the aircraft operator if a flight number callsign is being used (e.g. QFA1 for Qantas 1, THA54 for Thai 54).

(ii) the nationality and registration mark (without hyphen) of the aircraft if the callsign is the full version of the registration (e.g .VHABC for international operations).

(iii) The registration mark alone of the aircraft if the callsign is the abbreviated version of the registration (eg ABC for domestic operations).

(iv) The designator corresponding to a particular callsign approved by the ANSP or regulator (e.g. SPTR13 for firespotter 3).

(v) The designator corresponding to a particular callsign in accordance with the operations manual of the relevant recreational aircraft administrative organization (e.g. G123 for Gyroplance 123).

9.11 PROCEDURES TO HANDLE NON-COMPLANT ADS-B AIRCAFT OR MIS-LEADING ADS-B TRANSMISSIONS

ADS-B technology is increasingly being adopted by States in the Asia/Pacific Region. Asia/Pacific Region adopted 1090 extended squitter technology. Reliance on ADS-B transmissions can be expected to increase over the coming years.

Currently a number of aircraft are transmitting ADS-B data which is misleading or non-compliant with the ICAO standards specified in Annex 10. Examples include:

a) aircraft broadcasting incorrect message formats;

b) aircraft broadcasting inertial positional data and occasionally indicating in the messages that the data has high integrity when it does not;

c) using GPS sources that do not generate correct integrity data, whilst indicating in the messages that the data has high integrity;

d) transmitting ADS-B data with changing (and incorrect) flight identity; and

e) transmitting ADS-B data with incorrect flight identity continuously.

If the benefits of ADS-B are to flow to the aviation industry, misleading and non-compliant ADS-B transmissions need to be curtailed to the extent possible.

The transmission of a value of zero for the NUCp or the NIC or the SIL by an aircraft indicates a navigational uncertainty related to the position of the aircraft or a navigation integrity issue that is too significant to be used by air traffic controllers.

As such, the following procedure, stipulated in the Regional Supplementary Procedures Doc 7030, shall be applicable in the concerned FIRs on commencement of ADS-B based surveillance services notified by AIP or NOTAM:

If an aircraft operates within an FIR where ADS-B-based ATS surveillance service is provided, and

a) carries 1090 extended squitter ADS-B transmitting equipment which does not comply with one of the following:
   1) EASA AMC 20-24; or
   2) the equipment configuration standards in Appendix XI of Civil Aviation Order 20.18 of the Civil Aviation Safety Authority of Australia; or
   3) installation in accordance with the FAA AC No. 20-165 – Airworthiness Approval of ADS; or

b) the aircraft ADS-B transmitting equipment becomes unserviceable resulting in the aircraft transmitting misleading information;

then:

a) except when specifically authorized by the appropriate ATS authority, the aircraft shall not fly unless the equipment is:

   1) deactivated; or
   2) transmits only a value of zero for the NUCp or NIC~~,~~ or SIL

States may elect to implement a scheme to blacklist those non-compliant aircraft or aircraft consistently transmitting mis-leading ADS-B information, so as to refrain the aircraft from being displayed to ATC.

A sample template is given below for reference by States to publish the procedures to handle non-compliant ADS-B aircraft or misleading ADS-B transmissions in their ADS-B mandate/regulations:

After <insert earliest date that ADS-B may be used for any relevant operational purpose> if an aircraft carries ADS-B transmitting equipment which does no comply with :

(a) EASA AMC 20-24; or
(b) the equivalent configuration standards in Appendix XI of Civil Aviation Order 20.18 of the Civil Aviation Safety Authority of Australia; or
(c) Installation in accordance with the FAA AC No. 20-165 – Airworthiness Approval of ADS;

or the aircraft ADS-B transmitting equipment becomes unserviceable resulting in the aircraft transmitting misleading information;

the aircraft must not fly unless equipment is:

(a) deactivated; or
(b) set to transmit only a value of zero for the NUCp or NIC or SIL.

Note:

1. It is considered equivalent to deactivation if NUCp or NIC or SIL is set to continually transmit only a value of zero.
2. Regulators should take appropriate action to ensure that such regulations are complied with.
3. ATC systems should discard ADS-B data when NUC or NIC or SIL =0.

9.1~~0~~2 EMERGENCY PROCEDURES

ATC surveillance systems should provide for the display of safety-related alerts and warnings, including conflict alert, minimum safe altitude warning, conflict prediction and unintentionally duplicated SSR codes and aircraft identifications.

The ADS-B avionics may transmit emergency status messages to any ADS-B ground station within coverage. The controller receiving these messages should determine the nature of the emergency, acknowledge receipt if appropriate, and initiate any assistance required. An aircraft equipped with ADS-B might operate the emergency and/or urgency mode as follows:

a) emergency;
b) no communications;
c) unlawful interference;
d) minimum fuel; and/or
e) medical.

Selection of an emergency transponder code (e.g. 7600) automatically generates an emergency indication in the ADS-B message. However, some ADS-B transponders may only generate a generic emergency indication. That means, the specific type of emergency, e.g., communication failure, is not always conveyed to the controller in an ADS-B environment. The controller may only receive a generic emergency indication irrespective of the emergency codes being selected by the pilot.

Due to limitations of some ADS-B transponders, procedures should be developed for ATC to confirm the types of emergency with pilots based on operational needs of States.

Executive control responsibility

The responsibility for control of the flight rests with the ATSU within whose airspace the aircraft is operating. However, if the pilot takes action contrary to a clearance that has already been coordinated with another sector or ATSU and further coordination is not possible in the time available, the responsibility for this action would rest with the pilot in command, and performed under the pilot's emergency authority.

Emergency procedures

The various circumstances surrounding each emergency situation preclude the establishment of exact detailed procedures to be followed. The procedures outlined in PANS-ATM Chapter 15 provide a general guide to air traffic services personnel and where necessary, should be adapted for the use of ADS-B.

10. SECURITY ISSUES ASSOCIATED WITH ADS-B

10.1 INTRODUCTION

ADS-B technologies are currently "open systems" and the openness is an essential component of successful use of ADS-B. It was also noted that ADS-B transmission from commercial aircraft is a "fact of life" today. Many commercial aircraft are already equipped with ADS-B and have been transmitting data for some time.

It was noted that there has been considerable alarmist publicity regarding ADS-B security. To a large extent, this publicity has not considered the nature and complexity of ATC. Careful assessment of security policies in use today for ADS-B and other technologies can provide a more balanced view.

10.2 CONSIDERATIONS

A list of ADS-B vulnerabilities categorised into threats to Confidentiality, Integrity and Availability has been reviewed and documented into the guidance material on security issues associated with ADS-B provided on the ICAO APAC website "http://www.bangkok.icao.int/edocs/index.html" under "Restricted Site" for reference by States. States could contact ICAO Regional Office to get access to the guidance material. The following recommendations are made to States :

(a) While ADS-B is recognized as a key enabling technology for aviation with potential safety benefits, it is recommended that States made aware of possible ADS-B security specific issues;
(b) It is recommended that States note that much of the discussion of ADS-B issues in the Press has not considered the complete picture regarding the ATC use of surveillance data;
(c) For current ADS-B technology implementation, security risk assessment studies should be made in coordination with appropriate national organisations and ANSPs to address appropriate mitigation applicable in each operational environment, in accordance with ATM interoperability requirements; and
(d) Future development of ADS-B technology, as planned in the SESAR master plan for example, should address security issues. Studies should be made to identify potential encryption and authentication techniques, taking into consideration the operational need of air to ground and air to air surveillance applications. Distribution of encryption keys to a large number of ADS-B receivers is likely to be problematic and solutions in the near and medium term are not considered likely to be deployed worldwide. Internet based encryption strategies are not deployable when ground stations are pass receivers.

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Commissioning Readiness

The requirement for this form is specified in the System Management Manual (Section 11.2 of V4), C-MAN0107

Project/Task Name	**SAP Project/Task ID:**	**Sites or Locations affected:**
Documentation prepared by:	**Date:**	**Commissioning Date:**
Affected System(s)	**System Criticality**	**Change Consequence Level**
Brief Description of Change:		

Commissioning Readiness Endorsement

The endorsement of this form by the appropriate authorities as specified in the System Management Manual certifies that the requirements detailed in this form (with the exception of the non-critical deficiencies[1] listed herein) have been completed prior to the commissioning of the system change or new system.

Chief Engineer or Technical or Maintenance Authority

Name:	**Signature:**	**Date**:
Designation:		
Name:	**Signature:**	**Date**:
Designation:		

Chief Operating/User Authority or Operating/User Authority

Name:	**Signature:**	**Date**:
Designation:		

Records Management Instructions

Place the completed Commissioning Readiness Form, together with any support documents on the Project file
Provide a copy of the completed Commissioning Readiness Form to P&E, Asset Lifecycle Manager, Planning and Integration

Note 1: Non-critical deficiencies (NCD) are those outstanding technical and operational issues that do not prevent the safe and effective use or maintenance of the facility, but will be addressed in a specified and agreed time. NCDs shall be listed on the Commissioning Certificate (C-FORMS0300) and recorded in the relevant system (ASID / HEAT / SAIR). It is preferable for each NCD to be recorded as a separate Issue.

Item No:	Requirement:	Requirement Reference: (Procedure/instruction used to specified required input)	Completed or N/A	Evidence of Compliance (If a requirement is N/A, a reason why it is N/A is required to be entered)
1	OPERATIONAL SAFETY			
1.1	Provide a link to the completed SCARD **SCARD** Template (AA-TEMP-SAF-0042) Note: For unregulated systems the SCARD shall be used to assess the impact of the change and perform a preliminary hazard analysis	Safety Change Management Requirements **AA-NOS-SAF-0104**	Completed ☐ N/A ☐	**Link to SCARD**
1.2	The outcome of the SCARD will be the requirement for one of the following for commissioning: **Safety Statement** – included in SCARD or standalone Safety Statement which must provide Airservices Australia management with sufficient information to demonstrate that safety has been considered and the change presents minimal or no safety issues. **Safety Plan & Safety Assessment Report, or** **Safety Plan & Safety Case** Safety Plans, Safety Assessment Reports and Safety Cases are required to be available in the Document Search Database	Safety Change Management Requirements **AA-NOS-SAF-0104** Document Search Database	Completed ☐ N/A ☐	**Link to Safety statement or** **Link to Safety Plan & Safety Assessment Report or** **Link to Safety Plan & Safety Case**
1.3	Safety risk management process completed and includes • any new hazards / impact to existing hazards identified? • controls identified and in place? and • residual risk justified and accepted.	Safety Risk Management Procedures **AA-PROC-SAF-0105**	Completed ☐ N/A ☐	
1.4	Impacts on the Operational Risk Assessments from residual risks have been assessed and implemented using Operational Risk Assessment Change Request and Acceptance Record – AA-FORM-SAF-0032	Operational Risk Assessment **AA-NOS-SAF-0006** Safety Risk Management Procedures **AA-PROC-SAF-0105**	Completed ☐ N/A ☐	Link to Operational Risk Assessment Change Request and Acceptance Record:
1.5	Arrangements for monitoring and review of risks are in place including arrangements for safety performance monitoring following the transition.	Safety Risk Management Procedures **AA-PROC-SAF-0105**	Completed ☐ N/A ☐	
1.6	CASA have approved / accepted or been advised of the change, as applicable	Safety Change Management Requirements **AA-NOS-SAF-0104**	Completed ☐ N/A ☐	

Item No:	Requirement:	Requirement Reference: (Procedure/instruction used to specified required input)	Completed or N/A	Evidence of Compliance (If a requirement is N/A, a reason why it is N/A is required to be entered)
2	WORKPLACE HEALTH & SAFETY			
2.1	Initial WHS Hazard Identification must be completed as per the template AA-TEMP-SAF-0020	Safety Risk Management Procedures AA-PROC-SAF-0105 Initial WHS Hazard Identification AA-TEMP-SAF-0020 Workplace Health and Safety Risk Management Summary AA-TEMP-SAF-0016	Completed ☐ N/A ☐	**Link to completed Workplace Health and Safety Management Summary** AA-TEMP-SAF-0016
2.2	Ensure employees and stakeholders are consulted when significant changes to work arrangements are being considered.	Working Together Workplace Consultation AA-PROC-SAF-0009	Completed ☐ N/A ☐	
2.3	Tower Access / Classification assessed? Working at Heights Safety Checklist & Daily Toolbox Meeting (F098) Fall arrest facility / equipment available	Working at Heights PROC-157 Working at Heights Safety Checklist & Daily Toolbox Meeting F098	Completed ☐ N/A ☐	
2.4	WHS hazard controls are in place - Safe Work Method Statement completed - Plant risks managed - Radhaz survey completed, published on the Avnet and general public & occupational exposure boundaries identified	Safe Work Method Statement AA-TEMP-SAF-0017 Managing WHS Risk for Contractors and Projects AA-PROC-SAF-0012 Plant Risk Management PROC-134 RF Radiation, Surveys & Health & Safety Mgmt PROC-121	Completed ☐ N/A ☐	**Link to completed Safe Work Method Statement** AA-TEMP-SAF-0017 **Link to completed** F131 **Plant Risk Management Checklist**
2.5	At the completion of works ensure WHS Inspections are completed and hazard controls are in place. Building condition; clean, undamaged, all work completed.	Conducting Workplace Safety Inspections AA-PROC-SAF-0008	Completed ☐ N/A ☐	

