INTERNATIONAL CIVIL AVIATION ORGANIZATION
ASIA AND PACIFIC OFFICE

REPORT

ADS-B SEMINAR AND ELEVENTH MEETING OF AUTOMATIC DEPENDENT SURVEILLANCE – BROADCAST (ADS-B) STUDY AND IMPLEMENTATION TASK FORCE (ADS-B SITF/11)

24 - 27 April 2012
Jeju, Republic of Korea

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

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

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SUMMARY OF DISCUSSIONS

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1. Introduction

1.1 The ADS-B Seminar and Eleventh Meeting of Automatic Dependent Surveillance – Broadcast (ADS-B) Study and Implementation Task Force (ADS-B SITF/11) were held in Jeju, Republic of Korea from 24 to 27 April 2012. The Seminar and the Meeting were hosted by the Korean Office of Aviation, Ministry of Land, Transportation and Maritime Affairs (MLTM) and the Incheon International Airport Corporation (IIAC).

1.2 Deputy Minister, Ministry of MLTM Republic of Korea, Mr. Yeo Hyung-koo opened the seminar and the meeting. In his opening speech, Mr. Yeo extended a warm welcome to all participants. He stated that global aviation traffic had experienced rapid growth and informed the meeting of the Korean safety record and training programme offered by Republic of Korea for developing countries in various fields. He highlighted the MLTM research and development technology projects, including ADS-B. In order to cope with traffic demand, the Republic of Korea would continue working together with other States to implement ADS-B in the Region.

1.3 Mr. Lee Young Geun, Vice President of the Incheon International Airport Corporation, extended a warm welcome to participants and emphasized the need for the timely implementation of ADS-B. Mr. Lee informed that Incheon Airport had been awarded best airport continuously for seven years. He thanked the States for their support and expressed his pleasure in jointly hosting ADS-B related events.

1.4 In his opening remarks, Mr. Greg Dunstone, Chairman of the Task Force, recalled the history and achievements of the Task Force and highlighted recent developments related to ADS-B. He expressed his appreciation to the Republic of Korea for hosting the Task Force meeting for the second time since the one held in Seoul in 2007. He mentioned the timely guidance materials that had been developed by the Task Force. 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 the MLTM and the IIAC for supporting ICAO regional activities and hosting the events. He highlighted the challenges resulting from the unprecedented growth of global civil aviation and emphasized greater need for cooperation and collaboration between States in order to ensure harmonious implementation of rule and procedures associated with ADS-B implementation. He also highlighted the outcomes of APANPIRG/22 meeting and DGCA Conf/48, which urged States and administrations to expedite ADS-B implementation. He thanked administrations, organizations and industry partners for their continuous support and contributions to the work of the Task Force.

2. Attendance

2.1 The Seminar was attended by 238 participants and the Meeting was attended by 71 participants from Australia, Bangladesh, Cambodia, China, Hong Kong-China, Macao-China, Fiji Islands, India, Indonesia, Japan, Malaysia, Mongolia, Myanmar, Nepal, the Philippines, Republic of Korea, Singapore, Thailand, USA, 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/11. The objective of the Seminar was to provide updated information to participants on ADS-B planning and implementation, with a focus on the operational role of ADS-B, and avionics standards and equipment. Eleven presentations were made, covering a comprehensive list of topics on ADS-B as follows:

- ADS-B in Context
- ADS-B within the APAC Region and benefits
- IATA View on ADS-B implementation
- ADS-B development and implementation plan in Republic of Korea
- Australian current rule and future
- USA FAA rule and future
- ADS-B Out Applications in China
- Airbus updates on ADS-B
- Boeing updates on ADS-B
- Rockwell Collins Avionics; and
- ACSS & Thales Avionics

3.2 During the Seminar, a number of speakers from States, CANSO, IATA and aviation industries provided valuable information on the development and status of ADS-B. The ADS-B Seminar was well received by the participants.

4. Officers and Secretariat

4.1 Mr. Heo Moon-Beom from Republic of Korea and Mr. Greg Dunstone, Surveillance Program Lead of Airservices Australia facilitated the Seminar and Mr. Greg Dunstone, Chairman of the Task Force chaired the Meeting. Mr. Li Peng, Regional Officer CNS and Mr. Len Wicks, Regional Officer ATM ICAO Asia and Pacific Office acted as Secretaries.

5. Organization, working arrangements and language

5.1 The Meeting met as a single body for the Seminar and the Meeting except for second day of the Meeting on which four ad hoc working groups (South East Asia, East Asia, Bay of Bengal and Regulatory Group) 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 outcome of the APANPIRG/22 on ADS-B SITF/10 and SEA/BOB ADS-B WG/7 Meetings

Agenda Item 3: Review outcome of DGCA Conf/48 and progress made by ADS-B related ICAO panels

Agenda Item 4: Review the Terms of Reference and Subject/Tasks List.

Agenda Item 5: Report and updates by the leading member of the Task Force on Tasks assigned

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

Agenda Item 8: Any other business

Agenda Item 2: Review outcome of the APANPIRG/22 on ADS-B SITF/10 and SEA/BOB ADS-B WG/7 Meetings

2.1 Under this agenda item, the meeting reviewed the outcome of APANPIRG/22 meeting on matters relating to ADS-B.

APANPIRG/22 Outcome on ADS-B (WP/2)

2.2 The APANPIRG/22 meeting held in September 2011 reviewed the work accomplished by the Tenth Meeting of the ADS-B Study and Implementation Task Force. The report of the Tenth Meeting of the Task Force had also been reviewed by CNS/MET SG/15 and the ATM/AIS/SAR SG/21 meetings.

2.3 APANPIRG/22 appreciated the progress made by the ADS-B SITF and the SEA ADS-B WG and expressed its appreciation and gratitude to the Civil Aviation Authority of Singapore for hosting the Sixth Meeting of the South East Asia Sub-Regional ADS-B Implementation Working Group and the Tenth Meeting of the ADS-B Study and Implementation Task Force.

2.4 The following outcomes from the APANPIRG/22 meeting related to ADS-B were noted by the meeting:

- adopted guidance material on ADS-B including Guidance Material on Building a safety case for the delivery of an ADS-B separation service and the revised Sample Agreement for Data Sharing;

- adopted amendments to the ADS-B Implementation Guidance Document (AIGD) consequential to amendment to the Flight Plan and on the reliability and availability for ADS-B ground system;

- urged States to support provision of VHF radio voice air/ground communication infrastructure to adjacent States and co-ordinate with ICAO regional Office and their national Telecommunication Regulatory Authority (Radio Frequency regulator) for assignment of VHF radio frequencies to be used by the adjacent States;

- adopted Conclusion to support DO260 B Compliant Avionics and urged States to upgrade their ADS-B ground stations in time (2012-2015) to receive DO260B standard transmissions in addition to those aircraft transmitting ADS-B data compliant with DO260 and DO260A;

- made a Decision to rename SEA ADS-B Working Group into SEA/ BOB Sub-regional ADS-B Implementation Group;

- urged States to expedite ADS-B implementation project in South China Sea area including coordination to achieve the implementation; and

- the meeting generally supported a proposal and adopted a Conclusion to amend the Regional Supplementary Procedures (Doc 7030) to include regional requirements on ADS-B.

2.5 Hong Kong China noted the sample proposal attached to Conclusion 22/36 for amendment to the Regional Supplementary Procedure Doc7030 in which there was a reference to FAA Rulemaking AC No. 20-165 – Airworthiness Approval of ADS-B. It was required to be discussed by the Task Force as States may be required to include AC No. 20-165 in their ADS-B mandates.

2.6 As result of discussion, the meeting requested Secretariat to slightly amend the wording in the draft SUPPs ("avionics installation in accordance with FAA AC No. 20-165" to replace "FAA Rulemaking AC No. 20-166) to issue the amendment proposal in accordance with the established procedure.

2.7 The meeting noted the follow-up actions taken by the ICAO regional office and the guidance materials adopted by APANPIRG/22 which had been posted on the ICAO APAC website: http://www.bangkok.icao.int/edocs.

ATM – Perspective (WP/3)

2.8 The meeting also noted that APANPIRG/22 adopted the Asia/Pacific Air Navigation Concept of Operations as regional guidance material for navigation facility, service and avionics equipage planning particularly for the following points:

- **Surveillance**: in areas where the provision of direct ATS surveillance is possible, ATC separation must be based on these surveillance systems (i.e. radar, multilateration and ADS-B). In areas where direct surveillance is not possible, ADS-C surveillance (and associated CPDLC capability) must be enabled providing reduced horizontal separations (i.e. RNP4 30/30 and planning for RNP2).

- Establishing equipage mandates requiring operators to equip with a specific technology is an acceptable concept provided the timeline for compliance is developed after due consultation and the benefits in equipage are clearly identified and agreed.

- **Safety Nets**: powered aeroplanes operating above FL195 and within terminal controlled airspace (CTA and CTR) associated with major international aerodrome must have an operable mode S transponder, ACAS (airborne collision avoidance system), and the ATS surveillance systems must be fitted with STCA (Short Term Conflict Alert) and MSAW (Minimum Safe Altitude Warning).

ADS-B Mandate

2.9 Based on the discussions at ATM/AIS/SAR/SG/21 meeting, APANPIRG/22 adopted Conclusion 22/8 to encourage States intending to implement ADS-B based surveillance services to mandate the carriage and use of ADS-B in a defined airspace or provide priority for access to such airspace for aircraft with operative ADS-B as equipment over those aircraft not operating ADS-B equipment.

2.10 The Chairman noted the complexity of rules and regulations in each State in instituting rules for priority and also noted that the Concept of Operation would be helpful in guiding State planning. The USA noted the analogy of priority lanes for road traffic where vehicles with more than one passenger were given priority, so this was a well established concept. The meeting was informed that the Asia/Pacific Seamless ATM Plan being developed would include a more prescriptive set of planning expectations (including implementation dates) and was likely to incorporate much of the present Concept of Operations.

Review outcome of SEA/BOB ADS-B WG/7 Meeting (WP/5)

2.11 The meeting reviewed the report of outcome of the Seventh meeting of the SEA/BOB ADS-B Working Group meeting as presented by India and the Secretariat. The meeting noted follow-up actions taken by member States and the Secretariat.

2.12 The Chairman noted the excellent work of the South-east Asia Bay of Bengal Sub-regional ADS-B Implementation Working Group (SEA/BOB ADS-B WG/7).

2.13 IATA supported the proposed Australian black list process. The current “white list” approval process could be slow and meant that some aircraft were not provided with an ADS-B separation service. The meeting noted that the move to a black list would result in no need for individual approvals.

Agenda Item 3: Review outcome of DGCA Conf/48 and progress made by ADS-B related ICAO panels

3.1 Under this agenda item, the meeting reviewed a paper presented by the Secretariat on the outcome of DGCA Conf/48 on ADS-B related issues and developments of PBN and ADS-B by panels.

Review Outcome of DGCA Conf/48

3.2 The meeting was informed that the 48th Conference of Directors General of Civil Aviation (DGCAs), Asia and Pacific Regions, Noumea, New Caledonia, October 2011) had noted the progress of collaborative ADS-B activities over the South China Sea area and the regional ADS-B implementation plan.