Item No:	Requirement:	Requirement Reference: (Procedure/instruction used to specified required input)	Completed or N/A	Evidence of Compliance (If a requirement is N/A, a reason why it is N/A is required to be entered)
3	ENVIRONMENT			
3.1	Environmental Impact must be assessed using the Environmental Impact Screening & Assessment Criteria for Changes to On-ground Activities Assistance in assessing the Environmental Impact can be obtained from Environment and Climate Change Unit in Environment Group.	Environmental Screening & Assessment Criteria for Changes to On-ground Activities **AA-REF-ENV-0010** Environmental Assessment of Changes to On-ground Activities. **AA-NOS-ENV-2.200**	Completed ☐ N/A ☐	**Link to completed Environmental Impact Screening and Assessment Form** **If a stage 2 assessment is required provide ARMS reference and links to any Permits, Master Development Plans and relevant correspondence as required.**
3.2	Environmental Clearance obtained for ATM changes as per **AA-NOS-ENV-2.100** Assistance in assessing the Environmental Impact can be obtained from Environment and Climate Change Unit in Environment Group.	Environment Assessment Process for ATM Changes **AA-NOS-ENV-2.100**	Completed ☐ N/A ☐	**Provide ARMS reference and NRFC reference if ATM change required**
4	PEOPLE- SUPPORT			
ATC TRAINING				
4.1	ATC Training Needs Analysis completed and Training Plan developed?		Completed ☐ N/A ☐	**Link to Training Needs Analysis and Training Plan**
4.2	Sufficient number of trained, rated and endorsed ATC staff available.		Completed ☐ N/A ☐	**Number Trained:**
4.3	ATC staff individual training records in SAP database have been updated		Completed ☐ N/A ☐	
4.4	Plans are in place to complete any outstanding training, rating, and endorsement of remaining ATC staff (Normally an identified hazard)		Completed ☐ N/A ☐	**HAZLOG Register No:**

Item No:	Requirement:	Requirement Reference: (Procedure/instruction used to specified required input)	Completed or N/A	Evidence of Compliance (If a requirement is N/A, a reason why it is N/A is required to be entered)
TECHNICAL TRAINING				
4.5	Training Needs Analysis completed and Training Plan developed for system support staff and field maintenance staff?		Completed ☐ N/A ☐	**Link to Training Needs Analysis and Training Plan**
4.6	TechCert codes have been created, assessment criteria developed or existing assessment criteria has been amended	**TechCert codes** **TechCert Guides and Forms**	Completed ☐ N/A ☐	**Link to TechCert Guides and Forms**
4.7	Sufficient system support staff and field maintenance staff appropriately trained?		Completed ☐ N/A ☐	
4.8	Are plans are in place to complete any outstanding training and certification of system support staff and remaining field maintenance staff?		Completed ☐ N/A ☐	
4.9	Field maintenance staff hold the relevant TechCert to perform duties.	Technical Certification **PROC-141**	Completed ☐ N/A ☐	
4.10	Statutory / special licensing obtained by field maintenance staff including high risk work competencies and licensing requirements?		Completed ☐ N/A ☐	
4.11	ABS and FMS staff training details sent to Technical Training Coordinator and training records updated as required?	Training **PROC-119**	Completed ☐ N/A ☐	
4.12	TechCert details sent to FMS System Support to update the Qualifications (TechCert) Database	Technical Certification **PROC-141**	Completed ☐ N/A ☐	
LOGISTICAL SUPPORT				
4.13	CMRD have been consulted regarding special test equipment, test beds, etc		Completed ☐ N/A ☐	

Item No:	Requirement:	Requirement Reference: (Procedure/instruction used to specified required input)	Completed or N/A	Evidence of Compliance (If a requirement is N/A, a reason why it is N/A is required to be entered)
4.14	CMRD / NDC have been consulted regarding spares holdings and repair of LRUs from this equipment or in-house support of Depot Level Support Contract / repair contract		Completed ☐ N/A ☐	
4.15	TEMACC advised of any specialised test equipment requirements.	Test Equipment Management **PROC-150**	Completed ☐ N/A ☐	
4.16	Maintenance support contracts in place (external and/or internal)? – Appropriate vendor and/or internal support? – Appropriate Level 3 maintenance arrangements		Completed ☐ N/A ☐	
4.17	Test equipment provided to maintenance base. Note: Test equipment purchasing and calibration requirements detailed in Engineering Execution Readiness form.		Completed ☐ N/A ☐	
4.18	Specialised hardware or software system support and field maintenance tools, test / patch leads, adaptors, isolators, electronic discharge protection (mats, straps), etc supplied?		Completed ☐ N/A ☐	
4.19	System Business Continuity/ Disaster Recovery provisions supplied/updated?		Completed ☐ N/A ☐	
4.20	Spares – Supplied, storage correct, transport cases supplied?	Management of Goods & Supplies **PROC-118**	Completed ☐ N/A ☐	
4.21	Spares – Software / firmware loaded, tested & configured?		Completed ☐ N/A ☐	
4.22	Service Restoration Times (SRT) established?	Airways Service Data **PROC-207**	Completed ☐ N/A ☐	

Item No:	Requirement:	Requirement Reference: (Procedure/instruction used to specified required input)	Completed or N/A	Evidence of Compliance (If a requirement is N/A, a reason why it is N/A is required to be entered)
4.23	Conduct Hardware physical configuration audit and ensure SAP Plant Maintenance has updated information of all installed and/or demolished equipment (including monitoring circuits) and sent to System Operations SAP PM DATA CHANGES.	Equipment Installed/Demolished Advice SAP Data Input Form **F104**	Completed ☐ N/A ☐	**Link to Email from SAP PM Support confirming update/s**
5	PROCEDURES			
ATC DOCUMENTATION				
5.1	System Requirements documentation including Operating Concept or Business Process Rules - produced/updated and approved?		Completed ☐ N/A ☐	**Link to documentation**
5.2	Manual of Air Traffic Services (MATS) reviewed / updated. Aeronautical information publications (AIP Book, AIP SUPP, AIC, DAP, ERSA, Charts, etc) reviewed / updated. Amendment times are determined by the AIS Distribution Schedule	**AA Publications** **AIS Distribution Schedule**	Completed ☐ N/A ☐	**NRFC No.**
5.3	National ATC Procedures Manual (NAPM) and any other relevant ATC procedures reviewed / updated.		Completed ☐ N/A ☐	**NRFC No.**
5.4	ATC contingency / continuity plans reviewed / updated.	**ATS Contingency Plans** Business Continuity Plans **C-BCP**	Completed ☐ N/A ☐	**ATS-CP No:** **C-BCP No:**
5.5	NOTAM and/or AIP SUP issued / amended / cancelled	Works Planning **PROC-213** Refer also **LOA3024**	Completed ☐ N/A ☐	**NOTAM No:**
5.6	ATC Temporary Local Instruction (TLI) issued notifying Operational staff of change?	**Temporary Local Instructions & Database**	Completed ☐ N/A ☐	**NRFC No.**

Item No:	Requirement:	Requirement Reference: (Procedure/instruction used to specified required input)	Completed or N/A	Evidence of Compliance (If a requirement is N/A, a reason why it is N/A is required to be entered)
USER DOCUMENTATION				
5.7	User/operator manuals updated		Completed ☐ N/A ☐	
5.8	User/operator procedures provided/updated as applicable		Completed ☐ N/A ☐	
5.9	On-line user/operator documentation completed and published		Completed ☐ N/A ☐	
5.10	ARFF instructions updated		Completed ☐ N/A ☐	
5.11	Other Business Groups instructions updated?		Completed ☐ N/A ☐	
TECHNICAL DOCUMENTATION				
5.12	Software design documents updated, adequate and supplied to system support?		Completed ☐ N/A ☐	
5.13	Software and/or dataset Version or Release Description Documentation supplied and adequate?		Completed ☐ N/A ☐	**Link to Version Description Document or Release Description Document**
5.14	Software installation procedure and instructions supplied/updated and adequate?		Completed ☐ N/A ☐	**Link to Installation Procedure**

Item No:	Requirement:	Requirement Reference: (Procedure/instruction used to specified required input)	Completed or N/A	Evidence of Compliance (If a requirement is N/A, a reason why it is N/A is required to be entered)
5.15	**SMP**: System Management Plan created / updated and adequate?	SMP Template	Completed ☐ N/A ☐	**SMP No:**
5.16	**SCP:** System Contingency / continuity plans supplied/updated and adequate?	SCP Template	Completed ☐ N/A ☐	**SCP No:**
5.17	Technical drawings updated and listed in Data Viewer and list supplied to system supporters and field maintenance staff.	Technical Drawing Management PROC-178	Completed ☐ N/A ☐	
5.18	Technical handbooks/manuals supplied to ABS or FMS Engineering/IT support and field maintenance staff (base and site copy).	Document Management PROC-103	Completed ☐ N/A ☐	
5.19	On-line system support and field maintenance documentation completed and published		Completed ☐ N/A ☐	
5.20	Technical documentation registered and placed under documentation control	Document Management PROC-103	Completed ☐ N/A ☐	
5.21	Appropriate engineering performance requirements specified and issued for ongoing use? System Specification documentation supplied/updated and adequate?	System Performance Requirements & Reporting Specification ASYS-106	Completed ☐ N/A ☐	
5.22	**Configuration & Modification AEI:** Equipment and System Modifications and Configuration (for hardware and software), and Software Release Authorisations are documented in a Part 2 AEI (or other approved documentation)	Development of Maintenance Instructions for Equipment PROC-151	Completed ☐ N/A ☐	**AEI No/s:** **Link to documentation detailing configuration and modification**
5.23	**Maintenance AEI:** Maintenance requirements, including Performance Inspection tolerances, have been defined and documented in AEIs (or other approved documentation). (AEI Part 3,4,7)	Development of Maintenance Instructions for Equipment PROC-151	Completed ☐ N/A ☐	**AEI No/s:**

Item No:	Requirement:	Requirement Reference: (Procedure/instruction used to specified required input)	Completed or N/A	Evidence of Compliance (If a requirement is N/A, a reason why it is N/A is required to be entered)
5.24	**AEI:** New maintenance AEIs trialled by maintenance staff	Development of Maintenance Instructions for Equipment **PROC-151**	Completed ☐ N/A ☐	
5.25	**TTD**: Temporary Technical Dispensation raised and published on the Document Search database.	Temporary Technical Dispensations **PROC-153**	Completed ☐ N/A ☐	**TTD No:**
5.26	Site Manifest updated	Site Manifests **FMS-304**	Completed ☐ N/A ☐	
6 SYSTEM				
DESIGN REQUIREMENTS				
6.1	System Requirements documentation including Operating Concept or Business Process Rules - supplied/updated and approved?	Design Control **PROC-146**	Completed ☐ N/A ☐	**Links to documentation**
6.2	Standards – Installation and equipment comply with all relevant Australian Standards? Building Codes - Structures comply with the relevant Building Codes? The relevant Australian Standards and Building Codes are to be determined by the Chief Engineer, Technical Authority or Maintenance Authority	Australian Standards Design Control **PROC-146**	Completed ☐ N/A ☐	
6.3	Other applicable Federal and/or State licensing requirements met? The relevant licensing requirements are to be determined by the Chief Engineer, Technical Authority or Maintenance Authority	Design Control **PROC-146**	Completed ☐ N/A ☐	

Item No:	Requirement:	Requirement Reference: (Procedure/instruction used to specified required input)	Completed or N/A	Evidence of Compliance (If a requirement is N/A, a reason why it is N/A is required to be entered)
6.4	Electrical Mechanical, Structure and Building impacts have been assessed as adequate or modifications organised and completed through consultation with Engineering Branch, P&E? (Power supply capability / airconditioning capacity / mast loadings)	Design Control PROC-146	Completed ☐ N/A ☐	
6.5	Earthing and Lightning Protection meets Airservices requirements?	Earthing and Lightning Protection Systems for Operational Facilities AEI 3.1504 Site Earthing and Lightning Protection Systems for Existing Installations AEI 2.3011	Completed ☐ N/A ☐	
6.6	Battery Procurement as per Airservices requirements?	Lead Acid Batteries (Stationary) Procurement and Acceptance Testing AEI-3.7050 Panel Contract Arrangement C-PROC0140	Completed ☐ N/A ☐	
6.7	Assessing the impact of information systems against corporate objectives (7 Ticks process).	Information Technology Application Certification –'7 Ticks' MI-0804 and PROC-190	Completed ☐ N/A ☐	**Link to completed 7 Ticks Interim Certificate or Final Certificate**
6.8	IT Security measures appropriate and in place(ie. to ensure effective security and control practices to minimise the risks of unauthorised access, inappropriate use, modification, destruction or disclosure of electronically held data).	IT Security Roles and Responsibilities Statement MS-0013 Information Security MI-0808 ICT Resources – Conditions of Use MI-0829	Completed ☐ N/A ☐	

Item No:	Requirement:	Requirement Reference: (Procedure/instruction used to specified required input)	Completed or N/A	Evidence of Compliance (If a requirement is N/A, a reason why it is N/A is required to be entered)
6.9	Information Security	Information Security C-PROC0184	Completed ☐ N/A ☐	**Link to completed security risk management plan**
INSTALLATION REQUIREMENTS				
6.10	Has met the regulation and safety requirements for Telecommunications Installations. Cable Markers installed (external)? Equipment complies with ACMA statutory requirement Telecommunication Labelling (Customer Equipment and Customer Cabling) Notice 2001 as amended (i.e. 'A' ticked on the equipment compliance plate)	Implementing Regulation and Safety Requirements for Telecommunications Installations PROC-138 Installation of Optical Fibre Cable - Underground AEI 4.5001 Underground Cable Marking AEI 4.3001	Completed ☐ N/A ☐	**Link to Telecommunications Cabling Advice**
6.11	MDF/IDF Records created / updated? Labelling/Colour Coding – Rack, Cable, Chassis, etc.?	Colour Coding of RJ45 Patch Leads for Voice and Data Installations AEI 7.3241	Completed ☐ N/A ☐	
6.12	Transmitters licence label affixed	Radio Communication Transmitter Labelling AEI 7.4238	Completed ☐ N/A ☐	
6.13	Electrical Certificate of Testing and Safety or Testing and Compliance on connection to a source of electricity (i.e. installation conforms to AS3000) are required to be supplied as soon as possible after connection or testing of any electrical installation or change. Labelling – Switch Boards, etc Meets Airservices Electrical Cable Colour Coding requirements?	Electrical Safety Regulation 2002 Sections 15 and 159 AS 3000 – Aust Standard Electrical Cable Colour Coding AEI 3.1502	Completed ☐ N/A ☐	**Links to Electrical Certificates**