3.3 The Conference noted that many States/Administrations in the APAC Region had taken proactive steps to plan, conduct trials and implement ADS-B technology. However, in a survey conducted by the ICAO for 16 States/Administrations on their plan to implement ADS-B, it was revealed that only six of them had provided an implementation roadmap with specific timelines. States/Administrations with a near-term plan to implement ADS-B by 2013 were urged to publish their mandate no later than 2011 in accordance with APANPIRG Conclusion 21/39, in order to give sufficient prior notice to aircraft operators for early planning and implementation, as well as making reference to the agreed operational framework. States/Administrations were requested to review their strategy on surveillance coverage (for both Radar and ADS-B) and submit their ADS-B Implementation Plan to the ICAO APAC Regional Office before end of 2012.

3.4 The meeting noted that the Conference reaffirmed the need for expediting implementation of ADS-B and developed action Item 48/4.

3.5 The meeting noted that in order for States and Administrations to take timely follow-up action on the above action plan, the Asia/Pacific Regional Office had issued a State Letter AP – RD0108/11 during November 2011 on the outcome of DGCA Conf/48, in which administrations were requested to provide their responses to the Regional Office by 30 April 2012 for their follow-up actions taken on the action items developed by the Conference. The Regional Office issued another State letter (T 8/10.17, T 8/10.21:AP050/12 (CNS), 4 April 2012) to request administrations to share their ADS-B implementation plan by 30 April 2012. In the letter, administrations were also reminded of APANPIRG Conclusion 21/39 adopted in 2010 urging States with implementation plan to publish equipage mandate no later than 2011 to give sufficient prior notice to aircraft operators for early planning and implementation.

3.6 States were reminded of the need to update the Regional Office with responses to these State Letters.

ADS-B OUT Included in the Aviation System Block Upgrades (ASBU)

3.7 The meeting noted that Action Item No. 2 of DGCA Conf/48 regarding potential significant impact of the ICAO Aviation System Block Upgrades (ASBU) on national ATM modernization and regional harmonization. In this connection, the ADS-B SITF/11 meeting noted the comments expressed by the SEA/BOB ADS-B WG at its seventh meeting and further discussion at the Asia Pacific Seamless ATM Planning Group of APANPIRG (30 January to 3 February 2012). The

meeting further noted the ADS-B Out together with Multilateration (MLAT)-based surveillance had been included as Module B0-84 of ASBU Block '0' (zero). Participants were requested to review the latest edition of Module B0-84 and provided feedback to the secretariat.

Outcome of APSAPG/1 and PBN/9 Meetings (WP/12)

3.8 The Secretariat presented WP/12, which provided an update from the First Meeting of the ICAO Asia/Pacific Seamless ATM Planning Group (APSAPG/1) in January 2012 and the Ninth Meeting of the ICAO Asia/Pacific Performance-Based Navigation Task Force (PBN/TF/9) in March 2012. The meeting was apprised of the development of Seamless ATM Principles relevant to the ADS-B SITF being drafted by the APSAPG and the development of new PBN standards. The meeting encouraged the APSAPG process to make provision for general aviation issues.

Update of ICAO Panels on ADS-B Related issues

Aeronautical Surveillance Panel (ASP) on Amendment to Annex 10 Vol. IV

3.9 The meeting was informed that the preliminary review of amendment Annex 10 Vol. IV which includes "updates to transponder requirements for compatibility with the new 1090 MHz extended squitter ADS-B Version 2 format" was held in the 189th Air Navigation Commission session. The State Letter inviting comments would be circulated to States in the near future. This amendment would be incorporated into Amendment 88 of Annex 10, scheduled to be adopted by the ICAO Council in March 2013.

3.10 It was also informed that Second Edition of the Doc 9871 (Technical Provisions for Mode S Services and Extended Squitter) had been finalized by the ASP. The Second Edition also included material of DO 260B, but publication of the Second Edition was still in process of being prepared for publication. Considering the urgent needs, an unedited version of the document had been uploaded on the ICAO NET in mid-April 2012.

Separation and Airspace Safety Panel (SASP) on Circular (326) on safety assessment on using ADS-B for separation service

3.11 The meeting noted that at the time of the ADS-B SITF/11 Meeting, ICAO Headquarters had not published the replacement Circular (326) to the withdrawn ADS-B Circular 311. The meeting noted that information contained in the withdrawn Circular 311 and the draft version of Circular 326 contained important material on the application and operational use of ADS-B and MLAT for ATM. In particular, the material included basic operational parameters (aircraft position accuracy and integrity standards), which had been recommended by the SASP, along with a significant amount of guidance material on the operational implementation and use of ADS-B surveillance. The meeting also noted that ICAO had recently uploaded other un-edited material onto the ICAONET to ensure that it was available with priority. The meeting expressed concerns about the delay in the publication of Circular 326 and requested the secretariat to convey such concerns to ICAO HQ and request ICAO HQ to upload the unedited Circular on the ICAONET pending the formal publication and release of the Circular.

Agenda Item 4: Review the Terms of Reference and Subject/Tasks List

4.1 Under this agenda item, the meeting reviewed the current TOR of ADS-B Study and Implementation Task Force which was adopted by APANPIRG/18 meeting in 2007, and discussed subject and tasks to be undertaken by the Task Force.

4.2 Considering several ADS-B related elements being included in the draft ASBU document to be adopted during the Twelfth Air Navigation Conference (AN Conf/12) in November 2012, Hong Kong China suggested to add ADS-B IN element into the relevant clause(s) of ADS-B SITF Terms of Reference. The meeting also requested to seek guidance from CNS/MET SG regarding inclusion of ADS-B IN implementation into the work programme of the Task Force. The meeting discussed the proposed change and developed a revised Terms of Reference as shown in the **Appendix A** to the Report.

4.3 The meeting reviewed the Subject/Tasks List for the Task Force adopted by APANPIRG under Decision 22/30. A consolidated Tasks List and Action items was reviewed and further updated during the meeting. In view of the foregoing, the meeting formulated the following draft Decision:

Draft Decision 11/1 – Revised Terms of Reference (TOR) and Subject/Tasks List of ADS-B Study and Implementation Task Force

That, the revised Terms of Reference and updated Subject/tasks list for ADS-B Study and Implementation Task Force provided in **Appendices A** and **B** to the Report be adopted.

Agenda Item 5: Report and updates by leading members of the Task Force on Tasks assigned

5.1 Under this agenda item, the meeting discussed reports prepared by leading members according to the subject/task list.

ASTERIX Category 21 ADS-B Messages (WP/6)

5.2 The meeting discussed the Draft Guidance Material on generation, processing and sharing of ASTERIX Category 21 Messages presented by Hong Kong, China and Australia. The paper analyzed various aspects in generation, processing and sharing of ASTERIX Category 21 ADS-B messages. It introduced a concept of grouping ASTERIX data fields (i.e. mandatory, desirable and optional ADS-B data fields) for sharing of ADS-B data in ASTERIX Category 21 format to ensure system interoperability and harmonize ADS-B implementation in the Asia/Pacific Region. The paper also highlights deployment of an ADS-B format conversion and filter (ADS-B FC&F) system in the overall system design, to enable ADS-B data to be shared with other states in a cost-effective manner and provide the necessary data protection with flexibility to cope with future changes in ASTERIX standards. The meeting supported the concept and considered the guidance material should be adopted, based on the Seamless ATM Planning concept.

5.3 The meeting further discussed whether filtering information was required and the role of bilateral agreements. Singapore was concerned about the possibility of lost information during a conversion and filtering process. The issue was with Category Group 3 (Optional Data Items) - a potential problem for data sharing. For Category Group 2 (Desirable Data Items) information, if any field was received, then it must be transmitted. In view of the foregoing, an amendment was made to include the above concern and the meeting formulated the following draft Conclusion:

Draft Conclusion 11/2 - Guidance Material on generation, processing and sharing of ASTERIX Category 21 Messages

That, the guidance material on generation, processing and sharing of ASTERIX Category 21 ADS-B Messages provided in **Appendix C** to the report be adopted.

TASK No. 13 – Amendment to the Australian ADS-B Rule (WP/10)

5.4 Australia informed the meeting of recent amendments to the Australian ADS-B rule (included in Civil Aviation Orders applicable to both Australian and foreign registered aircraft) for flight in Australian airspace at or above FL290. The changes were made in response to Conclusions taken at the ADS-B SITF/10 Meeting and related to the:

i) date for forward fit of SA Aware within the GNSS avionics used as a position source for ADS-B. (Task No 13 in the ADS-B Subject/Task List); and

ii) conditions under which an aircraft may undertake flight in Australia with unserviceable ADS-B equipment (Conclusion 2 of the Regulatory Authority Ad Hoc Working Group at ADS-B SITF/10).

5.5 Based on feedback resulted from aviation industry consultation on the amendment proposal undertaken in September 2011, Australia had decided on 8 December 2016 for forward fit of SA Aware in the GNSS avionics. In making this decision, Australia was aware that the safety impact of not having SA Aware had been offset to a large extent by a recently approved lowering of the level of the aircraft transmitted position integrity (Navigation Uncertainty Category) parameter acceptable in the ADS-B ground system for display of ADS-B targets to ATC.

Flight with unserviceable ADS-B equipment

5.6 Industry consultation on the proposed additions to the ADS-B rule to allow for flight with unserviceable ADS-B equipment was also undertaken in the same NPRM (No 1103AS) that proposed the change to the date for SA Aware.

5.7 The outcome was that the Australian ADS-B rule was amended to provide for aircraft having unserviceable ADS-B equipment undertaking flight under certain conditions to position the aircraft for equipment repairs as follows:

a) the equipment was listed in the aircraft operator's Minimum Equipment List as a Permissible Unserviceability (PUS) for the flight; or

b) flight with unserviceable equipment had been approved by CASA and both of the following applies:

i) the flight took place within 3 days of the discovery of the unserviceability; and

ii) ATC cleared the flight before it commenced.

5.8 The meeting noted the changes made by Australia and IATA expressed appreciation to CASA for being pro-active in addressing industry concerns.

Difference between DO-260, DO-260A and DO-260B (WP/18)

5.9 Further to the discussion held during the tenth meeting of the ADS-B Study and Implementation Task Force, Hong Kong China and Singapore presented paper analyzing the difference between DO-260, DO-260A and DO-260B which provided useful functionality in the ATM automation system. This paper discussed some of the potential uses of the additional information available under DO-260A/B.

5.10 IATA thanked the States involved for the paper and asked the manufacturers for clarification what was involved in an update from DO-260A to B. Boeing responded that it varied from aircraft to aircraft as to either a software change or one that involved a hardware and software change. It was also noted that DO-260B requires the addition of a number of backplane "programming" input. However even software-only updates might involve removal of the box to have a change made. The USA stated that just because the element was in the standard, it might not be part of the legislative requirement for either the USA or Europe.