Item No:	Requirement:	Requirement Reference: (Procedure/instruction used to specified required input)	Completed or N/A	Evidence of Compliance (If a requirement is N/A, a reason why it is N/A is required to be entered)
6.14	All modifications complete and scratch plate labels affixed to equipments	Identification of Airways Systems Equipment Hardware Modifications PROC-154	Completed ☐ N/A ☐	
6.15	Integration with National Technical Monitoring has been organised and completed through Engineering Branch, P&E?		Completed ☐ N/A ☐	
6.16	Alarm monitoring installed and tested at TOC for local and remote site?		Completed ☐ N/A ☐	
6.17	Source media – supplied/backed up, stored, registered with system support?	Software Media Archival and Storage PROC-147	Completed ☐ N/A ☐	
6.18	Site installable media – supplied/backed up, appropriately stored and registered by field maintainers?	Software Media Archival and Storage PROC-147	Completed ☐ N/A ☐	
6.19	Software licences provided, registered and appropriately stored? (Including details of any third party licensing)		Completed ☐ N/A ☐	
6.20	Update HEAT and/or ASID database to incorporate new system/version number and assign issue management roles?		Completed ☐ N/A ☐	

Item No:	Requirement:	Requirement Reference: (Procedure/instruction used to specified required input)	Completed or N/A	Evidence of Compliance (If a requirement is N/A, a reason why it is N/A is required to be entered)
DESIGN CONFIRMATION				
6.21	Airservices Physical Security requirements met. The minimum security requirements are specified in C-GUIDE0157. Physical Security advise can be obtained from the relevant Security Advisor in Security and Crisis Planning, Safety & Environment Physical Access requirements are determined and established Siting and accommodation impact has been assessed as being satisfactory or modifications organised through National Property?	Physical Security – Critical Operational Facilities C-GUIDE0157 Site Management PROC-170	Completed ☐ N/A ☐	
6.22	Network data load impact has been assessed as being satisfactory or modifications organised and completed through Engineering Branch, P&E?		Completed ☐ N/A ☐	
6.23	Spectrum licences (either cancelled if no longer required or for new licenses including if antenna moves by more than 10 metres)	Frequency Management: Obtaining a Frequency Assignment and Licence AEI 7.4202	Completed ☐ N/A ☐	
6.24	New system or system change acceptance tests (software and/or hardware) satisfactorily completed against the approved system requirements? – Test Plans provided? – FAT, SAT, UAT test results complete, passed to the required level and provided? – Test identified defect listings and re-test information provided?	System Management Manual SMM Design Control PROC-146	Completed ☐ N/A ☐	
6.25	Battery Acceptance Tests as per Airservices requirements?	Lead Acid Batteries (Stationary) Procurement and Acceptance Testing AEI-3.7050	Completed ☐ N/A ☐	**Link to Battery Acceptance Test Results**

Item No:	Requirement:	Requirement Reference: (Procedure/instruction used to specified required input)	Completed or N/A	Evidence of Compliance (If a requirement is N/A, a reason why it is N/A is required to be entered)
6.26	Standard Operating Conditions (SOCs) / Site Configuration Data (SCD) established / approved	Standard Operating Conditions & Site Configuration Data Management PROC-143	Completed ☐ N/A ☐	
6.27	Flight Test results supplied and satisfactory	Certification of Radio Navigation Aid Facilities AEI 7.4003	Completed ☐ N/A ☐	
6.28	Equipment operation is as per AEI specifications and any additionally specified requirements? Relevant requirements and performance specifications to be determined by the Chief Engineer, Technical Authority or Maintenance Authority		Completed ☐ N/A ☐	
7 TRANSITION				
PLANNING				
7.1	Does the system meet all critical user and technical requirements?		Completed ☐ N/A ☐	
7.2	If non-critical deficiencies are proposed to be accepted into operation, are they managed and tracked via ASID, HEAT or SAIR, including responsibilities and timings and attached to the Commissioning Certificate?		Completed ☐ N/A ☐	
7.3	Cutover Plan prepared and authorised by: – Appropriate level of engineering authority? – Appropriate level of User Authority?	Cutover Plan C-TEMP0045	Completed ☐ N/A ☐	**Link to Cutover Plan**
7.4	Works plan created at least 7 days before deployment	Works Planning PROC-213	Completed ☐ N/A ☐	**Works Plan No.**

Item No:	Requirement:	Requirement Reference: (Procedure/instruction used to specified required input)	Completed or N/A	Evidence of Compliance (If a requirement is N/A, a reason why it is N/A is required to be entered)
NOTIFICATION				
7.5	Industry education / notification been completed?		Completed ☐ N/A ☐	
7.6	Relevant Business Managers advised of impending change?		Completed ☐ N/A ☐	
7.7	Change requester and/or sponsor notified?		Completed ☐ N/A ☐	
7.8	System Operations' TOC and Service Desk notified and accepted operating responsibility for the change.		Completed ☐ N/A ☐	
7.9	ABS/FMS Manager has accepted maintenance responsibility		Completed ☐ N/A ☐	
7.10	Notify the following (as appropriate) that the system is at **"OPERATIONAL READINESS"** and provide details of commissioning and any system changes: **ATC** System Supervisor, Melbourne (ATC) System Supervisor, Brisbane (ATC) National ATC Systems Manager Operating Authority (relevant)	**Sys to Svc List**	Completed ☐ N/A ☐	

Item No:	Requirement:	Requirement Reference: (Procedure/instruction used to specified required input)	Completed or N/A	Evidence of Compliance (If a requirement is N/A, a reason why it is N/A is required to be entered)
7.11	Notify the following (as appropriate) that the system is at **"ENGINEERING READINESS"** and provide details of commissioning and any system changes: **P&E** Technical Authority (relevant) Technical Operations Centre – Director Service Desk -Airways SAP PM Support	**Sys to Svc List**	Completed ☐ N/A ☐	

COMMISSIONING CERTIFICATE

The requirement for this form is specified in the System Management Manual (Section 11.2 of V4), C-MAN0107

Project/Task Name	SAP Project/Task ID:	Sites or Locations affected:
Documentation prepared by:	Date:	Commissioning Date:
Affected System(s)	System Criticality	Change Consequence Level
Brief Description of Change:		

Commissioning Approval

The approval of this document by the appropriate authorities as specified in the System Management Manual certifies that the new system or system change is satisfactory to meet the specified service and performance requirements; that system operating and support requirements are in place; that required user and technical training is adequately provisioned; as detailed in the Commissioning Readiness Form and consequently the new system or system change is declared fit-for-purpose and can be deployed and operated until formally decommissioned or otherwise revoked.

This approval is provided subject to the non-critical deficiencies[1] listed herein.

Chief Engineer, Technical or Maintenance Authority

Name	Signature:	Date
Designation:		

Name:	Signature:	Date:
Designation:		

Chief Operating/User Authority or Operating/User Authority

Name:	Signature:	Date:
Designation:		

Records Management Instructions

Place the completed Commissioning Certificate, together with the completed Commissioning Readiness form on the Project file

Provide a copy of the completed Commissioning Certificate, and the completed Commissioning Readiness Form to P&E, Asset Lifecycle Manager, Planning and Integration

Note 1: **Non-critical deficiencies** are those outstanding technical and operational issues that do not prevent the safe and effective use of the facility by users or prevent effective technical maintenance, but will be addressed in a specified and agreed time.

LIST OF NON-CRITICAL DEFICIENCIES WAIVED AT TIME OF COMMISSIONING Either list non-critical deficiencies here or attach a list if space insufficient				
Issue	**Issue Tracking Reference Number**	**Allocated to**	**Proposed Completion Date**	**Comments**

Commissioning Readiness

The requirement for this form is specified in the System Management Manual (Section 11.2 of V4), C-MAN0107

Project/Task Name	**SAP Project/Task ID:**	**Sites or Locations affected:**
Documentation prepared by:	**Date:**	**Commissioning Date:**
Affected System(s)	**System Criticality**	**Change Consequence Level**
Brief Description of Change:		

Commissioning Readiness Endorsement

The endorsement of this form by the appropriate authorities as specified in the System Management Manual certifies that the requirements detailed in this form (with the exception of the non-critical deficiencies[1] listed herein) have been completed prior to the commissioning of the system change or new system.

Chief Engineer or Technical or Maintenance Authority

Name:	**Signature:**	**Date**:
Designation:		
Name:	**Signature:**	**Date**:
Designation:		

Chief Operating/User Authority or Operating/User Authority

Name:	**Signature:**	**Date**:
Designation:		

Records Management Instructions

Place the completed Commissioning Readiness Form, together with any support documents on the Project file

Provide a copy of the completed Commissioning Readiness Form to P&E, Asset Lifecycle Manager, Planning and Integration

Note 1: Non-critical deficiencies (NCD) are those outstanding technical and operational issues that do not prevent the safe and effective use or maintenance of the facility, but will be addressed in a specified and agreed time. NCDs shall be listed on the Commissioning Certificate (C-FORMS0300) and recorded in the relevant system (ASID / HEAT / SAIR). It is preferable for each NCD to be recorded as a separate Issue.

Item No:	Requirement:	Requirement Reference: (Procedure/instruction used to specified required input)	Completed or N/A	Evidence of Compliance (If a requirement is N/A, a reason why it is N/A is required to be entered)
1	OPERATIONAL SAFETY			
1.1	Provide a link to the completed SCARD **SCARD** Template (AA-TEMP-SAF-0042) Note: For unregulated systems the SCARD shall be used to assess the impact of the change and perform a preliminary hazard analysis	Safety Change Management Requirements **AA-NOS-SAF-0104**	Completed ☐ N/A ☐	**Link to SCARD**
1.2	The outcome of the SCARD will be the requirement for one of the following for commissioning: **Safety Statement** – included in SCARD or standalone Safety Statement which must provide Airservices Australia management with sufficient information to demonstrate that safety has been considered and the change presents minimal or no safety issues. **Safety Plan & Safety Assessment Report, or** **Safety Plan & Safety Case** Safety Plans, Safety Assessment Reports and Safety Cases are required to be available in the Document Search Database	Safety Change Management Requirements **AA-NOS-SAF-0104** Document Search Database	Completed ☐ N/A ☐	**Link to Safety statement or** **Link to Safety Plan & Safety Assessment Report or** **Link to Safety Plan & Safety Case**
1.3	Safety risk management process completed and includes • any new hazards / impact to existing hazards identified? • controls identified and in place? and • residual risk justified and accepted.	Safety Risk Management Procedures **AA-PROC-SAF-0105**	Completed ☐ N/A ☐	
1.4	Impacts on the Operational Risk Assessments from residual risks have been assessed and implemented using Operational Risk Assessment Change Request and Acceptance Record – AA-FORM-SAF-0032	Operational Risk Assessment **AA-NOS-SAF-0006** Safety Risk Management Procedures **AA-PROC-SAF-0105**	Completed ☐ N/A ☐	Link to Operational Risk Assessment Change Request and Acceptance Record:
1.5	Arrangements for monitoring and review of risks are in place including arrangements for safety performance monitoring following the transition.	Safety Risk Management Procedures **AA-PROC-SAF-0105**	Completed ☐ N/A ☐	
1.6	CASA have approved / accepted or been advised of the change, as applicable	Safety Change Management Requirements **AA-NOS-SAF-0104**	Completed ☐ N/A ☐	

Item No:	Requirement:	Requirement Reference: (Procedure/instruction used to specified required input)	Completed or N/A	Evidence of Compliance (If a requirement is N/A, a reason why it is N/A is required to be entered)
2	WORKPLACE HEALTH & SAFETY			
2.1	Initial WHS Hazard Identification must be completed as per the template AA-TEMP-SAF-0020	Safety Risk Management Procedures AA-PROC-SAF-0105 Initial WHS Hazard Identification AA-TEMP-SAF-0020 Workplace Health and Safety Risk Management Summary AA-TEMP-SAF-0016	Completed ☐ N/A ☐	**Link to completed Workplace Health and Safety Management Summary** AA-TEMP-SAF-0016
2.2	Ensure employees and stakeholders are consulted when significant changes to work arrangements are being considered.	Working Together Workplace Consultation AA-PROC-SAF-0009	Completed ☐ N/A ☐	
2.3	Tower Access / Classification assessed? Working at Heights Safety Checklist & Daily Toolbox Meeting (F098) Fall arrest facility / equipment available	Working at Heights PROC-157 Working at Heights Safety Checklist & Daily Toolbox Meeting F098	Completed ☐ N/A ☐	
2.4	WHS hazard controls are in place - Safe Work Method Statement completed - Plant risks managed - Radhaz survey completed, published on the Avnet and general public & occupational exposure boundaries identified	Safe Work Method Statement AA-TEMP-SAF-0017 Managing WHS Risk for Contractors and Projects AA-PROC-SAF-0012 Plant Risk Management PROC-134 RF Radiation, Surveys & Health & Safety Mgmt PROC-121	Completed ☐ N/A ☐	**Link to completed Safe Work Method Statement** AA-TEMP-SAF-0017 **Link to completed** F131 **Plant Risk Management Checklist**
2.5	At the completion of works ensure WHS Inspections are completed and hazard controls are in place. Building condition; clean, undamaged, all work completed.	Conducting Workplace Safety Inspections AA-PROC-SAF-0008	Completed ☐ N/A ☐	

Item No:	Requirement:	Requirement Reference: (Procedure/instruction used to specified required input)	Completed or N/A	Evidence of Compliance (If a requirement is N/A, a reason why it is N/A is required to be entered)
3	ENVIRONMENT			
3.1	Environmental Impact must be assessed using the Environmental Impact Screening & Assessment Criteria for Changes to On-ground Activities Assistance in assessing the Environmental Impact can be obtained from Environment and Climate Change Unit in Environment Group.	Environmental Screening & Assessment Criteria for Changes to On-ground Activities **AA-REF-ENV-0010** Environmental Assessment of Changes to On-ground Activities. **AA-NOS-ENV-2.200**	Completed ☐ N/A ☐	**Link to completed Environmental Impact Screening and Assessment Form** **If a stage 2 assessment is required provide ARMS reference and links to any Permits, Master Development Plans and relevant correspondence as required.**
3.2	Environmental Clearance obtained for ATM changes as per **AA-NOS-ENV-2.100** Assistance in assessing the Environmental Impact can be obtained from Environment and Climate Change Unit in Environment Group.	Environment Assessment Process for ATM Changes **AA-NOS-ENV-2.100**	Completed ☐ N/A ☐	**Provide ARMS reference and NRFC reference if ATM change required**
4	PEOPLE- SUPPORT			
ATC TRAINING				
4.1	ATC Training Needs Analysis completed and Training Plan developed?		Completed ☐ N/A ☐	**Link to Training Needs Analysis and Training Plan**
4.2	Sufficient number of trained, rated and endorsed ATC staff available.		Completed ☐ N/A ☐	**Number Trained:**
4.3	ATC staff individual training records in SAP database have been updated		Completed ☐ N/A ☐	
4.4	Plans are in place to complete any outstanding training, rating, and endorsement of remaining ATC staff (Normally an identified hazard)		Completed ☐ N/A ☐	**HAZLOG Register No:**

Item No:	Requirement:	Requirement Reference: (Procedure/instruction used to specified required input)	Completed or N/A	Evidence of Compliance (If a requirement is N/A, a reason why it is N/A is required to be entered)
TECHNICAL TRAINING				
4.5	Training Needs Analysis completed and Training Plan developed for system support staff and field maintenance staff?		Completed ☐ N/A ☐	**Link to Training Needs Analysis and Training Plan**
4.6	TechCert codes have been created, assessment criteria developed or existing assessment criteria has been amended	**TechCert codes** **TechCert Guides and Forms**	Completed ☐ N/A ☐	**Link to TechCert Guides and Forms**
4.7	Sufficient system support staff and field maintenance staff appropriately trained?		Completed ☐ N/A ☐	
4.8	Are plans are in place to complete any outstanding training and certification of system support staff and remaining field maintenance staff?		Completed ☐ N/A ☐	
4.9	Field maintenance staff hold the relevant TechCert to perform duties.	Technical Certification **PROC-141**	Completed ☐ N/A ☐	
4.10	Statutory / special licensing obtained by field maintenance staff including high risk work competencies and licensing requirements?		Completed ☐ N/A ☐	
4.11	ABS and FMS staff training details sent to Technical Training Coordinator and training records updated as required?	Training **PROC-119**	Completed ☐ N/A ☐	
4.12	TechCert details sent to FMS System Support to update the Qualifications (TechCert) Database	Technical Certification **PROC-141**	Completed ☐ N/A ☐	
LOGISTICAL SUPPORT				
4.13	CMRD have been consulted regarding special test equipment, test beds, etc		Completed ☐ N/A ☐	

Item No:	Requirement:	Requirement Reference: (Procedure/instruction used to specified required input)	Completed or N/A	Evidence of Compliance (If a requirement is N/A, a reason why it is N/A is required to be entered)
4.14	CMRD / NDC have been consulted regarding spares holdings and repair of LRUs from this equipment or in-house support of Depot Level Support Contract / repair contract		Completed ☐ N/A ☐	
4.15	TEMACC advised of any specialised test equipment requirements.	Test Equipment Management **PROC-150**	Completed ☐ N/A ☐	
4.16	Maintenance support contracts in place (external and/or internal)? – Appropriate vendor and/or internal support? – Appropriate Level 3 maintenance arrangements		Completed ☐ N/A ☐	
4.17	Test equipment provided to maintenance base. Note: Test equipment purchasing and calibration requirements detailed in Engineering Execution Readiness form.		Completed ☐ N/A ☐	
4.18	Specialised hardware or software system support and field maintenance tools, test / patch leads, adaptors, isolators, electronic discharge protection (mats, straps), etc supplied?		Completed ☐ N/A ☐	
4.19	System Business Continuity/ Disaster Recovery provisions supplied/updated?		Completed ☐ N/A ☐	
4.20	Spares – Supplied, storage correct, transport cases supplied?	Management of Goods & Supplies **PROC-118**	Completed ☐ N/A ☐	
4.21	Spares – Software / firmware loaded, tested & configured?		Completed ☐ N/A ☐	
4.22	Service Restoration Times (SRT) established?	Airways Service Data **PROC-207**	Completed ☐ N/A ☐	

Item No:	Requirement:	Requirement Reference: (Procedure/instruction used to specified required input)	Completed or N/A	Evidence of Compliance (If a requirement is N/A, a reason why it is N/A is required to be entered)
4.23	Conduct Hardware physical configuration audit and ensure SAP Plant Maintenance has updated information of all installed and/or demolished equipment (including monitoring circuits) and sent to System Operations SAP PM DATA CHANGES.	Equipment Installed/Demolished Advice SAP Data Input Form **F104**	Completed ☐ N/A ☐	**Link to Email from SAP PM Support confirming update/s**
5	PROCEDURES			
ATC DOCUMENTATION				
5.1	System Requirements documentation including Operating Concept or Business Process Rules - produced/updated and approved?		Completed ☐ N/A ☐	**Link to documentation**
5.2	Manual of Air Traffic Services (MATS) reviewed / updated. Aeronautical information publications (AIP Book, AIP SUPP, AIC, DAP, ERSA, Charts, etc) reviewed / updated. Amendment times are determined by the AIS Distribution Schedule	**AA Publications** **AIS Distribution Schedule**	Completed ☐ N/A ☐	**NRFC No.**
5.3	National ATC Procedures Manual (NAPM) and any other relevant ATC procedures reviewed / updated.		Completed ☐ N/A ☐	**NRFC No.**
5.4	ATC contingency / continuity plans reviewed / updated.	**ATS Contingency Plans** Business Continuity Plans **C-BCP**	Completed ☐ N/A ☐	**ATS-CP No:** **C-BCP No:**
5.5	NOTAM and/or AIP SUP issued / amended / cancelled	Works Planning **PROC-213** Refer also **LOA3024**	Completed ☐ N/A ☐	**NOTAM No:**
5.6	ATC Temporary Local Instruction (TLI) issued notifying Operational staff of change?	**Temporary Local Instructions & Database**	Completed ☐ N/A ☐	**NRFC No.**

Item No:	Requirement:	Requirement Reference: (Procedure/instruction used to specified required input)	Completed or N/A	Evidence of Compliance (If a requirement is N/A, a reason why it is N/A is required to be entered)
USER DOCUMENTATION				
5.7	User/operator manuals updated		Completed ☐ N/A ☐	
5.8	User/operator procedures provided/updated as applicable		Completed ☐ N/A ☐	
5.9	On-line user/operator documentation completed and published		Completed ☐ N/A ☐	
5.10	ARFF instructions updated		Completed ☐ N/A ☐	
5.11	Other Business Groups instructions updated?		Completed ☐ N/A ☐	
TECHNICAL DOCUMENTATION				
5.12	Software design documents updated, adequate and supplied to system support?		Completed ☐ N/A ☐	
5.13	Software and/or dataset Version or Release Description Documentation supplied and adequate?		Completed ☐ N/A ☐	**Link to Version Description Document or Release Description Document**
5.14	Software installation procedure and instructions supplied/updated and adequate?		Completed ☐ N/A ☐	**Link to Installation Procedure**

Item No:	Requirement:	Requirement Reference: (Procedure/instruction used to specified required input)	Completed or N/A	Evidence of Compliance (If a requirement is N/A, a reason why it is N/A is required to be entered)
5.15	**SMP**: System Management Plan created / updated and adequate?	SMP Template	Completed ☐ N/A ☐	**SMP No:**
5.16	**SCP:** System Contingency / continuity plans supplied/updated and adequate?	SCP Template	Completed ☐ N/A ☐	**SCP No:**
5.17	Technical drawings updated and listed in Data Viewer and list supplied to system supporters and field maintenance staff.	Technical Drawing Management PROC-178	Completed ☐ N/A ☐	
5.18	Technical handbooks/manuals supplied to ABS or FMS Engineering/IT support and field maintenance staff (base and site copy).	Document Management PROC-103	Completed ☐ N/A ☐	
5.19	On-line system support and field maintenance documentation completed and published		Completed ☐ N/A ☐	
5.20	Technical documentation registered and placed under documentation control	Document Management PROC-103	Completed ☐ N/A ☐	
5.21	Appropriate engineering performance requirements specified and issued for ongoing use? System Specification documentation supplied/updated and adequate?	System Performance Requirements & Reporting Specification ASYS-106	Completed ☐ N/A ☐	
5.22	**Configuration & Modification AEI:** Equipment and System Modifications and Configuration (for hardware and software), and Software Release Authorisations are documented in a Part 2 AEI (or other approved documentation)	Development of Maintenance Instructions for Equipment PROC-151	Completed ☐ N/A ☐	**AEI No/s:** **Link to documentation detailing configuration and modification**
5.23	**Maintenance AEI:** Maintenance requirements, including Performance Inspection tolerances, have been defined and documented in AEIs (or other approved documentation). (AEI Part 3,4,7)	Development of Maintenance Instructions for Equipment PROC-151	Completed ☐ N/A ☐	**AEI No/s:**

Item No:	Requirement:	Requirement Reference: (Procedure/instruction used to specified required input)	Completed or N/A	Evidence of Compliance (If a requirement is N/A, a reason why it is N/A is required to be entered)
5.24	**AEI:** New maintenance AEIs trialled by maintenance staff	Development of Maintenance Instructions for Equipment **PROC-151**	Completed ☐ N/A ☐	
5.25	**TTD**: Temporary Technical Dispensation raised and published on the Document Search database.	Temporary Technical Dispensations **PROC-153**	Completed ☐ N/A ☐	**TTD No:**
5.26	Site Manifest updated	Site Manifests **FMS-304**	Completed ☐ N/A ☐	
6 SYSTEM				
DESIGN REQUIREMENTS				
6.1	System Requirements documentation including Operating Concept or Business Process Rules - supplied/updated and approved?	Design Control **PROC-146**	Completed ☐ N/A ☐	**Links to documentation**
6.2	Standards – Installation and equipment comply with all relevant Australian Standards? Building Codes - Structures comply with the relevant Building Codes? The relevant Australian Standards and Building Codes are to be determined by the Chief Engineer, Technical Authority or Maintenance Authority	Australian Standards Design Control **PROC-146**	Completed ☐ N/A ☐	
6.3	Other applicable Federal and/or State licensing requirements met? The relevant licensing requirements are to be determined by the Chief Engineer, Technical Authority or Maintenance Authority	Design Control **PROC-146**	Completed ☐ N/A ☐	

Item No:	Requirement:	Requirement Reference: (Procedure/instruction used to specified required input)	Completed or N/A	Evidence of Compliance (If a requirement is N/A, a reason why it is N/A is required to be entered)
6.4	Electrical Mechanical, Structure and Building impacts have been assessed as adequate or modifications organised and completed through consultation with Engineering Branch, P&E? (Power supply capability / airconditioning capacity / mast loadings)	Design Control PROC-146	Completed ☐ N/A ☐	
6.5	Earthing and Lightning Protection meets Airservices requirements?	Earthing and Lightning Protection Systems for Operational Facilities AEI 3.1504 Site Earthing and Lightning Protection Systems for Existing Installations AEI 2.3011	Completed ☐ N/A ☐	
6.6	Battery Procurement as per Airservices requirements?	Lead Acid Batteries (Stationary) Procurement and Acceptance Testing AEI-3.7050 Panel Contract Arrangement C-PROC0140	Completed ☐ N/A ☐	
6.7	Assessing the impact of information systems against corporate objectives (7 Ticks process).	Information Technology Application Certification –'7 Ticks' MI-0804 and PROC-190	Completed ☐ N/A ☐	**Link to completed 7 Ticks Interim Certificate or Final Certificate**
6.8	IT Security measures appropriate and in place(ie. to ensure effective security and control practices to minimise the risks of unauthorised access, inappropriate use, modification, destruction or disclosure of electronically held data).	IT Security Roles and Responsibilities Statement MS-0013 Information Security MI-0808 ICT Resources – Conditions of Use MI-0829	Completed ☐ N/A ☐	

Item No:	Requirement:	Requirement Reference: (Procedure/instruction used to specified required input)	Completed or N/A	Evidence of Compliance (If a requirement is N/A, a reason why it is N/A is required to be entered)
6.9	Information Security	Information Security C-PROC0184	Completed ☐ N/A ☐	**Link to completed security risk management plan**
INSTALLATION REQUIREMENTS				
6.10	Has met the regulation and safety requirements for Telecommunications Installations. Cable Markers installed (external)? Equipment complies with ACMA statutory requirement Telecommunication Labelling (Customer Equipment and Customer Cabling) Notice 2001 as amended (i.e. 'A' ticked on the equipment compliance plate)	Implementing Regulation and Safety Requirements for Telecommunications Installations PROC-138 Installation of Optical Fibre Cable - Underground AEI 4.5001 Underground Cable Marking AEI 4.3001	Completed ☐ N/A ☐	**Link to Telecommunications Cabling Advice**
6.11	MDF/IDF Records created / updated? Labelling/Colour Coding – Rack, Cable, Chassis, etc.?	Colour Coding of RJ45 Patch Leads for Voice and Data Installations AEI 7.3241	Completed ☐ N/A ☐	
6.12	Transmitters licence label affixed	Radio Communication Transmitter Labelling AEI 7.4238	Completed ☐ N/A ☐	
6.13	Electrical Certificate of Testing and Safety or Testing and Compliance on connection to a source of electricity (i.e. installation conforms to AS3000) are required to be supplied as soon as possible after connection or testing of any electrical installation or change. Labelling – Switch Boards, etc Meets Airservices Electrical Cable Colour Coding requirements?	Electrical Safety Regulation 2002 Sections 15 and 159 AS 3000 – Aust Standard Electrical Cable Colour Coding AEI 3.1502	Completed ☐ N/A ☐	**Links to Electrical Certificates**