ADS-B Equipage and NUC value analysis (WP/19)

5.11 Singapore presented a paper analyzing the quality of the ADS-B reports observed by the Singapore ADS-B ground station and the level of ADS-B equipage within the Singapore FIR. The paper provided the brief explanation of Navigation Uncertainty Category. The meeting noted the result of the statistics and analysis provided in the paper and discussed the issue of NUC value which can be used to support procedure control and for situation awareness. The Chairman noted that more analysis was required to move from an overall system performance assessment to specific problem analysis. The Secretariat noted that there was no equivalent of RVSM and data-link monitoring for ADS-B performance monitoring.

5.12 As result of discussion, the meeting agreed that it was not useful to use a separate quality threshold (NUC or NIC) for monitoring of procedural standards. Few reports of NUC<3 are transmitted and the value of building systems to use a separate threshold are not warranted. It was noted that the Australian regulator was in the process of approving NUC 3 for the application of 5NM separation.

5.13 The meeting agreed that States should follow the guidance provided in the Circular 326 and no separate guidance on NUC value for situational awareness would be required.

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.

Cambodia (IP/4)

6.2 The meeting was informed the meeting that Cambodia currently has MSSRs located at Phnom Penh, Siem Reap and a Mode S MSSR at Sihanouk Ville. The coverage of each MSSR is about 250 NM. In 2011 Cambodia added three ADS-B AX680 Thales ground stations located at Phnom Penh, Siem Reap and Steung Treng, with coverage to about 250 NM. Surveillance data from these MSSRs and ADS-B stations are sent to EUROCAT-C system for processing and the display system of which was upgraded from Eurocat-1000 at the end of 2011. Cambodia was willing to conduct trials with Thailand, Laos and Viet Nam for testing AIDC and FPL amendment. Cambodia also informed the meeting that 10NM separation was being used with the implementation of these surveillance systems.

Republic of Korea (IP/5)

6.3 At the Incheon International Airport (IIAC), four ADS-B systems had been operational since 2008 for airborne and surface vehicles to provide efficient RIMCAS (Runway Incursion Monitoring and Conflict Alert System) functions and to enhance air traffic efficiency. The ROK encouraged more airplanes to be equipped with ADS-B equipment to minimise incorrect position reports. Currently ADS-B reports were compared with position derived from ASR/SSR radars and verified before integration within the MRT (Multi Radar Tracking) system. In order to gain more confidence using ADS-B for airport surface surveillance, the Republic of Korea was considering installing a multilateration system in addition to the ADS-B/ASDE radar.

6.4 The meeting discussed the reason why errors were being observed and noted that analysis to identify the root cause was necessary. It was emphasized that an aircraft with a NUC value of zero (0) should not be considered as error with a major positional displacement as data received from such aircraft should not be processed because its data integrity should not be trusted.

ADS-B Validation System Development (IP/6)

6.5 The ADS-B Validation System (AVS) was an operational validation tool as part of ADS-B system funded by the Ministry of Land, Transport and Maritime Affairs (MLTM) of Korea. The purpose of the AVS was to support the validation of ADS-B system in terms of operation for enhanced ATS in radar-controlled areas using ADS-B surveillance and enhanced traffic situational awareness for surface operations. AVS provides ADS-B subsystems with simulated surveillance sensor target reports and system tracks to support validation of subsystems of ADS-B system. AVS also provided interoperability and performance testing with integrated ADS-B systems, based not only on simulation data but also on real flight data.

Updates on Surveillance Activities in Japan (IP/7)

6.6 The meeting was informed of 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. Japan would also implement SSR/SSR and SSR/WAM/ADS-B target data fusion equipment for all en-route sectors, and would mainly use fused target data between SSR and WAM in the early stages. After the safety assessment works and increase of ADS-B equipage, JCAB would shift to use fused target data derived from SSR/WAM and ADS-B. Japan confirmed that the nationwide WAM and ADS-B programme would eventually result in a rationalization of SSR stations. Japan still had some concerns with ADS-B data use, such as:

- mixture of ADS-B avionics version 0 and 2;
- mixture of ADS-B aircraft and non-ADS-B aircraft; and/or
- existence of unreliable/non-accurate ADS-B position data.

ADS-B Data Sharing between Papua New Guinea (PNG) and Australia (IP/8)

6.7 The meeting noted an update provided by Australia and PNG on the potential ADS-B data sharing project between Australia and PNG, with a possible extension of data-sharing between PNG and Indonesia. The meeting noted that PNG ATMS modernization programme, which included plans to deploy ADS-B as one of its surveillance sources. PNG's NPRM (Notice of Proposed Rule Making) was being prepared and would be published in mid. 2012. The NPRM would specify the same requirements as expressed in the Australian 2013 FL290 mandate but would apply in 2014. PNG was planning to utilise ADS-B surveillance within its Class A and C controlled airspace above FL245.

USA - IP/9

6.8 A comprehensive presentation made by USA provided a summary of U.S. ADS-B implementation related activities including recent FAA regulatory activities, Surveillance and Broadcast Services (SBS) Program, Service Delivery Approach and Implementation Status, SBS Monitor and FAA ADS-B Development Strategy. The meeting appreciated the detailed information presented and noted the source of reference provided at the end of the information paper.

Indonesia – IP/10

6.9 Indonesia provided an information paper about predictive coverage of other potential sites of ADS-B Ground stations to be shared with Manila, Port Moresby, Kuala Lumpur, Kota Kinabalu and Chennai FIRs. The meeting noted that Indonesia had completed the installation of VHF-ER facilities in Natuna while VHF-ER facilities in Matak were still in progress. It was also noted that backup system of JAATS (E-JAATS) in Jakarta which supports ADS-B would be fully operational in July 2012.

China – IP/11

6.10 China highlighted the significant activities on the studies of ADS-B technology, implementation projects, promotion policies, standards and equipment licensing issued by the Civil Aviation Administration of China (CAAC). The meeting noted that CAAC had selected 1090 MHz ES as the ADS-B data link for the transport and general aviation. A series of Advisory Circular and provisions on surveillance technology policy, ADS-B application, Airworthiness and operational approval of ADS-B, ATC procedure etc. had been issued since 2008. China announced that it would publish a significant ADS-B plan in third quarter 2012.

Fiji – IP/13

6.11 Fiji presented a paper on the status of implementation of ADS-B and MLAT in Fiji. The paper provided introduction of characteristics of Nadi FIR. A minimum of eight ADS-B Ground Station (GS) sites were identified with three additional sites required for MLAT operation near Nadi. The eleven sites include Rotuma (the most remote site) and Delaikoro, Matei, Lakeba, Nausori Tower, Monasavu, and the five sites around Nadi were at Lomolomo, Nagado, Nawaka, Denarau and Nadi Tower. The system was expected to be available with ADS-B service performance requirement category Tier 2 as shown in the Appendix J to APRNPIRG/18 report on Agenda Item 3.3 for commencement of ATC surveillance training in August 2012. Fiji also advised that the mandate date was 13 December 2012. Fiji requested guidance on quality or integrity requirement for ADS-B data, and was referred to the draft Circular 326 for the specified NUC value, statistics and practices by other States in the region.

India – WP/17

6.12 India presented an update on India's preparedness towards ADS B implementation plan which would provide ATS surveillance in remote areas, to cover existing radar gaps, especially around Port Blair to enhance the safety and efficiency of aircraft operations. India was working towards seamless ATM through integrated surveillance coverage over its airspace with overlapping radar coverage and ADS-B coverage over continental airspace. As a proof of concept, ADS-B had also been integrated with the ATC Automation System at Chennai ATC. India also had a similar plan for other FIRs, whereby 11 ACCs would be amalgamated into four ACCs initially and finally into two centres.

6.12.1 India was planning to install and commission 14 ADS-B stations across the subcontinent in the first phase, including one station at Port Blair which would provide surveillance coverage over Bay of Bengal up to the FIR boundary of Chennai / Kuala Lumpur and Kolkata / Yangon. The data to be derived from Port Blair ADS-B station would be fed into ATC automation systems at Chennai and Kolkata respectively. Implementing ADS-B at Port Blair would enable the provision of efficient air traffic services on ATS routes P628, L510, N877, N 571, P761, P762 and L759, and aid the controllers in better conflict detection and separation management over crossing points. The existing separation of 15 minutes over crossing points could be reduced to ATS surveillance separation minima, allowing aircraft on crossing tracks to maintain optimum levels. The provision of ADS-B in Port Blair would permit efficient resolution of en-route traffic, particularly in critical areas east of Port Blair.

6.12.2 In the recently concluded BOBASIO/2 (Chennai, India, 11-13 April 2012), the Maldives had informed their plan for installation of two ADS-B stations. The Maldives expressed their willingness to share ADS-B data with India and Sri Lanka. The ADS-B station was proposed to be installed at Hanimadhoo so as to have overlapping coverage with the Chennai Upper ACC and Trivandrum ACC. This would provide redundancy of surveillance data to Chennai Upper ACC and Trivandrum ACC.

6.12.3 India announced its willingness to share ADS-B data with Indonesia and Maldives to enhance the surveillance capability in the Bay of Bengal and Indian Ocean. All the participating states in BOBASIO/2 (Nepal, Bangladesh, Thailand, Singapore, Indonesia, Maldives, Seychelles, Oman) were requested to take necessary action for sharing of ADS-B data with India. There would be minor benefits in using Indonesian ADS-B data by India and no identified benefits in sharing data between Thailand and India.

6.12.4 India had committed in RASMAG/16 to provide data from these ADS-B locations for RMA use in height monitoring. The process for issuance of mandate for carriage and use of ADS-B equipment in the entire Indian airspace has already been initiated. India planned to operationalize ADS-B stations by December 2013 as per Asia/Pacific regional plan. An ADS-B Site survey had been completed for all 14 locations and installation was scheduled to be completed by mid-2012.

6.13 The meeting congratulated India for their progress. In response to a query, India confirmed that there was existing radar at Kolkata, and ADS-B data derived from Coco Island would be provided to Chennai. Bangladesh informed that Bangladesh was considering a plan to install ADS-B at Chittagong.

Update on the ADS-B Collaboration Project in the South China Sea Area (WP/20)

6.14 Indonesia, Singapore and Viet Nam updated the meeting on the implementation of ADS-B in the South China Sea area. The project involves collaboration between Indonesia and Singapore as well as collaboration between Singapore and Viet Nam.

6.14.1 The meeting noted the collaborative efforts and progress made by Indonesia, Singapore and Viet Nam to achieve a seamless ADS-B surveillance coverage over the South China Sea Area with the eventual aim of improving flight efficiency and enhancing safety. The presentation highlighted significant progress to date and the updated timeline of task and milestones. The VHF ground station at Natuna was installed in January 2012. The VHF at Matak (or another suitable location nearby) was expected to complete by August 2012. On 24 November 2011, Singapore and Viet Nam signed the ADS-B Collaboration Agreement. The installation and setup of ADS-B and VHF stations and the necessary lines were targeted to be complete by the second half of 2012.

Regional Performance Framework Form updates (WP/13)

6.15 The meeting reviewed and updated the Performance Framework Form (Asia/Pacific Regional Object 10) presented by the Secretariat. The contents contained in the Form were updated. The updated Performance Framework Form for improved situational awareness and surface surveillance implementation on use of ADS-B is provided in **Appendix D** to this Report.

Guidance Material relating to Sharing ADS-B DATA (WP/7)

6.16 According to the Subject/Tasks List, the meeting reviewed the draft *"Guidance material addressing military concerns regarding sharing ADS-B data"* presented by Australia. During preparation for ADS-B data sharing between Australia and Indonesia, it was considered necessary for the military organizations to be briefed on the data-sharing proposal

6.16.1 Singapore advised that they had no issues with defense agencies in data-sharing. The Secretariat expressed appreciation for development of the Guidance Material which would be very useful for the APSAPG to consider as guidance material for civil-military cooperation aspects. In view of the foregoing, the meeting formulated the following Draft Conclusion for consideration by APANPIRG.

Draft Conclusion 11/3 - Guidance Material on Advice to military authorities regarding sharing ADS-B data

That, the guidance material on advice to military authorities regarding sharing ADS-B data provided in **Appendix E** to the Report be adopted.

AMC20-24 in a RADAR Environment (WP/8)

6.17 In response to a debate about whether AMC20-24 certified aircraft can receive ADS-B services when the ATC service also includes radar (i.e.: in a RAD environment). This doubt arises because AMC-20-24 defines a means of airworthiness and operational approval of the "Enhanced Air Traffic Services in Non-Radar Areas using ADS-B Surveillance" (ADS-B-NRA) application – and does not refer to a RAD service.

6. 18 Australia presented WP/8, which addressed the issue of AMC-20-24 defining a means of airworthiness and operational approval of the 'Enhanced Air Traffic Services in Non-Radar Areas using ADS-B Surveillance' (ADS-B-NRA) application – but did not refer to a RAD service. Australia stated that the non-radar environment appeared to be more demanding than a radar environment, so questioned the need for differentiation of the radar environment for ADS-B environment. The USA stated that they are not using NRA. Singapore was comfortable with the paper as it clarified matters for them.

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

ADS-B Implementation over the South China Sea and Bay of Bengal (WP/9)

7.1 In presenting a working paper, CANSO highlighted a call to action by the recent 48th DGCA Conference to harmonize and expedite ADS-B implementation in the region and called for the development of concrete plans for ADS-B implementation over the Bay of Bengal and enhanced ADS-B coverage over the South China Sea. Three possible projects were identified – one over the eastern part of the South China Sea involving Singapore, Philippines and Brunei and two over the Bay of Bengal involving India and Myanmar.

7.2 Noting the broad support to push for greater harmonization and wider implementation of ADS-B in the region, CANSO cited in particular WP/15 by Hong Kong China and WP/17 by India. CANSO further noted the positive support for ADS-B implementation over the Bay of Bengal at the recent meetings in Chennai i.e. SEA/BOB ADS-B WG/7 and BOBASIO/2 and urged the States/ANSPs involved quickly meeting and discussing concrete follow-up actions.

7.3 In this regard, the meeting supported a proposal by CANSO to facilitate a two day focus group meeting in Singapore in July 2012 for the parties concerned to focus on specific project deliverables and milestones using the framework/model developed for the initial phase of the South China Sea project (*Appendix F*). The focus group meeting could comprise India, Myanmar, Maldives and possibly Sri Lanka for Bay of Bengal and Indian Ocean; and Singapore, Philippines and Brunei for the eastern part of the South China Sea.

7.4 WP/11 provided by Australia was discussed at the Ad Hoc Regulatory Group, which reflected the result of discussions in **Appendix F**.

Hong Kong China (WP/15)

7.5 Hong Kong, China presented WP/15, highlighting progress in ADS-B equipage along two ATS routes L642 and M771, and recommended extending the ADS-B Harmonization Framework over the South China Sea to other high density routes in the APAC Regions. Concerned CAAs/ANSPs were also encouraged to continue liaison with IATA/airlines to equip their fleets in a timely manner in compliance with the published ADS-B mandates. The paper was supported by the meeting, especially by IATA. The Chairman recommended Hong Kong China to further investigate the root cause of NUC = 0 transmitted from aircraft, and liaise with regulators/airlines concerned for timely rectification.

7.5.1 The meeting discussed a proposal from Hong Kong China to include a sample template on harmonization framework for ADS-B implementation into the AIGD based on experience gained in the South China Sea ADS-B implementation project. The meeting agreed to the proposal and formulated following draft Conclusion.

Draft Conclusion 11/4 – Amendment to ADS-B Implementation Guidance Document (AIGD)

That, the AIGD be amended to include a sample template on harmonization framework for ADS-B implementation as provided in **Appendix G** to the Report.

Australian ADS-B Fitment Mandate in December 2013 (IP/2)

7.6 Australia presented information paper highlights that the Australian ADS-B fitment becomes mandatory end of 2013 and highlighted efforts undertaken by Australia to ensure that Airlines are aware significant efforts have been undertaken to ensure that operators are aware of the ADS-B mandate.

Black List /White List filtering (WP/21)

7.7 Australia provided the meeting details about ADS-B avionics issues experienced by the Australian ANSP and made recommendations for other ANSPs to report these deficiencies. The paper catalogues the issues experienced.

7.8 The meeting was informed that currently Australia's filtering uses a "white list" filtering system whereby only "approved" aircraft have ADS-B data forwarded to ATC. Airservices is working on a safety case, to abandon the use of the aircraft by aircraft "white list" filtering system. Once abandoned, the ATC system will present all aircraft ADS-B transmissions with adequate quality, other than known (blacklisted) aircraft having faulty transmissions, to ATC. As is the case for transponders, the ATC system will assume that all transmitting aircraft have ADS-B equipment that operates correctly in accordance with the regulations. Exceptions will then be managed in the same way that problems are managed for SSR transponders.

7.9 After noting the above change from a 'white' list showing all the approved ADS-B aircraft to a 'black' list there was considerable discussion about whether the Asia/Pacific Region should develop a regional or even a global database of errant aircraft.

7.10 The Chairman agreed to approach Airservices Australia's management with the request to place information on their restricted website. It was considered possible to add this monitoring to the function of Australian Airspace Monitoring Agency (AAMA).

7.11 The Chairman spoke of the need for States to influence the ADS-B environment (correct ADS-B transmissions, Correct Flight ID, fitment rate etc.) rather than simply measuring and reporting on the environment. States were encouraged to influence the environment by having regulations, enforcing regulations, providing operational incentives and operational consequences of non-compliance. Only through appropriate feedback networks, good ADS-B environment will be achieved.

7.12 In view of the foregoing, the meeting considered necessary to establish a database for the region to maintain a list of identified ADS-B airframe problems. Australia was requested to establish and maintain such database and States were requested to provide required information for entry in the Database for sharing. Accordingly, the meeting formulated following Draft Conclusion for consideration by APANPIRG.

Draft Conclusion 11/5 – Database of Blacklist Airframe broadcasting misleading ADS-B Data

That,

a) Australia be requested to establish and maintain a Database of Blacklist airframe broadcasting misleading ADS-B data for sharing with other Administrations in the Asia/Pacific Region; and

b) States implementing ADS-B based surveillance service be encouraged to provide the identified occurrences of airframe broadcasting misleading data to Australia for entry into the ADS-B Blacklist Database.

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

7.13 The meeting reviewed the updates on the Sub-regional ADS-B implementation projects from SEA, BOB and Regulator's Working Group as presented by the Ad Hoc working groups at the ADS-B SITF/11 meeting. The discussions were based on the outcome of previous meetings of the ADS-B SITF/10 and SEA/BOB ADS-B WG/7. The outcome of discussions by the Ad Hoc working groups is provided in **Appendix F** to this report, which could serve as a basis for further development of the sub-regional implementation plans.

Agenda Item 8: Any other business

ADS-B derived data for RVSM height monitoring (WP/14)

8.1 IATA presented a paper on the availability of ADS-B as a cost effective solution to enable long-term height monitoring capability, and encouraged States to consider utilizing ADS-B for this function as they implemented ADS-B in the Region.

8.2 Hong Kong, China suggested if their Regional Monitoring Agency (RMA) that currently assessed their height-monitoring compliance could utilize ADS-B data for this purpose. The Secretariat advised that all the Asia/Pacific RMAs were aware of the work undertaken by Australia and the United States in this field.

8.3 The Secretariat further updated the meeting that the last Regional Airspace Safety Monitoring Advisory Group meeting (RASMAG/16, Bangkok, 20-24 February 2012) had endorsed this process and it was expected that the next RASMAG meeting (RASMAG/17, 28-31 August 2012) would be updated on RMA progress on the usage of ADS-B data for height monitoring. The meeting was also informed that RASMAG/17 was expecting to discuss updated *the Asia/Pacific Regional Impact Statement for RVSM monitoring* to incorporate reference to ADS-B as a preferred solution, given the cost advantages of using ADS-B for airlines.

8.4 In this connection, the meeting noted that MAAR Bangkok had agreed to receive and process ADS-B data for RVSM monitoring. However, calculating Altimetry System Error (ASE) using ADS-B data would largely depend on the availability of the ADS-B data from States and how to retrieve ADS-B data directly from the ADS-B messages by States. It was also required to forward all relevant data to States once the reports of calculation and analysis are completed.

8.5 The meeting recommended RASMAG to develop a requirement and procedure for collection of ADS-B data for height monitoring at its next meeting.

Validations of WAM in China – IP/12

8.6 CAAC was developing WAM standards/specifications, and WAM equipment/system had been developed by China's aviation industry. Some WAM validations showed that the system's accuracy was 60-150m (EPU). China had conducted validation of ADS-B data and some security problems were found. Remedial technical solutions to the problems observed had been developed, using TDOA to evaluate the position data. Other issues of ADS-B data would continue to be studied.

Note of appreciation

8.7 The meeting expressed its appreciation and gratitude to the Office of Civil Aviation of MLTM and the Incheon International Airport Corporation (IIAC) for hosting the ADS-B Seminar and the meeting, as well as the excellent arrangements made for the meeting and for all associated activities.

Time and Venue of Next Meeting

8.8 The meeting discussed proposed dates for next meeting of the Task Force. For the SEA/BOB ADS-B Working Group meeting, a 12 month gap between meetings would be too long at this critical phase for many States. To expedite implementation and exchange of ideas, and experience during initial phase of implementation, small scale coordinated meetings between States and/or frequent bilateral discussion were considered invaluable. In this connection, the meeting encouraged the focus groups meeting to be hosted by CANSO in July 2012.

8.9 The SEA/BOB working group meeting was scheduled to be held in November 2012 and the timing for next meeting of ADS-B Study and Implementation Task Force was scheduled to be held in April 2013. The members of the Task Force will be informed well in advance of venue and dates of the meetings after consultation with the concerned.