Item No:	Requirement:	Requirement Reference: (Procedure/instruction used to specified required input)	Completed or N/A	Evidence of Compliance (If a requirement is N/A, a reason why it is N/A is required to be entered)
6.14	All modifications complete and scratch plate labels affixed to equipments	Identification of Airways Systems Equipment Hardware Modifications PROC-154	Completed ☐ N/A ☐	
6.15	Integration with National Technical Monitoring has been organised and completed through Engineering Branch, P&E?		Completed ☐ N/A ☐	
6.16	Alarm monitoring installed and tested at TOC for local and remote site?		Completed ☐ N/A ☐	
6.17	Source media – supplied/backed up, stored, registered with system support?	Software Media Archival and Storage PROC-147	Completed ☐ N/A ☐	
6.18	Site installable media – supplied/backed up, appropriately stored and registered by field maintainers?	Software Media Archival and Storage PROC-147	Completed ☐ N/A ☐	
6.19	Software licences provided, registered and appropriately stored? (Including details of any third party licensing)		Completed ☐ N/A ☐	
6.20	Update HEAT and/or ASID database to incorporate new system/version number and assign issue management roles?		Completed ☐ N/A ☐	

Item No:	Requirement:	Requirement Reference: (Procedure/instruction used to specified required input)	Completed or N/A	Evidence of Compliance (If a requirement is N/A, a reason why it is N/A is required to be entered)
DESIGN CONFIRMATION				
6.21	Airservices Physical Security requirements met. The minimum security requirements are specified in C-GUIDE0157. Physical Security advise can be obtained from the relevant Security Advisor in Security and Crisis Planning, Safety & Environment Physical Access requirements are determined and established Siting and accommodation impact has been assessed as being satisfactory or modifications organised through National Property?	Physical Security – Critical Operational Facilities C-GUIDE0157 Site Management PROC-170	Completed ☐ N/A ☐	
6.22	Network data load impact has been assessed as being satisfactory or modifications organised and completed through Engineering Branch, P&E?		Completed ☐ N/A ☐	
6.23	Spectrum licences (either cancelled if no longer required or for new licenses including if antenna moves by more than 10 metres)	Frequency Management: Obtaining a Frequency Assignment and Licence AEI 7.4202	Completed ☐ N/A ☐	
6.24	New system or system change acceptance tests (software and/or hardware) satisfactorily completed against the approved system requirements? – Test Plans provided? – FAT, SAT, UAT test results complete, passed to the required level and provided? – Test identified defect listings and re-test information provided?	System Management Manual SMM Design Control PROC-146	Completed ☐ N/A ☐	
6.25	Battery Acceptance Tests as per Airservices requirements?	Lead Acid Batteries (Stationary) Procurement and Acceptance Testing AEI-3.7050	Completed ☐ N/A ☐	**Link to Battery Acceptance Test Results**

Item No:	Requirement:	Requirement Reference: (Procedure/instruction used to specified required input)	Completed or N/A	Evidence of Compliance (If a requirement is N/A, a reason why it is N/A is required to be entered)
6.26	Standard Operating Conditions (SOCs) / Site Configuration Data (SCD) established / approved	Standard Operating Conditions & Site Configuration Data Management PROC-143	Completed ☐ N/A ☐	
6.27	Flight Test results supplied and satisfactory	Certification of Radio Navigation Aid Facilities AEI 7.4003	Completed ☐ N/A ☐	
6.28	Equipment operation is as per AEI specifications and any additionally specified requirements? Relevant requirements and performance specifications to be determined by the Chief Engineer, Technical Authority or Maintenance Authority		Completed ☐ N/A ☐	
7 TRANSITION				
PLANNING				
7.1	Does the system meet all critical user and technical requirements?		Completed ☐ N/A ☐	
7.2	If non-critical deficiencies are proposed to be accepted into operation, are they managed and tracked via ASID, HEAT or SAIR, including responsibilities and timings and attached to the Commissioning Certificate?		Completed ☐ N/A ☐	
7.3	Cutover Plan prepared and authorised by: – Appropriate level of engineering authority? – Appropriate level of User Authority?	Cutover Plan C-TEMP0045	Completed ☐ N/A ☐	**Link to Cutover Plan**
7.4	Works plan created at least 7 days before deployment	Works Planning PROC-213	Completed ☐ N/A ☐	**Works Plan No.**

Item No:	Requirement:	Requirement Reference: (Procedure/instruction used to specified required input)	Completed or N/A	Evidence of Compliance (If a requirement is N/A, a reason why it is N/A is required to be entered)
NOTIFICATION				
7.5	Industry education / notification been completed?		Completed ☐ N/A ☐	
7.6	Relevant Business Managers advised of impending change?		Completed ☐ N/A ☐	
7.7	Change requester and/or sponsor notified?		Completed ☐ N/A ☐	
7.8	System Operations' TOC and Service Desk notified and accepted operating responsibility for the change.		Completed ☐ N/A ☐	
7.9	ABS/FMS Manager has accepted maintenance responsibility		Completed ☐ N/A ☐	
7.10	Notify the following (as appropriate) that the system is at **"OPERATIONAL READINESS"** and provide details of commissioning and any system changes: **ATC** System Supervisor, Melbourne (ATC) System Supervisor, Brisbane (ATC) National ATC Systems Manager Operating Authority (relevant)	**Sys to Svc List**	Completed ☐ N/A ☐	

Item No:	Requirement:	Requirement Reference: (Procedure/instruction used to specified required input)	Completed or N/A	Evidence of Compliance (If a requirement is N/A, a reason why it is N/A is required to be entered)
7.11	Notify the following (as appropriate) that the system is at **"ENGINEERING READINESS"** and provide details of commissioning and any system changes: **P&E** Technical Authority (relevant) Technical Operations Centre – Director Service Desk -Airways SAP PM Support	**Sys to Svc List**	Completed ☐ N/A ☐	

COMMISSIONING CERTIFICATE

The requirement for this form is specified in the System Management Manual (Section 11.2 of V4), C-MAN0107

Project/Task Name	SAP Project/Task ID:	Sites or Locations affected:
Documentation prepared by:	Date:	Commissioning Date:
Affected System(s)	System Criticality	Change Consequence Level
Brief Description of Change:		

Commissioning Approval

The approval of this document by the appropriate authorities as specified in the System Management Manual certifies that the new system or system change is satisfactory to meet the specified service and performance requirements; that system operating and support requirements are in place; that required user and technical training is adequately provisioned; as detailed in the Commissioning Readiness Form and consequently the new system or system change is declared fit-for-purpose and can be deployed and operated until formally decommissioned or otherwise revoked.

This approval is provided subject to the non-critical deficiencies[1] listed herein.

Chief Engineer, Technical or Maintenance Authority

Name	Signature:	Date
Designation:		

Name:	Signature:	Date:
Designation:		

Chief Operating/User Authority or Operating/User Authority

Name:	Signature:	Date:
Designation:		

Records Management Instructions

Place the completed Commissioning Certificate, together with the completed Commissioning Readiness form on the Project file

Provide a copy of the completed Commissioning Certificate, and the completed Commissioning Readiness Form to P&E, Asset Lifecycle Manager, Planning and Integration

Note 1: **Non-critical deficiencies** are those outstanding technical and operational issues that do not prevent the safe and effective use of the facility by users or prevent effective technical maintenance, but will be addressed in a specified and agreed time.

LIST OF NON-CRITICAL DEFICIENCIES WAIVED AT TIME OF COMMISSIONING Either list non-critical deficiencies here or attach a list if space insufficient				
Issue	**Issue Tracking Reference Number**	**Allocated to**	**Proposed Completion Date**	**Comments**

CNS/ATM Implementation Planning Matrix

				Navigation*					
State/Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**En-route**	**Terminal**	**Approach**	**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
AFGHANISTAN									
AUSTRALIA	ATN tests were conducted. BIS Router and Backbone BIS Router and AMHS implemented.	AFTN based AIDC Implemented between Brisbane and Melbourne, Auckland, Nadi and Auckland. AIDC is also in use between Melbourne and Mauritius.	Implemented and integrated with ATM systems to support FANS1/A equipped aircraft.	Implemented	Implemented		A total of 29 UAP and ~~14~~28 WAM stations are used to provide a 5 Nm separation service ~~and operational~~ - using ADS-B mandate ~~applies from 12/2013~~ at/ ~~and~~ above FL290 from 12/2013 for domestic & foreign aircraft. A forward fit ADS-B mandate also applies from 2/2014 for all IFR aircraft at all flight levels. An ADS-B for all IFR aircraft applies from 2/2017. ADS-B data sharing with Indonesia operational since 2/2011. Mandates for additional flight level are considered for	FANS 1/A ADS-C implemented.	

				Navigation*					
State/Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**En-route**	**Terminal**	**Approach**	**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
AUSTRALIA (Cont'd)							2015 & 2017. WAM is operating in Tasmania since 2010 delivery 5 Nm separation service. ~~Commissioned in 2010.~~ WAM ~~being~~ is operating ~~installed~~ in Sydney ~~to~~for ~~provide~~ 3 Nm separation service in TMA and for precision runway monitoring function ~~PRM which is expected to be operational 2011~~. ADS-B data sharing with Indonesia operational since 2/2011. ASMGCS using multilateration is operational in ~~Melbourne &~~ Brisbane, Sydney & Melbourne. ~~in~~ It is being installed in Perth. ~~2010~~.		

				Navigation*					
State/Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**En-route**	**Terminal**	**Approach**	**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
							~~Brisbane and Perth being installed.~~		
BANGLADESH	Bangladesh has already installed COMSOFT ATN/AMHS at Dhaka. Commissioning & SAT Completed in March 2013. Official correspondences are going on for the ATN/AMHS link between Dhaka, Bangladesh and Mumbai, India BIS Router and AMHS planned for 2011.	AIDC between Dhaka and CTG, Dhaka and Sylhet planned for 2011.		Not yet planned	~~Not yet planned~~ - RNAV design is in progress.	RNAV design is in progress	~~Not yet planned~~ Bangladesh has a plan to commission two ADS-B ground stations to be installed at Dhaka and Cox's Bazar Airports by December 2015.	Not yet planned	
BHUTAN	ATN BIS Router and UA service 2011.					Procedures developed for NPA.			
BRUNEI DARUSSALAM	ATN BIS Router planned for 2012 and AMHS planned for 2012.								

				Navigation*					
State/Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**En-route**	**Terminal**	**Approach**	**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
CAMBODIA	BIS Router and AMHS planned for 2011. AMHS installation is in progress and will be tested with Bangkok soon.	Planned 2009	Planned 2009			Procedure developed for NPA.	3 ADS-B ground stations have been installed in Cambodia since 2011 and able to provide full coverage for Phnom Penh FIR		

				Navigation*					
State/Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**En-route**	**Terminal**	**Approach**	**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
CHINA	ATN Router and AMHS deployed in 2008. Tripartite BBIS trial completed with Bangkok and Hong Kong, China in Jan. 2003. ATN trial with Hong Kong using XOT over internet conducted in 2006, Further trials planned in 2009. AMHS/ATN technical tests with Macau completed in 2009. ATN/AMHS circuit with ROK put into operational use in June 2011. ATN/AMHS tests with India are on-going. Plan for ATN/AMHS implementation with Hong Kong, China (2013). Plan for ATN/AMHS implementation with Macau, China (2013). ATN and AMHS technical trial with Mongolia is TBD.	AIDC between some of ACCs within China has been implemented. AIDC between several other ACCs are being implemented. AIDC between Sanya and Hong Kong put in to operational use in Feb 2007. AIDC between Qingdao and Incheon planned for 2013.	Implemented to ATS Rout. L888 route, Trial on HF data link conducted for use in western China.	Implemented in certain airspace. L888, Y1 and Y2 routes. Total distance of air route with PBN is around 10.4 thousand km. which is approximately 7% of national route distance in China. 4RNP10 routes have been implemented in Sanya FIR. RNP4 has been implemented in Lhasa to Ali, Xining to Yushu and Europe-Asia route.	RNAV (GNSS) implemented in certain airports. Beijing, Guangzhou, Tianjin.	Ali, Linzhi and Lhasa airports	5 UAT ADS-B sites are used for flight training of CAFUC. Chengdu-Jiuzhai project finished in 2008 with 2 ADS-B stations and additional site is planned to enhance the surveillance coverage. Chengdu - Lhasa route surveillance project completed with 5 ADS-B stations using 1090ES since 2010. Trials planned from May 2011. 1 ADS-B site installed in Sanya FIR since 2008. 3 additional ground stations planned, Trial planned for Jun, 2011.	FANS 1/A based ADS-C implemented. L888 route.	

				Navigation*					
State/Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**En-route**	**Terminal**	**Approach**	**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
	Plan for test with Russian Federation (TBD) Connection tests with Thailand is 2014 Connection tests with Nepal is 2013								
HONG KONG, CHINA	ATN and AMHS technical trial with Japan conducted in 2003. 64 Kbps ATN Link with Bangkok put into operational use in June 2004. Preliminary ATN/AMHS technical trials with China (Beijing) using VPN over Internet connection conducted in September 2006. Operational AMHS commissioned in July2009. ATN/AMHS circuit with Macao put into operational use in Dec. 2009. ATN/AMHS interoperability tests with other adjacent communications centres commenced in late 2009, viz	AFTN-based AIDC with Sanya put into operational use in February 2007. AIDC trial with other adjacent ATS authorities for new ATC system to be commissioned by 2013. AIDC technical trial with Taibei conducted in 2010 and completed in 2012 and put into operational use in Nov. 2012.	FANS 1/A based CPDLC trials completed in 2002. VDL Mode-2 technical trial conducted in 2002. D-ATIS, D-VOLMET and 1-way PDC implemented in 2001. PDC service upgraded to 2-way data link in June 2008.	Implemented in certain airspace RNP4 Enroute (>FL290 in 2014)	Implemented in certain airspace Basic RNP-1 for SIDs and STARs in 2013.	RNAV (GNSS) departure procedures implemented in July 2005. RNP AR APCH procedures for 07L/25R runways implemented in June 2010.	A larger-scale A-SMGCS covering the whole Hong Kong International Airport put into operational use in April 2009. Data collection/ analysis on aircraft ADS-B equipage in Hong Kong airspace conducted on quarterly basis since 2004. ADS-B trial using a dedicated ADS-B system completed in 2007. ADS-B out operations over PBN routes L642 and M771 at or above FL 290 within HK FIR	FANS 1A trials for ADS-C completed in 2002.	

				Navigation*					
State/Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**En-route**	**Terminal**	**Approach**	**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
	Taibei (2009), Beijing (2010), Thailand (2012), Japan ((Planned Q3/2016), Philippines (Planned Q2/2015) and Viet Nam (Planned Q4/2014) Plan for ATN/AMHS implementation with China (2013) and Taibei (2013).						are planned in December 2013 and within HK FIR at or above FL 290 in December 2014 ADS-B trial using ADS-B signal provided by Mainland China to cover southern part of Hong Kong FIR commenced in 2010.		
MACAO, CHINA	ATN/AMHS interoperability test with Beijing commenced in March 2009. ATN/AMHS circuit with Hong Kong put into operational use in end Dec. 2009.								ATZ within Hong Kong and Guangzhou FIRs. In ATZ full VHF coverage exist. Mode SMSSR coverage available for monitoring purposes.

				Navigation*					
State/Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**En-route**	**Terminal**	**Approach**	**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
COOK ISLANDS									
DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA	The ATN BIS Router and AMHS to be implemented in 2011.	With neighboring ACCs to be implemented TBD		Implemented in certain ATS routes G711, B467		RNAV (GNSS) Non-precision approach to be implemented in 2011.	ADS-B has been used as back-up surveillance of SSR since 2008.		
FIJI	ATN BIS Router and AMHS implemented	AFTN based AIDC implemented between Nadi, Brisbane, Auckland and Oakland.	Implemented and integrated with ATM systems to support FANS1/A equipped aircraft.	Implemented		Implemented	ADS- B /multilateration ground stations installed. Situations awareness service will be provided in 2013.	FANS 1/A ADS-C implemented.	
FRANCE ***(French Polynesia Tahiti)***		Implementation of limited message sets with adjacent centres under discussion.	FANS-1. Implemented since 1996.					FANS 1/A ADS-C implemented since March 1999.	
INDIA	MUMBAI – SINGAPORE – BBIS – Circuit Implemented MUMBAI – PAKISTAN – BIS – Operational Trial Completed MUMBAI – CHINA – BBIS – Under operational trials	AIDC with Dhaka /Muscat – TBD Mumbai/Karachi under trial operations	FANS-1 implemented at Kolkata, Chennai, Mumbai and Delhi.	SBAS (GAGAN project) likely to operational in the year 2013	PBN based SIDs & STARS implemented at Delhi, Mumbai, Chennai, Ahmadabad, Hyderabad and Kolkata		ASMGCS with MLAT commissioned at Delhi, Hyderabad and Bangalore Mumbai and Chennai ASMGCS	FANS 1/A ADS-C implemented at Kolkata, Chennai, Delhi and Mumbai.	

				Navigation*					
State/Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**En-route**	**Terminal**	**Approach**	**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
	MUMBAI – OMAN – BIS -Presently AFTN over TCP/IP MUMBAI – THAILAND – BBIS -Awaiting readiness from Thailand MUMBAI AMHS – Commissioned in APRIL 2011						installed		
INDONESIA	ATN BIS Router and AMHS planned for trial in 2009. Trial with Singapore planned. ATNBIS Router and AMHS are still on going trial with Singapore planned to complete by 2012. (Part D: AMHS Commission)	Brisbane and Makasar in planned in June 2009. Makasar and Brisbane is still on going trial AIDC, planned operational in 2011	FANS-1/A. CPDLC in Ujung Pandang FIRs already trial start from 2008 and will be implemented in 2009. FANS-1/A CPDLC in Ujung Pandang FIRs is completely trial operational and will be full operational for designated route on September 2010.				30 Ground Station successfully installed. Since 2009, ATC Automation in MATSC has capabilities to support ADS-B application. ADS-B Task Force team established to develop planning and action concerning ADS-B Implementation within Indonesia FIR	FANS-1/A ADS-C trial planned at Jakarta and Ujung Pandang ACC in 2007. FANS-1/A ADS-C in Ujung Pandang FIRs is completely trial operational and will be full operational in September 2010.	

				Navigation*					
State/Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**En-route**	**Terminal**	**Approach**	**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
JAPAN	ATN BBIS router and AMHS installed at 2000. Connection tests with USA 2000 - 2004 and put into operational use in 2005. ATN BBIS router (to apply to Dual Stack) and AMHS (to upgrade in 2015. The connection test with each country which is not currently connecting is started after update.	AFTN based AIDC implemented with Oakland, Anchorage, Incheon and Taibei. Planned between Fukuoka ACC and Shanghai ACC for 2014.	FANS1/A system Implemented in Fukuoka FIR.	SBAS implemented RNAV5 implemented. RNP AR Approach implemented	RNAV1 implemented Basic RNP implemented	RNP Approach implemented	Two Multilateration Systems have been implemented at Narita and Haneda airports. Multilateration Systems have been implemented at five airports and are being implemented at three airports. PRM (WAM) is planned to be implemented at Narita Airport. (Operation will start in 2014).	FANS 1/A. ADS-C implemented in Fukuoka FIR.	
KIRIBATI									
LAO PDR	ATN BIS Router and AMHS completed planned for implementation with Bangkok in 2010.	AIDC with Bangkok planned for 2010.		Implemented. Planned for 2011.					

				Navigation*					
State/Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**En-route**	**Terminal**	**Approach**	**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
MALAYSIA	ATN BIS Router completed 2007. AMHS planned in 2012.	AFTN AIDC planned with Bangkok ACC – TBD. AIDC between Kuching and KK FIR already implemented. For Kuala Lumpur FIR, will be implemented by end of 2013.	On trial since July 2008. On 7 oceanic ATS routes i.e. P628, L510, L645, L627, N571, B466 and P574 within the Kuala Lumpur FIR. Implemented in 2011.	Implemented for Oceanic Routes. RNAV-5 domestic Routes implementation in progress and partially implemented.	Basic RNAV implemented	RNP AR APCH for WMKP and WBGG in progress, will be implemented by middle 2013. Other airports next.	Malaysia planned to start mandate ADS-B requirement in KL FIR in 2018 and ADS-B implementation on 2020. Implementation of ADS-B proposed in 2010 - 2015.	FANS 1/A ADS-C already implemented for Bay of Bengal area. Implemented since July 2008 on 7 oceanic ATS routes within KL FIR.	
MALDIVES	Implementation planned for 2013	ATM system software already upgraded to support AIDC. Trials with neighbouring ACC's planned in Sept. 2012.	New software upgrade in progress. Trials to be started in Aug. 2012.	Planned for completion in 2012	PBN based SIDS and STARS implemented.	RNP approach implemented at Ibrahim Nasir Int'l Airport	Implementation in progress. System to be commissioned in 2012.	Implemented since 2008. New software upgrade in progress and planned for completion in Aug. 2012	
MARSHALL ISLANDS						NPA implemented at Majuro Atoll.			
MICRONESIA (EDERATED STATES OF)									
Chuuk				Implemented					
Kosrae				Implemented					
Pohnpei				Implemented					
Yap				Implemented					

				Navigation*					
State/Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**En-route**	**Terminal**	**Approach**	**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
MONGOLIA	AMHS/AFTN gateway is implemented in first quarter of 2012. ATNBIS router will be implemented in 2013. Coordinating with China on ATN/AMHS connection technical trial target date TBD.	ATM automation system supports AIDS and OLDI. Coordinating with Russia on OLDI connection in target date TBD. Coordinating with China on AIDC connection technical trial target date TBD.	Function available. Regular trials are conducted.		GPS procedures are being developed and implemented at 10 airports.		Five ADS-B ground station for combination with SSR will be implemented first quarter of 2013. Full coverage for surveillance gaps will be implemented by 2015-2016.	FANS 1/A ADS-C implemented since August 1998.	
MYANMAR	AMHS implemented Nov. 2011	Plan to support AIDC to the ATM automation system at 2013	Implemented since August 1998. Software upgrading and integration to ATC automation will be completed in 2012.	Three new DVOR installation have been completed by 2012 and plan to operate in 2013.	New ILS system at YGN Int'l AP finished installation by 2012 and plan to operate in 2013.		Plan to implement two ADS-B ground stations at the end of 2012.	Implemented since August 1998. Software upgrading and integration to ATC automation will be complete in 2012.	
NAURU									
NEPAL	BIS Router and AMHS planned for 2011.	AFTN/AMHS based AIDC between KTM-CAL, KTM-BAN, KTM-LHASA planned for 2011.			GPS departure and approach has been developed for 8 airports and planned for implementation in 2008.		ADS-B feasibility study planned for 2007.		

				Navigation*					
State/Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**En-route**	**Terminal**	**Approach**	**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
NEW CALEDONIA	New router and AMHS planned at the end of 2013 with Nadi				Arrival GNSS based RNAV procedures have been developed by for La Tontouta Airport		Three ADS-B ground stations commissioned in 2010 to cover international traffic at La tontouta airport serving Tontouta ACC & APP. It is used for Situation awareness and SAR.		
NEW ZEALAND	AMHS implementation planned for 2012 using IPS links.	AFTN based AIDC implemented between New Zealand, Australia, Fiji, Tahiti, Chile and USA.	FANS-1/A. Implemented	Will be implemented as required.	RNAV procedures being implemented as developed.	RNP AR APCH implemented at Queenstown (NZQN).	MLAT being used in Queenstown area (WAM) and Auckland (airport surface movements). ADS-B data available from all MLAT & SSR sites.	FANS 1/A Implemented	
PAKISTAN	ATN/AMHS considered as Phase II implemented since 2010.	Implemented between Karachi and Lahore ACCs Plan to implement AIDC with Mumbai and Muscat for December 2010	Implementation planned from 2005-2010.	Planned for 2005-2010.	RNAV arrival and departure procedure being developed.	NPA (RNP) procedure are being developed and under flight inspection.	Feasibility study for using ADS-B is in hand. One station was installed at ACC Karachi and evaluation is in progress.	Planned for 2005-2010.	Existing Radar system being upgraded.

				Navigation*					
State/Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**En-route**	**Terminal**	**Approach**	**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
PAPUA NEW GUINEA	Plans to create a newly duplicated digital communications line connecting with existing and new sites and replacing AFTN switch with a AMHS before 2015	Implemented with Australia in April 2011	Plans for new ATM system supporting CPDLC by 2015	Implemented	GNSS based RNAV procedures have been developed by for five airports.	GNSS NPA approach implemented at 22 aerodromes.	Legislation mandating ADS-B and guidelines for aircraft equipage and operational approval to be issued by 31/12/2011 with target mandatory date by mid-2015 and plans to provide ADS-B service above FL245 within Port Moresby FIR and also in specific higher traffic areas domestically.	Plans for new ATM system with ADS-C within UTA airspace by 2015	
PHILIPPINES	ATN G/G BIS Router/AMHS installed in 2006. Pending AMHS Interoperability tests moved to Q3/2015 both for Singapore and Hong Kong. AMHS trials with Singapore by end 2012 and Hong Kong planned in 2012.	Planned for 2013.	CPDLC Planned for 2011. Trials on-going.	New ACC on test.	RNAV routes of MLA. MACTAN for FLT validation.		Two ground stations scheduled for implementation in 2013.	FANS 1/A ADS-C planned for 2013.	

				Navigation*					
State/Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**En-route**	**Terminal**	**Approach**	**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
REPUBLIC OF KOREA	ATN/AMHS circuit with China put into operational use in June 2011. ATN/AMHS test with Japan to be conducted	AFTN based AIDC implemented between ACC and Fukuoka ATMC. AIDC between Incheon and Qingdao to be implemented.	PDC & D-ATIS implemented 2003.	Two RNAV5 routes were implemented in 2011. More RNAV5/2 routes will be implemented gradually.	RNAV1 SID/STAR were partially implemented at GIMPO and INCHEON airports. More SIDs/STARs will be implemented gradually	RNP approaches with Baro were implemented at GIMPO airport in 2011. More RNP approaches with Baro will be implemented gradually	ADS-B implemented 2008 for SMC in Incheon International Airport.	FANS 1/A based ADS-C implemented since 2003 for contingency purpose.	
SINGAPORE	AMHS implemented. ATN Router trial with Malaysia completed in 2007 On-going ATN/AMHS trial with Indonesia and planned to complete by 2012. ATN/AMHS circuit with India put into operational use in March 2011. Completed ATN/AMHS trial using VPN over internet with Bahrain in 2011. On-going ATN/AMHS trial with Thailand and planned to complete by 2012.	AFTN based AIDC to be implemented	Implemented since 1997. Integrated in the ATC system in 1999.		RNAV SIDS and STARS implemented in 2006.	NPA Procedure implemented in 2005.	The airport M-lat system was installed in 2007 and "far-range" ADS-B sensor was installed in 2009.	FANS 1/A ADS-C implemented since 1997. Integrated with ATC system in 1999.	