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**THE REVISED TERMS OF REFERENCE OF
ADS-B STUDY AND IMPLEMENTATION TASK FORCE**

- Compare currently available technologies with respect to concept of operations, relative costing, technical and operational performance and maturity of alternative technology/solutions (primary, secondary radar including Mode-S, ADS-B, multilateration, ADS-C);

- Develop an implementation plan for near term ADS-B applications in the Asia Pacific Region including implementation target dates taking into account:

  - available equipment standards

  - readiness of airspace users and ATS providers

  - identifying sub-regional areas (FIRs) where there is a positive cost/benefit for near-term implementation of ADS-B OUT

  - developing a standardised and systematic task-list approach to ADS-B OUT implementation; and

  - holding educational seminars and provide guidance material to educate States and airspace users on what is required to implement ADS-B IN & OUT.

- Study and identify applicable multilateration applications in the Asia and Pacific Region considering:

  - Concept of use/operation

  - Required site and network architecture

  - Expected surveillance coverage

  - Cost of system

  - Recommended separation minimums; and

  - If multilateration can be successfully integrated into an ADS-B OUT-system for air traffic control.

- Coordinate ADS-B implementation plan and concept of operations with other ICAO regions where ADS-B implementation is going on and with relevant external bodies such as EUROCONTROL, EUROCAE, RTCA and Industry.

Note: *The Task Force, while undertaking the tasks, should take into account of the work being undertaken by SAS, AS Panels with a view to avoid any duplication.*

The Task Force should report to the APANPIRG, through the CNS/MET Sub-group and provide briefing to the ATM/AIS/SAR Sub-group.

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UPDATED ADS-B SUBJECT/TASKS LIST

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
	3	~~Each member State report on the number of airframes fitted and transmitting with good NUC/NIC.~~	~~D. Efficiency~~	~~GPI01/05/06/09/14/16/17/21/22~~	~~Report on statistics conducted~~	~~4/2011~~	~~Closed~~
	14	~~Guidance material on how to build safety case for delivery of separation services.~~	~~A.Safety~~	~~GPI01/05/06/09/14/16/17/21/22~~	~~Guidance material for implementation~~	~~Apr-11~~	~~Completed~~
	17	~~Guidance on legal liability issues for ADS-B data sharing.~~	~~A.Safety~~	~~GPI01/05/06/09/14/16/17/21/22~~	~~Guidance material for implementation~~	~~Aug-12~~	~~USA Closed~~
	25	~~Provide feedback to the proposed amendment and template for data sharing based on experience gained by Indonesia and Singapore.~~	~~D. Efficiency~~	~~GPI01/05/06/09/14/16/17/21/22~~	~~Comments~~	~~April-2011~~	~~Completed~~
	26	~~Prepare a paper on the experience of using the ADS-B data sharing template and make any recommendations for change of the data sharing template.~~	~~D. Efficiency~~	~~GPI01/05/06/09/14/16/17/21/22~~	~~Comments~~	~~April-2011~~	~~Completed Singapore & Indonesia~~
	27	~~Clarify relation between DO260B and 3NM separation in TMA.~~	~~D. Efficiency~~	~~GPI01/05/06/09/14/16/17/21/22~~	~~Prepare a WP~~	~~April-2011~~	~~Completed~~
	28	~~Renaming SEA ADS/B WG and relation between WG and TF.~~	~~D. Efficiency~~	~~GPI01/05/06/09/14/16/17/21/22~~	~~Comments~~	~~April-2011~~	~~All Members Completed~~
	29	~~Review the forward fit requirement for SA Aware compliance by June 2012.~~	~~D. Efficiency~~	~~GPI01/05/06/09/14/16/17/21/22~~	~~To develop a strategy to resolve this issue~~	~~April-2011~~	~~IATA & Australia Completed~~
	31	~~To exam possibility of sharing ADS-B data from potential ADS-B ground station from Coo Co and Pathein.~~	~~D. Efficiency~~	~~GPI01/05/06/09/14/16/17/21/22~~	~~Report status and possibility~~	~~April-12~~	~~Myanmar & India Completed~~
	32	~~ATS operational letter of agreements between neighboring FIRs among South China Sea States for radar-like surveillance service~~	~~D. Efficiency~~	~~GPI01/05/06/09/14/16/17/21/22~~	~~Report progress~~	~~April-12~~	~~China, Hong Kong China, Viet Nam and Singapore~~
	33	~~Review of FPL Amendment to update AIGD and its effective date.~~	~~D. Efficiency~~	~~GPI01/05/06/09/14/16/17/21/22~~	~~Update the AIGD~~	~~April-2012~~	~~Australia and Secretariat Completed~~
	34	~~Identify new data sharing projects in the eastern part of South China Sea.~~	~~D. Efficiency~~	~~GPI01/05/06/09/14/16/17/21/22~~	~~Prepare a working paper~~	~~April-13~~	~~Singapore Completed~~
	35	~~Identify new data sharing projects in Bay of Bengal.~~	~~D. Efficiency~~	~~GPI01/05/06/09/14/16/17/21/22~~	~~Prepare a working paper~~	~~April-12~~	~~Australia & CANSO Completed~~

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
	37	~~Guidance material addressing military concerns regarding sharing ADS-B data~~	~~A. Safety~~	~~GPI01/05/06/09/ 14/16/17/21/22~~	~~Prepare a working paper~~	~~April-12~~	~~Australia Completed~~
	39	~~Comparing the changes brought by DO260B and identifying any potential impacts on ATC systems.~~	~~A. Safety~~	~~GPI01/05/06/09/ 14/16/17/21/22~~	~~Prepare a working paper~~	~~April-12~~	~~Hong Kong China & Singapore Completed~~
1	18	Develop and implement regional collaboration project for ADS-B Out operational use including data sharing in SEA 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.	Jul-08/ 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.	April-09/ December-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-13	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-13	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-13	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	Letter to States	September-12	Regional Office

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GUIDANCE MATERIAL ON
GENERATION, PROCESSING & SHARING of ASTERIX
CATEGORY 21 ADS-B MESSAGES
(Including Attachments A, B, C & D)

1. INTRODUCTION

1.1 The "All Purpose Structured Eurocontrol Surveillance Information Exchange" (ASTERIX) Category 21 is a data format standard globally accepted by the Air Traffic Management (ATM) system manufacturing industry for sharing of ADS-B data with ATM automation system. Asterix Category 21 data is used to convey ADS-B data from ADS-B ground stations to ATC processing and display system. This guidance material discusses various aspects of this process. Since the ASTERIX Category 21 version 0.23 was issued in November 2003, it has undergone continuous revisions with some 14 subsequent versions. The focus of this guidance material is to concentrate on 1090ES ADS-B data using:

a) DO260;
b) DO260A; and
c) DO260B

1.2 The ASTERIX Category 21 version 1.0 issued in August 2008 has fully incorporated the DO260A standard while the latest version 2.1 issued in May 2011 has fully incorporated the latest DO260B standard.

2. ASTERIX CAT 21 IN ASIA AND PACIFIC REGIONS

2.1 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 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.

3. CHOICE OF ASTERIX VERSION NUMBER

3.1 The Asterix standard has been developed over many years. Stability in the standard is desirable so that ADS-B ground station designers and ATM automation designers and manufacturers can build interoperable systems with confidence. Because ADS-B technology has been evolving over the years, and will continue to do so, it is not surprising that the Asterix standard has also developed along with the ADS-B link technology standards to grasp the best benefits of its intended design.

3.2 During 2005, Asia Pacific decided to use V0.23 as the version for sharing ADS-B data between states. This version provides adequate information so that useful ATC operational services can be provided including ATC 3 nautical mile and 5 nautical mile separation services. 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 all the capabilities offered by DO260A and DO260B.

3.3 Nearly all V0.23 data items can be "re-constructed" from a received V2.1 data stream. However, most of the special DO260A/B data items cannot be "re-constructed" from a V0.23 data stream. In terms of domestic use and data sharing with other ANSPs concerning ADS-B data, several options exist for ANSPs as follows:

Option	Domestic use	Data sharing
1	V0.23	V0.23. This is the default and basic standard.
2	V2.1	V0.23. This will require some conversions to occur, probably through an ADS-B format conversion and filter system (see Paragraph 11), between a domestic system and a foreign system. Difficulties may exist if the domestic system requires special DO260A/B data items, since they cannot all be re-constructed from the external foreign V0.23 data stream.
3	V2.1	V2.1. Must negotiate bilaterally with data sharing partner regarding exact version to be used to achieve the intended functions.

Note: In this table, V2.1, the latest Asterix Cat 21 version, is chosen as a representation of an Asterix Cat 21 version after V0.23. There exists other Asterix CAT 21 versions (e.g. 0.26, 1.3. and etc.) after V0.23 that could be used by ANSPs for domestic and data sharing use.

4. SPECIFICATION OF ASTERIX MESSAGE PROCESSING

4.1 Care is needed to understand the difference in specifications :

4.2 **Asterix Cat 21**: Defines the characteristics of the data ON the interface including fields that are mandatory on the interface.

4.3 **ADS-B ground station specifications**: To define the Asterix standard, must also define which optional Asterix data items are required to be delivered on the Asterix interface, when the appropriate data is received from the aircraft. It is desirable that suppliers be required to :

a) indicate how the ground station processes and outputs every received DO260, DO260A and DO260B data element into an Asterix data element/field; and

b) indicate which and how each Asterix data element and field presented at the output are populated.

4.4 **ATM automation system specifications:** Defines which received Asterix data element and fields are processed and how they are processed. Also defines which Asterix optional data fields are required by the ATM automation systems (if any). ANSPs that specify ADS-B ground stations and ATM automation systems need to consider carefully and clearly about what they desire to achieve. Specifications which simply require compliance with a particular Asterix standard will be inadequate in most circumstances. In particular ANSPs, together with their suppliers should :

a) Specify the Asterix standard version to be used. This defines the message formats that are placed on the link between ADS-B ground station and downstream systems like ATM automation, recording & analysis systems, bypass ATC systems and foreign ANSPs. The standard will define which messages elements are mandatory in each message (very few fields) and a large number of optional fields. The optional fields can only be filled if relevant data is received from the aircraft. The optional fields will only be filled if the ground station specification requires them to be filled.

b) Specify the ADS-B ground station behaviour so that when data is received from the aircraft, the ground station is required to fill appropriate optional Asterix data fields.

c) Specify the ATM automation system behaviour including appropriate semantic and syntax checks applied to the Asterix data, including any triggers for the system to discard data. The processing applied to each received Asterix data field.

5. MANDATORY FIELDS : ASTERIX AND 1090ES ADS-B

5.1 Asterix Cat 21 has been designed to support multiple datalinks. It has been defined to support data fields which are not available in the 1090ES standards. Therefore some data items and fields are not relevant when 1090ES is used.

5.2 The standard itself defines various items as optional or mandatory. This is defining what is ON the interface. It does NOT specify the behaviour of the transmitting ground station nor the behaviour of the receiving ATM automation system.

5.3 When a single link technology has been chosen it may be sensible to diverge from the formal V0.23 standard to reduce the required Asterix datalink bandwidth. E.g.: in an environment with only 1090ES, it is unnecessary to transmit "Link Technology Indicator". Asterix Cat 21 Version 2.1 allows this selection.

Data Items	Description	Mandatory (M) or Optional (O) items as per ASTERIX Category 21	
		Version 0.23 Specification	Version 2.1 Specification
I021/010	Data Source Identification	M	M
I021/030	Time of Day	M	N/A
I021/071 or I021/073	Time of Applicability of Position or Time of Message reception for position	N/A	One of these is must be transmitted
I021/040	Target Report Descriptor	M	M
I021/080	Target Address	M	M
I021/210	Link Technology Indicator/ MOPS version	M	O

6. GENERATION OF ASTERIX AT AN ADS-B GROUND STATION

6.1 The following general principles should be adopted:

6.2 Commensurate with link bandwidth availability transmit all mandatory Asterix data items and also transmit those Asterix data items that are operationally desirable. That is, when the appropriate aircraft transmission is received by the ADS-B ground station, the data should be transmitted to the ATC system for operational use or for technical recording and analysis use. If no aircraft transmission data is received to fill an Asterix data item during any update cycle, the data item should not be included in the Asterix data stream to reduce bandwidth requirements.

6.3 **Group 1 (Mandatory Data Items)**: An Asterix Cat21 message should not be transmitted unless the mandatory data items defined in Appendix A are all present.

6.4 **Group 2 (Desirable Data Items)** : The data items defined in Appendix B are operationally desirable which should always be transmitted in the Asterix Cat 21 messages whenever the data are received by the 1090ES ground station from aircraft (if allowed by the relevant Asterix standard chosen).

6.5 **Group 3 (Optional Data Items)** : The data items defined in Appendix C are considered optional and may or may not need to be transmitted depending on availability of such data from aircraft and/or other specific operational needs.

6.6. **Group 4 (Future Data Items)**: The following data are defined in the DO260A and DO260B standards but are not yet defined in the Asterix standard. This group is provided for information only. It illustrates the need for system designers to provide for future adaptability when possible and when cost effective to do so. Not only will the Asterix standard continue to evolve, but changes to DO260 can also be anticipated within the decade.

a) Target heading: Information from DO260A/B Target state and status messages (On condition messages). These could be used for detection of pilot errors in selection of heading/altitude; and

b) GPS Offset: Could be used to more accurately display aircraft position on an airport surface, or better detect that an aircraft has passed an airport hold point.

6.7 When developing a specification for an ADS-B ground station, it is considered necessary that the specification requires the transmission of all data items that are operationally desirable (Group 2), when such data are received from the aircraft, in addition to the data items that are mandatory (Group 1) in Asterix messages. Whether Group 3 optional data items 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.

7. PROCESSING OF ASTERIX ADS-B DATA AT ATC SYSTEM

7.1 An Asterix Cat21 message should not be accepted by the ATC system for processing unless it includes at least all the Group 1 data items.

7.2 The ATC system should process all received Asterix Cat21 message data items that bring operational benefits (i.e. Group 2 data items). An ATM automation specification should require that the system appropriately process those Group 2 data items depending on specific operational need. Whether the ATC system will process Group 3 optional data items will depend on specific operational needs.

8. DATA SHARING OF ASTERIX ADS-B DATA

8.1 In principle, all data receiving from the shared ADS-B ground station should be delivered to the receiving party as far as practicable without filtering unless owing to technical reasons such as the need to convert the data from one ASTERIX format to another or it is requested by the receiving party of the data.

8.2 It is considered necessary that all data items 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.

9. ISSUE RELATED TO DO260A

9.1 Support of DO260A using Asterix Cat 21 V0.23

a) DO260A was developed after V0.23 of Asterix was defined. Therefore, V0.23 does not directly support DO260A. However, ground station software can generate useful V0.23 Asterix data from DO260A reports through use of the following techniques;

b) A useful I021/090 Figure of Merit can be generated from DO260A messages. Some implementations have a table, which defines the FOM/PA to be generated for each combination of SIL, NIC and NAC. The contents of the table can be offline defined to generate the appropriate FOM/PA values. The downstream ATC system can then process DO260A reports as if they were DO260 reports; and

c) If there is a particular need for the ATC system to have access to the NIC/NAC or SIL or other data item that exist in DO260A (but not in DO260), then users may need to consider a more recent version of Cat 21.

9.2 Support of DO260A using Asterix Cat 21 V2.1

a) If DO260A is used, then the ANSP could decide to use Asterix Cat 21 V1.0 (or later versions) or V2.1; and

b) Readers are invited to carefully examine the DO260A fields (see Appendix D) to determine if the benefits of additional DO260A fields are large enough to warrant adoption of Asterix Cat 21 V1.0 (or later versions) or V2.1.

10. ISSUE RELATED TO DO260B

10.1 Support of DO260B using Asterix Cat 21 V0.23

a) DO260B was developed some years after DO260A. Therefore, Asterix Cat 21, V0.23 does not directly support DO260B;

b) The same techniques used for processing DO260A can be used for processing DO260B, however, the table used must account for NIC supplement B & NIC supplement C; and

c) If there is a particular need for the ATC system to have access to the new data items offered by DO260B, then users may need to consider a more recent version of Cat 21 (e.g. V2.1).

10.2 Support of DO260B using Asterix Cat 21 V2.1

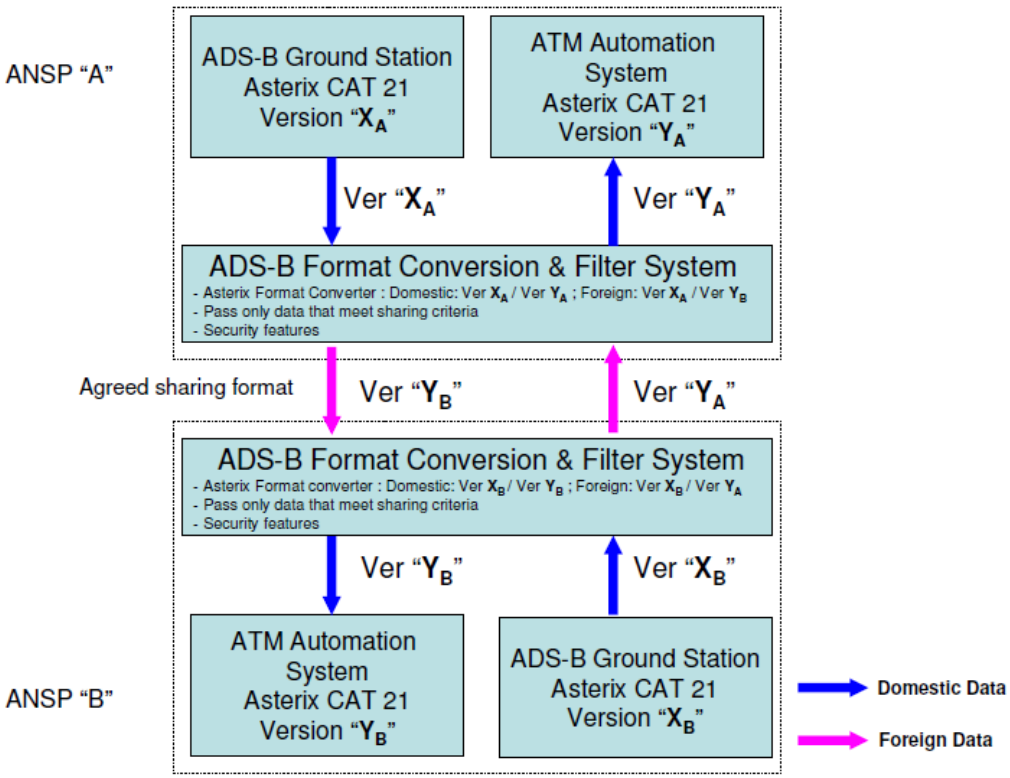
a) If DO260B is used, then the ANSP could decide to use Asterix Cat 21 V2.1; and

b) Readers are invited to carefully examine the DO260B data items (see Appendix D) to determine if the benefits of additional DO260B data items are large enough to warrant adoption of Asterix Cat 21 Version 2.1.

11. ADS-B FORMAT CONVERSION AND FILTER SYSTEM

11.1 It is clear that the evolution of 1090ES ADS-B transmission will continue. Avionics software will be upgraded to provide additional or changed functionality. As a result Asterix standards will also continue to evolve, and ATC systems will need to be adaptable to be able to cope with new functionality requirements and new message standards.

11.2 The use of an ADS-B format conversion & filter (ADS-B FC&F) system between domestic ADS-B systems and data shared with other states is a cost-effective way to provide the necessary protection and flexibility in this evolution. Such a system provides ADS-B format conversion between domestic and foreign ADS-B systems. While decoupling one ADS-B Asterix environment from another, the system allows information that meets specific sharing criteria to be passed through for data sharing. By doing so, loading on the ATM automation systems to process ADS-B data and bandwidth requires to transmit the ADS-B data could then be reduced. The system also allows independent domestic format changes without disruption to the foreign environment. A typical structure could be as shown below:


ANSP "A"
ADS-B Ground Station
Asterix CAT 21
Version "X_A"
ATM Automation
System
Asterix CAT 21
Version "Y_A"
Ver "X_A"
Ver "Y_A"
ADS-B Format Conversion & Filter System
- Asterix Format Converter : Domestic: Ver X_A / Ver Y_A ; Foreign: Ver X_A / Ver Y_B
- Pass only data that meet sharing criteria
- Security features
Agreed sharing format
Ver "Y_B"
Ver "Y_A"
ADS-B Format Conversion & Filter System
- Asterix Format converter : Domestic: Ver X_B / Ver Y_B ; Foreign: Ver X_B / Ver Y_A
- Pass only data that meet sharing criteria
- Security features
Ver "Y_B"
Ver "X_B"
ANSP "B"
ATM Automation
System
Asterix CAT 21
Version "Y_B"
ADS-B Ground Station
Asterix CAT 21
Version "X_B"
Domestic Data
Foreign Data

Attachment A - Group 1 (Mandatory Data Items)

Data Items	Description	V 0.23	V 2.1	Remarks
I021/010	Data Source Identification	X	X	Identifies source of data. Important if validity checks are performed as an anti spoofing capability. Validation that the data is received from an approved ADS-B ground station. Data received from a ground station should not be processed if the position of the reported aircraft is an unreasonable distance away from the known location of the ADS-B ground station
I021/030	Time of Day	X		Necessary to extrapolate the ADS-B data to time of display. Data received with a Time of Day too far in the past should be discarded. This data is too old.
I021/071 or I021/073	Time of Applicability of Position or Time of Message reception for position		X	Necessary to extrapolate the ADS-B data to time of display. Data received with a Time of Day too far in the past should be discarded. This data is too old.
I021/040	Target Report Descriptor	X	X	Indicates if report is a duplicate, on the ground, is a simulated target, is a test target. This needs to be checked by ATC system prior to processing. If the data indicates that the report is a test target or a simulated target, it is normally processed differently to “real” targets.
I021/080	Target Address	X	X	Included in all 1090ES downlink messages, so always available. Used for report/report linkage in ATC tracking.
I021/090	Figure of Merit/Quality Indicators	X	X	Position cannot be used without quality indicator. If the quality of the positional data does not meet the requirements the data should be discarded.
I021/130	Position in WGS-84 co-ordinates	X	X	Report cannot be used without position

Attachment B - Group 2 (Desirable Data Items)

Data Items	Description	V 0.23	V 2.1	Remarks
I021/008	Aircraft operational status		X	TCAS capability, Target state reporting capability, CDTI capability, Single/dual aircraft antenna. It is desirable to have immediate knowledge of RA event.
I021/020	Emitter Category	X	X	Aircraft or vehicle type
I021/140	Geometric Altitude/Height	X	X	Useful for RVSM monitoring. Not normally used for ATC application. Could perhaps be used as an indicator of correct QNH setting in aircraft.
I021/145	Flight Level	X	X	Flight level is an important information to ATC
I021/155	Barometric Vertical Rate	X	X	Used for predictive tools and safety nets. Either Barometric vertical rate or Geometric vertical rate is provided by the aircraft – not both. However, the ATC system can calculate vertical rate from multiple flight level reports if these data items are not available.
I021/157	Geometric Vertical Rate	X	X	
I021/160	Ground Vector	X	X	Provides excellent vector to support extrapolation of positional data to time of display. However, the ATC system can calculate the velocity vector (ground vector) from multiple position reports. I021/160 however, is normally far superior that ATC system calculation.