				Navigation*					
State/Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**En-route**	**Terminal**	**Approach**	**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
	ATN/AMHS circuit with UK put into operational use in March 2012.								
SRI LANKA	ATN BIS Router Planned for 2013. AMHS (Domestic) and AMHS/AFTN Gateway to be implemented by Oct. 2011.	Trials with Male' planned in 2013.	Implemented (FANS 1/A based)	14RNAV10 routes already established. 05 RNAV5 routes to be established in 2013. Upgrade airspace above FL225 to RNAV10 and introduce RNP4 routes in a phased manner within 2013-2016.	GNSS based RNAV-1 SIDS and STARS trials being conducted. To be implemented in a phased manner within 2013-2016.	Introduction of RNP APCH (with Baro-VNAV) in a phased manner with 2013-2016. GNSS based Precision Approaches planned beyond 2016.	ADS-B Trials planned for 2012 and implementation in 2013.	Implemented (FANS 1/A based) .	Information pertaining to Navigation are based on the PBN Implementation plan of Sri Lanka .
THAILAND	BBIS/BIS Routers already implemented. AMHS has been implemented. Trial with other BBIS States; Singapore, India and Hong Kong are on going. ATN/AMHS operational links for Singapore, India and Hong Kong, China are planned for completion by Q4 2013	AFTN based AIDC planned for TBD. (as a part of new ATM system)	FANS-1/A Implemented.	Under implementation	Implemented at Phuket Airport	Implemented at Phuket	Multilateration implemented in 2006 at Suvarnbhumi Int'l. Airport. ADS-B is planned to be part of future surveillance infrastructure.	FANS 1/A ADS-C Implemented.	

				Navigation*					
State/Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**En-route**	**Terminal**	**Approach**	**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
TONGA	AMHS planned for 2008. The provider is linked to the New Zealand AFTN				RNAV procedures planned for 2013-2014	NPA planned for 2007. RNP AR APCH planned for 2013-2017	Trial planned for 2017		CPDLC and ADS-C is not considered for lower airspace
UNITED STATES	AMHS implemented. (Salt Lake City & Atlanta)	AFTN based AIDC implemented.	FANS-1/A based CPDLC implemented.	Implemented	Implemented		Status as of March 31, 2011 81 Radio Stations under construction or in Final Design (77 in CONUS; 4 in AK) 342 Radio Stations constructed (313 in CONUS; 29 in Alaska) 326 Radio Stations Reporting on the SBS Network (297 in CONUS; 29 in AK) 275 Operational Radio Stations WAM implemented in areas of Colorado for 5nm separation services and coming to Juneau in 2011	Implemented	

				Navigation*					
State/Organization	**ATN G/G Boundary Intermediate System (BIS) Router/AMHS**	**AIDC**	**CPDLC**	**En-route**	**Terminal**	**Approach**	**ADS-B/ Multilateration**	**ADS-C**	**Remarks**
VANUATU									
VIET NAM	BIS Routers planned for 2009. ATN/AMHS trial in 2010 and operation in 2012. ATN BIS Router AMHS in 2013	AFTN based AIDC implemented in 2009. Trial for ATN based AIDC planned in 2010. Trial for AIDC in 2012. Plan to implement in 2013	CPDLC operational trial conducted in early 2007. Implemented in 2007	For en-route TBD.	RNAV	GBAS 2015	2013	FANS 1/A ADS-C operational trial conducted for oceanic area of Ho Chi Minh FIR since March 2002. FAN 1/A implemented in 2007	

* Navigation – Navigation including Performance Based Navigation (PBN), APV and precision approach

Group Discussion - Regulators

Participating Countries:

Australia
Hong Kong, China
Indonesia
Mongolia
Singapore

Introduction:

Discussion among participating States with particular focus on the regulatory statuses on ADS-B have been carried out and summarized as below.

Status and Comments

Australia

1. Generic regulations covering any CNS installation have already been put in place – Part 172 and Part 171 covering ATC and engineering.

2. Aircraft mandates have been put in place for the aircraft carriage of ADS-B. They will be phased in 2013 to 2017 for flight under IFR.

3. There is no further rule making action necessary. (The exception is that the 2017 mandate will be extended to foreign aircraft as a condition on the operators' AOC. The rule would affect turboprop operators from nearby States entering Australia.)

4. Australia is using blacklist to control the non-compliance aircraft.

Indonesia:

1. Indonesia is intended to have aircraft mandates but timelines have not been determined and are still under consideration.

2. Indonesia is reviewing the necessity of issuing operation approval.

3. Part 171 and Part 172 have been developed.

4. Part 170 – ATC procedures under Part 172 has been developed.

Mongolia:

1. It is targeted to have five ADS-B ground stations in 2013 for en-route services only.

2. There is no timeframe for aircraft mandate.

3. Part 171 has been put in place.

4. Question about the ATC controller rating necessary for ADS-B operations was raised. Australia will provide information.

Singapore:

1. AIC has been issued for aircraft mandate at the end of this year on M771 and L642 at the end of this year.

2. Discussion of the trunk route to Philippines is on going.

3. There is no intention to issue operation approval for foreign airline.

Hong Kong, China

1. AIC has been issued for aircraft mandate at the end of this year on M771 and L642 at the end of this year.

2. Hong Kong is issuing operation approvals to Hong Kong operators at fleet level.

3. General ATC procedures in place to handle non-compliance aircraft has been put in place.

In General

1. Regulators see the necessity for clear operation procedures for the ANSP to handle aircraft with ADS-B issue. These procedures have to be developed by ANSP and subject to regulator acceptance.

2. There is a need to develop the information network among regulators (States) with ADS-B operations to exchange information ADS-B issue on aircraft.

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BOB South Asia Working Group Side meeting

The following states and organizations participated in the discussion for harmonized plan for implementation and data sharing in the region:

1. Bangladesh
2. India
3. Malaysia
4. Nepal
5. Thailand
6. CANSO (Singapore)

Other states in the region are Sri Lanka, Pakistan, Maldives and Myanmar.

Agenda of discussion

1. Review of time line for ADS-B data Sharing between India and Myanmar
2. ADS-B data sharing and coordination in the region
3. VHF radio communication and resources sharing.

Minutes of meeting

- India in consultation with CANSO requested to extend the timelines for ADS-B data and VHF resource sharing between India and Myanmar by 6 months. Therefore, ADS-B data sharing agreement timeline is tentatively proposed as 2H 2013 and that for VHF resource sharing is tentatively proposed for 1H 2015.

- In India, discussions with the Ministry of Civil Aviation and Defense are in progress. It is proposed to provide ATS Surveillance Services to ADS-B equipped aircraft after July 2013 in en-route airspace FL 290 and above and some select terminal airspaces from GND to FL 150. The draft AIP Supplement is being circulated for comments and is likely to be issued soon. It is also proposed to mandate ADS equipage for aircraft operating at FL290 and above in all the FIRs - likely in May 2015. DGCA India is contemplating to issue a detailed CAR (Civil Aviation Requirement) by Jul 2013.

- Bangladesh indicated that timeline for implementation of ADS-B at 2 locations is 2015. India further suggested Bangladesh to consider the option of ADS-B data sharing from Agartala.

- Nepal has no ADS-B ground station. ADS-B Implementation Plan is under consideration.

- Malaysia indicated that they have currently no plans for ADS-B implementation and considering to request that India ADS-B data from Port Blair may be useful for them.

- Through discussion with India, Bangladesh and Nepal the BOB and SA working group meeting decided to share ADS-B data with neighboring states and the need to share VHF radio with neighboring states needs to be evaluated and examined based on the respective states' VHF coverage.

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North Asia Group Report

Group Member
Japan
Republic of Korea (ROK)

Topics
ROK and Japan discussed the ADS-B implementation issue.

Discussion
ROK and Japan already had radar coverage, the implementation of ADS-B would be considered as the future surveillance system.

The group discussed and shared the information about the ADS-B implementation status of each country including the ADS-B evaluation system, Multilateration system for airport surface and Wide Area Multilateration system.

In this sub- region, there is no data sharing project so far. But, the group agrees that data-sharing will be efficient for air traffic control in the region.

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REPORT FROM SOUTHEAST ASIA SUB GROUP

States Present
Australia
Brunei
Cambodia
Hong Kong, China
Macao, China
Malaysia
Indonesia
Thailand
Singapore
Japan (As observer)

Previously Identified Projects

The South East Asia Group provide an update on the near term implementation of the following projects that were identified in the last task force meeting.

Project 1 – ADS-B Data Sharing Between Australia and Indonesia

Phase 1a

Indonesia and Australia sharing data from the following stations:

- Saumlaki ADS-B (Indonesia) (Installed)
- Merauke ADS-B (Indonesia) (Installed)
- Kupang ADS-B (Indonesia) (Installed) –temporary replaced by Waingapu ADS-B due to technical fault at Kupang ADS-B
- Kintamani - Bali (Indonesia) (Installed)
- Thursday Island ADS-B (Australia) (Installed)
- Gove ADS-B (Australia) (Installed)
- Broome ADS-B (Australia) (Installed)
- Doongan ADS-B (Australia) (Installed)

Data Sharing Agreement signed in Nov 2010;

Initial Benefits
Data used for air situational awareness and safety nets.
Enhanced Safety at FIR boundary.
Operational service commenced by Australia in Feb 2011;
Indonesia will publish their ADS-B mandate by 2013 to be effective after 2016.

Phase 1b (Timeline to be decided)

Indonesia and Australia plan to share data from the following stations:

- Waingapu ADS-B (Indonesia) (Installed) (Temporary shared to replace Kupang ADS-B)
- Bayu Udan ADS-B (Australia) (Location to be decided)

Project 2 – ADS-B Data Sharing In South China Sea.

Phase 1
Under the near term implementation plan, China, Hong Kong China, Indonesia, Singapore and Vietnam would share the ADS-B data from the following stations:

- Singapore ADS-B (Singapore provide data to Indonesia) (Installed)
- Natuna ADS-B (Indonesia provide data to Singapore) (Installed)
- Matak ADS-B (Indonesia provide data to Singapore) (Installed)
- Con Son ADS-B (Viet Nam provide data to Singapore) (Installed)
- Sanya ADS-B (China provide data to Hong Kong China) (Installed)
- Three more Sanya ADS-B (China provide data to Hong Kong China) (To be installed by end 2013)

VHF radio communication services (DCPC) would be provided from the following stations to Singapore and Hong Kong China. This is to enable implementation of radar-like separations in the non-radar areas within the Singapore FIR as well as routes L642 and M771.

- Natuna VHF (Install for Singpore by Indonesia) (Installed and under testing)
- Matak VHF (Install for Singapore by Indonesia) (Installed and under testing)
- Con Son VHF (Install for Singapore by Viet Nam) (To be installed by 2H 2013)
- Sanya VHF (Install for Hong Kong China by China) (Installed)

ADS-B Data sharing and DCPC services agreement between Singapore and Indonesia signed in Dec 2010.
ADS-B Data sharing and DCPC services agreement between Singapore and Vietnam signed in Nov 2011.
DCPC services agreement between China and Hong Kong China signed in 2005.
ADS-B Data sharing agreement between China and Hong Kong China in progress.

Initial Benefits
The above sharing arrangement will benefit L642, M771, N891, M753 and L644. Enhanced safety and reduced separation may be applied. Mandate will be effective in 2013.

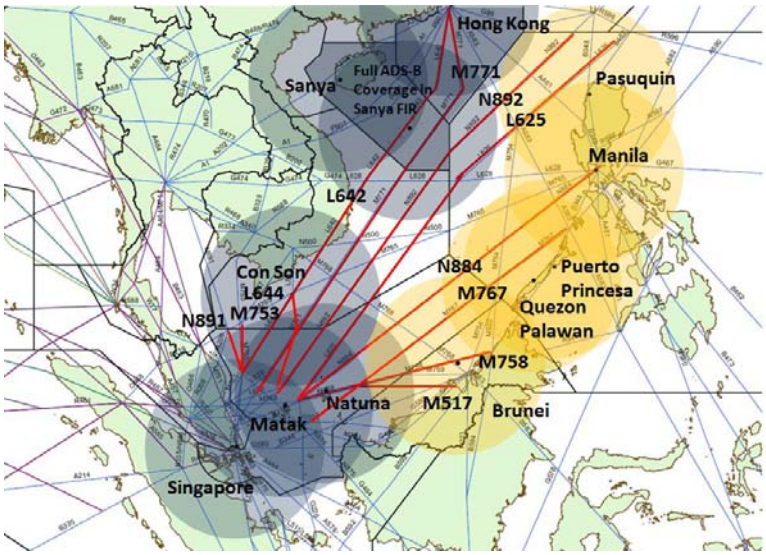
Phase 2
The Philippines CNS ATM project (under the review by Department of Transportation and Communication) includes Manila and Puerto Princesa ADS-B stations. The Philippines will look into the provision of two ADS-B stations in Quezon Palawan (currently a planned radar site) to cover N884 and M767 and in Pasuquin (under control by military) in the Northern part of the Philippines.

The Brunei CNS ATM project includes ADS-B stations. The locations of the stations are yet to be determined. Tentative location would be a oil rig 20NM North of Brunei. The meeting encouraged Brunei to share the ADS-B data and VHF facilities with Singapore to cover N884, M767, M758 and L517.
Both Brunei and the Philippines in-principle agreed to share ADS-B data and provide the VHF facilities for Singapore.

China will install three more ADS-B stations in Sanya FIR. The additional ADS-B stations may be available for sharing with the Philippines to benefit N892 and L625.

The Chairman of the Task Force urged to States to expedite the process as the projects were initiated three years ago at SITF/9.

Phase 3
The group will futher explore other possibilities to cover the Southern part of L625 and N892 in future discussions.



Project 3 – ADS-B data sharing between Indonesia and Malaysia

Indonesia is willing to share the ADS-B data from the following stations:

- Aceh ADS-B (installed) - to help cover Kuala Lumpur FIR
- Tarakan ADS-B (installed) - to help cover Kota Kinabalu FIR
- Pontianak ADS-B (installed) - to help cover Kota Kinabalu FIR.

The project is still under discussion between Malaysia and Indonesia.

Initial benefits
Enhanced Safety at FIR boundary

Malaysia currently has 1 ADS-B station at Terrengganu. Malaysia plans to install more ADS-B stations before 2020. The stations may be shared in future.

Project 4 – ADS-B data sharing between Cambodia, Thailand and Viet Nam

Cambodia is willing to share the ADS-B data from the following stations:

- Phnom Penh International Airport ADS-B (installed)
- Siem Reap International Airport ADS-B (installed)
- Stung Treng City ADS-B (installed)

Discussions between the three States are on-going.

Initial benefits
For redundancy

Project 5 – ADS-B data sharing between Indonesia and the Philippines

Indonesia is willing to share the ADS-B data from the following stations:

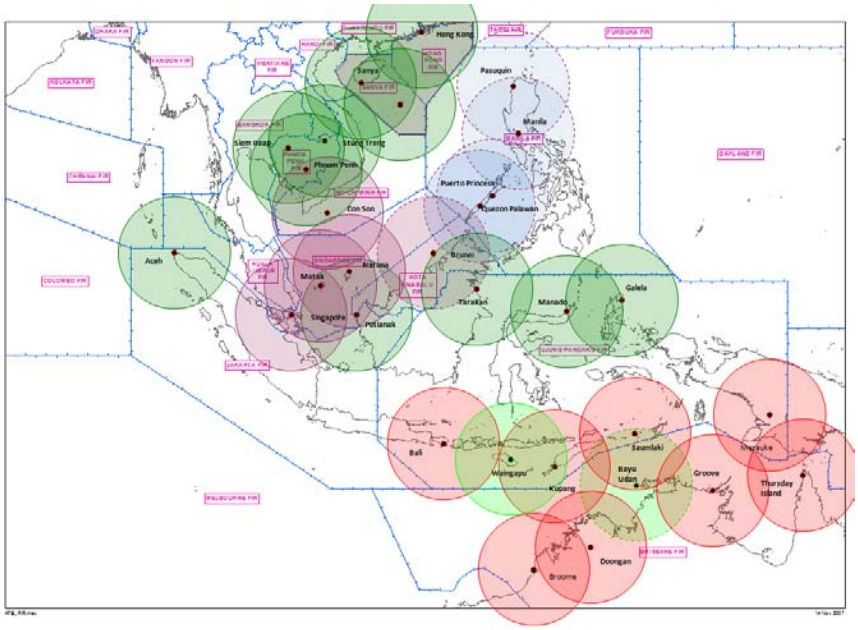
- Manado ADS-B (installed)
- Galela ADS-B (installed)
- Tarakan ADS-B (installed)

Where possible, Indonesia would like to receive ADS-B data from the Philippines from ADS-B stations near the Manila FIR – Ujung Pandang FIR boundary

Currently, the Philippines has no plans to install ADS-B stations at the Southern part of Manila FIR.

The project is still under discussion between Indonesia and the Philippines.

Initial benefits
Situational awareness



Harmonization Plan for L642 and M771			
No.	**What to harmonize**	**What was agreed**	**Issue / what needs to be further discussed**
1	Mandate Effective	SG, HK, CN : 12 Dec 2013 VN : may not be required as the routes are under radar coverage.	
2	ATC Operating Procedures	No need to harmonize	HK, CN and SG indicated agreement for reduction in longitudinal separation on L642 and M771.
3	Mandate Publish Date	No need to harmonize	To publish equipment requirements as early as possible.
4	Date of Operational Approval	No need to harmonize	
5	Flight Level	SG, HK, CN : - At or Above FL290 (ADS-B airspace) - Below FL290 (Non-ADS-B airspace) VN: Not applicable as routes were under radar coverage.	
6	Avionics Standard (CASA/AMC2024/FAA)	SG - CASA, AMC2024 or FAA HK - CASA, AMC2024 or FAA VN - Not applicable CN - CASA or AMC2024 (applicability of FAA to be confirmed)	ADS-B Task Force agreed that DO260B (FAA) will be accepted as well. SG, HK, and CN agreed their ADS-B GS will accept DO260, DO260A and DO260B by 1 July 2014 (Note 1) Both HK and SG expected the GS be upgraded with DO-260B capability by end 2013. VN's GS is already DO-260B capable.

7	Flight Planning	As per new flight plan	Transition to new flight plan completed.
8	Aircraft Approval		
8a)	Procedures if Aircraft Not Approved or Aircraft without a Serviceable ADS-B Transmitting Equipment before Flight	SG, HK, CN : FL280 and Below VN to be confirmed	
8b)	Aircraft Approved but Transmitting Bad Data (Blacklisted Aircraft)	For known aircraft, treat as non ADS-B aircraft.	Blacklist will be maintained by individual States. The black list may be shared and common blacklisting criteria may be adopted.
9	Contingency Plan		
9a)	Systemic Failure such as Ground System / GPS Failure	Revert back to current procedure.	
9b)	Avionics Failure or Approved Aircraft Transmitting Bad Data in Flight	Provide other form of separation, subject to bilateral agreement. From radar/ADS-B environment to ADS-B only environment, ATC coordination may be able to provide early notification of ADS-B failure.	Address the procedure for aircraft transiting from radar to ADS-B airspace and from ADS-B to ADS-B airspace.
10	Commonly Agreed Route Spacing	SEACG	Need for commonly agreed minimal in-trail spacing throughout.

Note 1: Also included two ADS-B GS supplied by Indonesia at Matak and Natuna

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Revised **SURVEILLANCE STRATEGY FOR THE ASIA/PACIFIC REGION**

Considering that:

1. States are implementing CNS/ATM systems to gain safety, efficiency and environmental benefits, and have endorsed the move toward satellite and data link technologies;

2. The future air traffic environment will require increased use of aircraft-derived surveillance information for the implementation of a seamless automated air traffic flow management system;

3. The 11th Air Navigation Conference endorsed the use of ADS-B as an enabler of the global air traffic management concept and encouraged States to support cost-effective early implementation of ADS-B applications;

4. The 12th Air Navigation Conference endorsed the ICAO Aviation System Block Upgrades (ASBU) Framework with Modules specifying effective use of ADS-B/MLAT and associated communication technologies in bridging surveillance gaps and its role in supporting future trajectory-based ATM operating concepts. Cooperation between States is the key to achieve harmonized ATM system operations.

5. APANPIRG has decided to use the 1090MHz Extended Squitter data link for ADS-B air-ground and air-air applications in the Asia/Pacific Region, noting that in the longer term an additional link type may be required;

6. SSR and ADS-C will continue to meet many critical surveillance needs for the foreseeable future;

7. SARPs, PANS and guidance material for the use of ADS-B have been developed;

8. ADS-B avionics and ground systems are available; and

9. Multilateration is a technology that can supplement SSR, ADS-B and SMR.

10. ADS-B IN applications and equipment are now available in commercial airliners and ICAO ASBUs include ADS-B IN applications in Block 0 and Block 1.

THE SURVEILLANCE STRATEGY FOR THE ASIA/PACIFIC REGION IS TO:

1. Minimise the reliance upon pilot position reporting, particularly voice position reporting, for surveillance of aircraft;

~~1.~~2. Maximise the use of ADS-B on major air routes and in terminal areas, giving consideration to the mandatory carriage of ADS-B Out as specified in Note 1 and use of ADS-B for ATC separation service;

~~2.~~3. Reduce the dependence on Primary Radar for area surveillance;

4. Provide maximum contiguous ATS surveillance coverage of air routes using 1090MHz Extended Squitter ADS-B and Mode S SSR based on operational requirements;

5. Make full use of SSR Mode S capabilities where radar surveillance is used and reduce reliance on 4-digit octal codes;

6. Make use of ADS-C where technical constraint or cost benefit analysis does not support the use of ADS-B, SSR or Multilateration;

7. Make use of Multilateration for surface, terminal and area surveillance where appropriate;

8. Closely monitor ADS-B avionics developments - such as Version 2 ES *(DO260B)* implementation and Spaced Based ADS-B application programs. - At an appropriate time (circa 2016) APAC should review progress and consider development of transition plans where cost/benefit studies indicate positive advantages for the region.

9. Carefully monitor ADS-B IN development and cost benefits to ensure that ASIA/PAC States are able to take advantage of ADS-B IN benefits when appropriate, -through procedures, rules and ATC automation capabilities.

Note 1:

a) *Version 0 ES as specified in Annex 10, Volume IV, Chapter 3, Paragraph3.1.2.8.6 (up to and including Amendment 82 to Annex 10) and Chapter 2 of* Technical Provisions for Mode S Services and Extended Squitter *(ICAO Doc 9871) (Equivalent to DO260) to be used till at least 2020.*

b) *Version 1 ES as specified in Chapter 3 of* Technical Provisions for Mode S Services and Extended Squitter *(ICAO Doc 9871) (Equivalent to DO260A);*

c) *Version 2 ES (including provisions for new set of 1 090 MHz extended squitter (ES) messages and traffic information service – broadcast (TIS-B) being developed by the Aeronautical Surveillance Panel (ASP) and scheduled to be incorporated in Annex 10 Vol. IV - Surveillance and Collision Avoidance System as part of Amendment 86 with target applicable date in November 2013. (Equivalent to DO260B and EUROCAE ED-102A which were issued in December 2009).*

Automatic Dependent Surveillance – Broadcast (ADS-B)
Seminar and the Twelfth Meeting of ADS-B Study and
Implementation Task Force of APANPIRG (ADS-B SITF/12)

Kolkata, India, 15 – 18 April 2013

Attachment 1 to the Report

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International Civil Aviation Organization

AUTOMATIC DEPENDENT SURVEILLANCE – BROADCAST SEMINAR AND TWELFTH MEETING OF AUTOMATIC DEPENDENT SURVEILLANCE – BROADCAST (ADS-B) STUDY AND IMPLEMENTATION TASK FORCE (ADS-B SITF/12)

Kolkata, India, 15-18 April 2013

LIST OF WORKING/INFORMATION PAPERS AND PRESENTATIONS

WP/IP/ SP No.	Agenda	Subject	Presented by
		WORKING PAPERS	
WP/1	-	Provisional Agenda	Secretariat
WP/2	4	Proposed Amendment to AIGD	Australia & Hong Kong, China
WP/3	2	Outcome of APANPIRG/23 on ADS-B	Secretariat
WP/4	5	Performance Monitoring Update	Australia
WP/5	6	The Need for Adequate Logistics and Spares Support for ADS-B Ground Stations	Australia
WP/6	6	Use of Commissioning Checklist for ADS-B Ground Stations	Australia
WP/7	2	Review Report of the Eighth Meeting of South-East Asia Bay of Bengal Sub-regional ADS-B Implementation Working Group (SEA/BOB ADS-B WG/8)	Secretariat
WP/8	**7**	Report of CANSO Focus Group Meeting	CANSO
WP/9	6	CNS/ATM Implementation and Planning Matrix	Secretariat
WP/10	3	Follow-up to Recommendations of the Twelfth Air Navigation Conference (AN-Conf/12) on ADS-B	Secretariat
WP/11	8	Review Surveillance Strategy for Asia/Pacific Region	Secretariat
WP/12	4	Australia's Transition to an ADS-B Black List	Australia
WP/13	5	Assessment of ADS-B Performance to Support ATS in India	India
WP/14	6	ADS-B Implementation: Meeting the Challenges	India

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WP/15	7	Asia/Pacific Seamless ATM Plan Requirements for ADS-B Surveillance	Secretariat
WP/16	5	Performance Monitoring and Analysis of ADS-B Equipped Aircraft	Hong Kong, China
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WP/18	6	Singapore's Experiences on the ADS-B Safety Assessment	Singapore
WP/19	6	Update on the ADS-B Collaboration Project in the South China Sea	Indonesia, Singapore and Viet Nam
		INFORMATION PAPERS	
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IP/2	6	Australia ADS-B Update	Australia
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IP/4	6	ADS-B Pilot's Guide	Australia
IP/5	6	The Question of the Entry of Non-ADS-B Fitted Aircraft into Mandated ADS-B Airspace	Australia
IP/6	6	Update on Australian Mandates for Aircraft GNSS and ADS-B Equipment	Australia
IP/7	6	Report of FAA ADS-B Activities	USA
IP/8	6	State Implementation Plan for India	India
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IP/10	6	ADS-B Implementation Plan in Bangladesh	Bangladesh
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SP/5		Aircraft avionics mandates to support the future ATM system in Australia - Update on CASA Rulemaking	Australia
SP/6		FAA ADS-B Update	USA
SP/7		Air Traffic Management and ADS-B	SAAB
SP/8		Update on ADS-B Thales Perspective	Thales
SP/9		The Comsoft Quadrant Solution	Comsoft
SP/10		ADS-B OUT & IN – Airbus Status	Airbus
SP/11		ADS-B – Boeing Perspective	Beoing
SP/12		ADS-B OUT, IN and GNSS Product Update	Rockwell Collins
SP/13		Honeywell Avionics	Honeywell

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