Data Items	Description	V 0.23	V 2.1	Remarks
I021/170	Target Identification	X	X	This is the callsign/Flight ID is extremely useful for ATC and matching to the flight plan (if any). Target identification is only sent once per 5 seconds. Some ground stations designs attach the target identification (if known from previous recent downlinks) even if not received in the last 5 seconds. The field can be missing at the edge of ADS-B coverage – for flights inbound to coverage.
I021/200	Target Status	X	X	This is the emergency type and is highly desirable.

Attachment C - Group 3 (Optional Data Items)

Data Items	Description	V 0.23	V 2.1	Remarks
I021/077	Time of report transmission		X	Time of applicability is relevant for ATC system processing. Time of transmission is less relevant.
I021/032	Time of Day Accuracy	X		Maximum error in Time of day. Normally the maximum value is known by the ANSP because of station design.
I021/095	Velocity Accuracy	X		If using GPS, velocity accuracy will be adequate if the Position quality is accurate.
I021/072	Time of applicability of velocity		X	Can be managed by a velocity data time out in Ground station.
I021/075	Time of message reception of velocity		X	Normally velocity is in the same Asterix message as position. Velocity data time out in Ground station.
I021/161	Track number		X	Tracking can be performed by ATC system. Also the 24 bit code (aircraft address) could be used as a pseudo track number.
I021/110	Trajectory Intent	X	X	Defined in DO260 but not transmitted by any known product. Not defined in DO260A or DO260B
I021/146	(Intermediate) Selected Altitude	X	X	Target altitude : Information from DO260A/B Target state and status messages (On condition messages). These could be used for detection of pilot errors in selection of heading/altitude.
I021/148	Final State Selected Altitude	X	X	
I021/015	Service identification		X	Type of Service (VDL4, Ext Squitter, UAT, TIS-B VDL4, TIS-B Ext Squitter, TIS-B UAT, FIS-B VDL4, GRAS VDL4, MLT). Not useful to most ATC systems.
I021/016	Service management		X	Update rate or whether data driven output from GS. Normally known by receiver.

Data Items	Description	V 0.23	V 2.1	Remarks
I021/074	Time of message reception of position – high resolution		X	High resolution is designed to support MLAT system processing by receiver. Not required for pure ADS-B.
I021/076	Time of message reception of velocity – high resolution		X	High resolution is designed to support MLAT system processing by receiver. Not required for pure ADS-B.
I021/210	MOPS version/ Link Technology Indicator	X	X	Maybe useful for statistics about equipage. Not operationally relevant
I021/070	Mode 3/A code		X	Could be used for legacy ATC system that do not use Flight ID
I021/165	Rate of Turn/Track Angle rate	X	X	Not transmitted in DO260, DO260A or DO260B messages
I021/271	Surface capabilities and characteristics		X	
I021/132	Message amplitude		X	Useful for technical analysis. Not operationally relevant
I021/250	Mode S MB data		X	
I021/260	ACAS resolution advisory report		X	
I021/400	Receiver ID		X	
I021/295	Data ages		X	
I021/150	Air Speed	X	X	Defined in standards but only sent in absence Ground vector information. Can't be used for extrapolation unless wind speed known.
I021/151	True Air Speed	X	X	
I021/152	Magnetic Heading	X	X	Defined in standards but only sent in absence Ground vector information.
I021/220	Met Report	X	X	Not transmitted in DO260, DO260A or DO260B messages
I021/230	Roll Angle	X	X	Not transmitted in DO260, DO260A or DO260B messages
I021/131	Position in WGS-84 coordinates, high resolution		X	

Attachment D - Differences among DO260, DO260A, DO260B

	DO-260	DO-260A	DO-260B	Availability of data in Asterix CAT 21	Potential uses of additional information
Introduction of Navigation Integrity Category (NIC) to replace Navigation Uncertainty Category (NUC_P)	NUC_P is used.	NIC is used to replace NUC_P.	More level of NIC available. Vertical component removed.	NIC is shown in v1.0 and above. More level of NIC (shown as PIC) is available in v2.1.	The additional quantum levels of NIC would allow the ANSP more flexibility in deciding whether the NIC is considered as 'good' (if required) However, for 3 NM & 5 NM separation with HPL 1Nm and 2 Nm respectively, this additional quantum is not useful.
Quality Indicator for Velocity (NUC_R and NAC_V)	NUC_R is used.	Replaced with NAC_V. Definition remains the same.	Vertical component removed.	Available in v0.23 and above.	Vertical component is not available for DO260B.
Surveillance Integrity Level and Source Integrity Level (SIL)	Not available.	Surveillance Integrity Level is used.	Renamed as Source Integrity Level. Definition is changed to exclude avionics fault.	Available in v1.0 and above.	The SIL will allow the user to further assess the integrity of the reported position (if required). NB: An implied SIL exists for DO260 aircraft if they always use GPS. However DO260 aircraft do not provide SIL.
System Design Assurance (SDA)	Not available.	Not available.	To address probability of avionics fault.	Available in v2.1.	The SDA will indicate the robustness of the system. ANSPs may decide on a minimum SDA for ADS-B services. If this action is taken then DO260 aircraft will be unable to meet the criteria.

	DO-260	DO-260A	DO-260B	Availability of data in Asterix CAT 21	Potential uses of additional information
Navigation Accuracy Category (NAC_P)	Not available.	Derived from HFOM and VFOM.	Relies only on HFOM.	Available in v1.0 and above.	A reported accuracy is not provided by DO260. However, an estimated accuracy can be derived from NUC – assuming that NUC is HPL based.
Geometric Vertical Accuracy (GVA)	Not available.	Not available.	Derived from VFOM.	Available in v2.1.	Geometric altitude accuracy is not normally required for operational purposes.
Barometric Altitude Integrity Code (NIC_{BARO})	Not available.	To indicate integrity of barometric altitude.	Same as DO-260A	Available in v1.0 and above.	The NIC_{BARO} indicates the integrity of the barometric height. ANSPs could indicate to the controller that Barometric data has not been verified, however, aircraft without dual barometric systems/air data computers may be unable to provide a non zero NIC_{BARO} as data could be unnecessarily discarded.
Length / Width of Aircraft	Not available.	Provide an indication of aircraft size.	Same as DO-260A	Available in v1.0 and above.	The width / length indicate the size of the aircraft. This information may be used as an input for generating alerts on airport surface movement control.

	DO-260	DO-260A	DO-260B	Availability of data in Asterix CAT 21	Potential uses of additional information
Indication of capabilities	Only show status of TCAS and CDTI.	More information available including capability to send Air Reference Velocity, Target State and Trajectory Change reports. Status of Identity Switch.	Additional information on type of ADS-B in (i.e. 1090ES in or UAT in).	Available in v1.0 and above, except availability of 1090ES/UAT in and information on GPS antenna offset.	Indication on the availability of 1090ES in / UAT in may allow the controller to anticipate a potential request for in-trail procedure clearance. NB: ITP requires decision support aids which are more complex than ADS-B IN alone.
Status of Resolution Advisory	Not available.	Information on whether Resolution Advisory is active.	Same as DO-260A	Available in v1.0 and above,	Indication of the resolution advisory status allows the controller to know whether the pilots were alerted about the potential conflict.
GPS offset	Not available.	Indication on whether GPS offset is applied.	Information on GPS antenna offset is provided.	GPS offset status is available in v1.0 and above. Information on GPS offset is not available in ASTERIX	Indication on GPS offset may be one of the inputs for generating alerts on airport surface movement control.
Intention	Not available.	Able to indicate intended altitude and heading.	Same as DO-260A	Intended altitude is available in v0.23. Intended heading is not available in ASTERIX.	The intended heading and flight level can be used as an input to the trajectory prediction algorithm in the Short-Term Conflict Alert.

	DO-260	DO-260A	DO-260B	Availability of data in Asterix CAT 21	Potential uses of additional information
Target Status	Not available.	Not available.	Indication of Autopilot mode, Vertical Navigation mode, Altitude Hold mode, Approach Mode and LNAV Mode.	Vertical Navigation mode, Altitude Hold mode and Approach Mode are available in v 0.23 and above LNAV Mode is available in v2.1	The target status allows the controller to know the mode that the aircraft is in. i.e.: It could be presented to ATC.
Resolution Advisory	Not available.	Not available.	Availability of Active Resolution Advisories; Resolution Advisory complement record, Resolution Terminated; Multiple Threat encounter; Threat Type indicator; and Threat Identity data.	Available in v1.0 and above.	The Resolution Advisory will help the controller know the advisories that are provided to the pilots by the ACAS. This helps prevent the controller from giving instructions that are in conflict with the ACAS.

	DO-260	DO-260A	DO-260B	Availability of data in Asterix CAT 21	Potential uses of additional information
Mode A	DO260A change 1, allows this using test message in USA only. This was not implemented in actual products.	Broadcasted using test message in USA only.	Broadcasted worldwide as a regular message.	Available in v0.26 and above.	The Mode A allows flight plans to be coupled with the ADS-B tracks (supports legacy ATM automation system).

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ASIA/PACIFIC REGION
PERFORMANCE FRAMEWORK FORM
(REGIONAL)

(Amended in April 2011)

REGIONAL PERFORMANCE OBJECTIVE: *APAC Objective 10* **IMPROVED SITUATIONAL AWARENESS AND SURFACE SURVEILLANCE-IMPLEMENTATION OF THE ADS-B TO GROUND SURVEILLANCE** **Benefits**					
Environment	• Reductions in fuel consumption and subsequent lower gas emissions				
Efficiency	• Increased flexibility and flow of traffic operations • Ultimately, when performing *radar-like* control, potential redesign of airspace taking into account the application of reduced separation minima, integrate use of aircraft navigation and surveillance capability				
Safety	• Introduction of surveillance in a non-radar environment • Support to search and rescue operations				
Strategy ***Medium Term (2011-2015)*** ***Short term (2010)***					
ATM OC COMPONENTS	**TASKS**	**TIME FRAME STARTED**	**RESPONSIBILITY**	**STATUS**	**REMARKS**
AOM *(Airspace Organization and Management)* **CM** *(Conflict Management)* **AUO** *(Airspace Users Operations)*	Implementation of ADS-B based surveillance service in the sub-regions.				
ATM SDM (ATM *Service Delivery Management)*	• Compare current technologies with respect to concept of operations, relative costing, technical and operational performance and maturity of alternative technology/solutions (primary, secondary radar including Mode-S, ADS-B, multilateration, ADS-C)	2009	ADS-B Study and Implementation Task Force (ADS-B SITF)	COMPLETED	Regional Guidance material on comparison of technologies developed and issued

	• Develop an implementation plan for near-term ADS-B applications in the Asia Pacific Region including implementation target dates taking into account: o available equipment standards; readiness of airspace users and ATS providers; o identifying sub-regional areas (FIRs) where there is a positive cost/benefit outcome expected for near-term implementation of ADS-B OUT; o developing a standardized and systematic task-list approach to ADS-B OUT implementation; and o holding educational seminars and provide guidance material to educate States and airspace users on what is required to implement ADS-B OUT.	2009-12	ADS-B Study and Implementation Task Force	In progress	The FASID Table CNS 4A and 4B – surveillance and ATM automation being updated; ADS-B Seminar conducted annually in conjunction with Task Force meetings. Potential sub-regions for using ADS-B identified; Requirements for avionics specification for the near-term application are developed based on AMC2024 and Australian CASA document.
	• Develop Guidance Material to support harmonized regulation of ADS-B systems required on board the aircraft.	2010	ADS-B Study and Implementation Task Force	Completed	DGCA Conf.45 through its Action Item 45/3 invited ICAO APANPIRG ADS-B SITF to develop the Guidance material. The GM was developed by Regulators Workshop and ADS-B SITF/9 held in Aug. 2010

	• Study and identify applicable multilateration applications in the Asia and Pacific Region considering: - Concept of use/operations; - Required site and network architecture; - Expected surveillance coverage; Cost of system; Recommended separation minimas; & - If multilateration can be successfully integrated into an ADS-B OUT system for air traffic control	2012	ADS-B Study and Implementation Task Force	In progress	Concept of using multlateration has been developed; Some states have plan in place to introduce multilateration in particular integrate it with A-SMGCS and Terminal area and en-route surveillance application
	• Coordinate ADS-B implementation plan and concept of operations with other ICAO regions where ADS-B implementation is going on and with relevant external bodies such as EUROCONTROL, EUROCARE, RTCA and Industry.	2013	ADS-B Study and Implementation Task Force	On- going	Information on ADS-B in Europe and North American Regions is provided to Task Force Meeting annually; Some Industry representatives provide input at ADS-B Seminar and meetings

	• Develop **Terms of Co-operation** for SEA which will include: • Establishing model documents for possible use by States when - Agreeing to share ADS-B data and DCPC (such as VHF radio voice communication) capability between adjoining States for various ADS-B applications (including a sample letter of agreement); or - Establishing ADS-B avionics fitment mandates Identifying optimum coverage for ADS-B ground stations and associated VHF radio voice communication in the sub-regional FIR boundary areas.	2012	South East Asia and Bay of Bengal (SEA/BOB) Sub-Regional ADS-B Implementation Working Group	In progress	Terms of co-operation updated; sample agreement of data sharing developed further updated Some location for ADS-B ground stations identified. CBA for SEA project has been completed; Implementation plan for Australia-Indonesia and South China Sea Data and VHF communication capacity sharing projects developed .
	• Develop an implementation plan for near- term ADS-B application in SEA which will deliver efficient airspace and increased safety on a sub-regional basis that includes: • Schedule and priority dates to bring into effect ADS-B based services taking into account: - Timing of any equipage mandates; - Timing of any ATC automation upgrades to support ADS-B; - Timing of commissioning of any ADS-B data sharing and associated VHF radio voice communication facilities; • Consideration of major traffic flows.	2013	~~South East Asia~~ (SEA/BOB~~)~~ Sub-Regional ADS-B Implementation Working Group	In progress	Major traffic flow from Australia to Singapore through Indonesia and Singapore to Hong Hong along L642 and M771 in South China Sea being progressed. Milestones and timelines have been established. The WG was renamed into ~~ADS-B WG into~~ SEA/BOB ADS-B WG by APANPIRG/22

linkage to GPIs	GSI-12 Use of Technology to Enhance Safety; GPI/9 Situational Awareness; GPI/5: RNAV and RNP, GPI/7: dynamic and flexible ATS route management, GPI/17: data link applications and GPI/22: Communication Infrastructure;
References	• *Report of AN CONF/11;* • *Global ATM Operational Concept (Doc 9854);* • *Global Air Navigation Plan (Doc 9750);* • *Technical Provisions for Mode S Services and Extended Squitter (Doc 9871)* • *APANPIRG/16, 17, 19, 20,21 reports on ADS-B* • *ADS-B related regional guidance materials adopted by APANPIRG*

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GUIDANCE MATERIAL ON ADVICE TO MILITARY AUTHORITIES REGARDING ADS-B DATA SHARING

Scope

This guidance material relates to the topic of sharing ADS-B data with adjacent ATC service providers. It does not provide guidance regarding the decision by States to adopt ADS-B or not. It assumes that the State has adopted the use of ADS-B for Civilian Air Traffic Control.

Automatic Dependent Surveillance Broadcast (ADS-B) Technology

ADS-B is a technology whereby aircraft transmit their position, altitude and identity to all listeners. This technology has been recognised by ICAO and is a major component of the future air traffic management systems for Europe, USA and Asia/Pacific.

Air Traffic Control supplier organisations have deployed receivers to collect and display ADS-B data to Air Traffic Controllers. This provides Air Traffic Control the ability to use rapid update, high integrity position, altitude, velocity and identity data to improve efficency and safety of operations.

Why data sharing?

The ADS-B and radar transmissions from aircraft are limited in range by the curvature of the earth and terrain obstructions. It is not always possible for two neighbouring ATC organisations to "see" aircraft approaching their areas of responsibility. Sometimes the boundary is out of range of radar or ADS-B receivers..

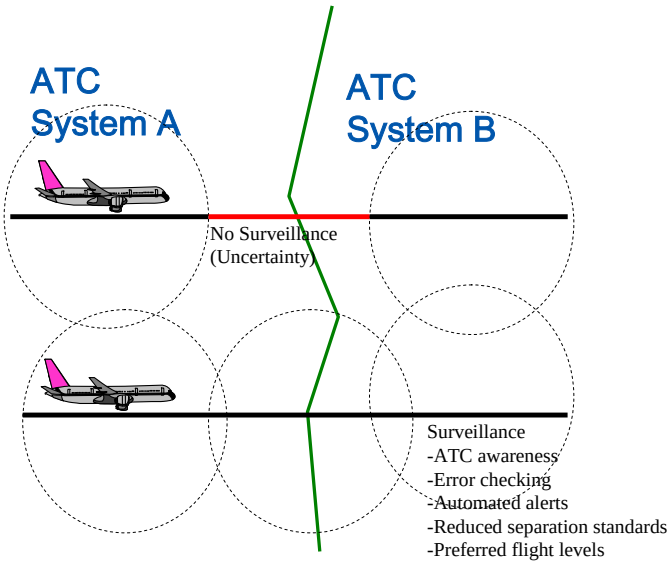
As international aircraft fly around the world, they move from one ATC system to another. To maintain safety, ATC attempt to co-ordinate the time, altitude and place of crossing the common boundary, typically using voice co-ordination and received flight plan information. Sometimes errors occur in this co-ordination and this results in air safety risks.

When either ATC system does not have surveillance, there are two negative consequences :

a) traffic is managed less efficiently using "procedural" means. Thus aircraft need to be separated by very large distances or times, or must fly at altitudes where they will burn more fuel

b) there is increased human error and limited means to detect these errors

These negative consequences can be avoided by providing the same surveillance view of traffic to both parties. ADS-B provides a ready solution since it is inexpensive to deploy ADS-B data receivers and to share this data with ATC systems in neighbouring countries.



Surveillance data allows differences to be identified early before they become a problem. It allows the application of automated safety net tools that automatically alert controllers to a range of problems such as aircraft at the wrong flight level.

Sharing of surveillance data, such as ADS-B, is a major safety benefit to civil air traffic at the boundary. IATA strongly support ADS-B data sharing. The expected outcomes of initial data sharing include :

- reduced numbers of safety incidents at the air traffic control boundary
- earlier detection of air traffic controller and pilot errors
- increased support and confidence in data sharing to allow introduction of radar-like separation at the FIR boundary in future phases.

Radar data sharing could also be as effective as ADS-B, however it is often more difficult to obtain clearance from military authorities because :

- primary radar can measure the position of military/civil aircraft and can therefore disclose location or performance characteristics which may be of concern to military organisations.
- SSR radar can measure the position and altitude of military aircraft which have operating ATC transponders and can therefore disclose location and performance characteristics which may be of concern to military organisations.
- Radars need to be carefully aligned and monitored, and hence the data user must rely on alignment provided by the other party.

In the case of ADS-B, the ground stations are similar to a communication channel, because the actual data is broadcast by the aircraft.

Military aircraft with ADS-B
ADS-B data sharing does **not** influence the decision by Defence Authorities to equip or not equip with ADS-B. The equippage decision is usually based upon a large number of factors including :

- the regulations and policies of the State
- the age, capability and cost of equippage of particular aircraft type fleets
- the operational benefits of using ADS-B in the civilian air traffic environment (and in military ATC environments with ADS-B). These benefits include safety, efficency, and search and rescue.
- the military advantages and disadvantaes of transmitting ADS-B data

Note that many modern Mode S transponders and Mode 5 transponders support ADS-B.
Some military transponders may support ADS-B based "station keeping" using encrypted DF19 ADS-B messages, but this data is not normally decoded or used at all by civil systems.

Military aircraft will not transmit ADS-B if they wish to be un-observed.
In most cases today, tactical military aircraft are not ADS-B equipped or can choose to disable transmissions. In future, increasing numbers of military aircraft will be ADS-B capable and will include the ability to disable the transmisisons.

Military authorities will enable or disable ADS-B data transmission from concerned aircraft taking into account whether they wish operations to be observed by any ADS-B receiver.
Because low cost ADS-B receivers are available to the general public , ADS-B data sharing is only making available to the adjacent authority data that is already available to members of the public (ie: [1]those members of the public that have ADS-B receivers).

Military aircraft that do transmit ADS-B data must always assume they are visible because any ADS-B receiver (on the ground or in the air) can receive and process the transmitted data.

Military needs can be satisfied
ADS-B on the other hand simply only conveys information from co-operative aircraft that have chosen to equip and broadcast ADS-B messages.

Further, if required, it is possible for States to instal ADS-B filters which will prevent data about sensitive flights being shared. These filters can be based on a number of criteria and typically use geographical filtering to only provide ADS-B data to the other party if aircraft are within 150-200 NM on their side of the boundary.

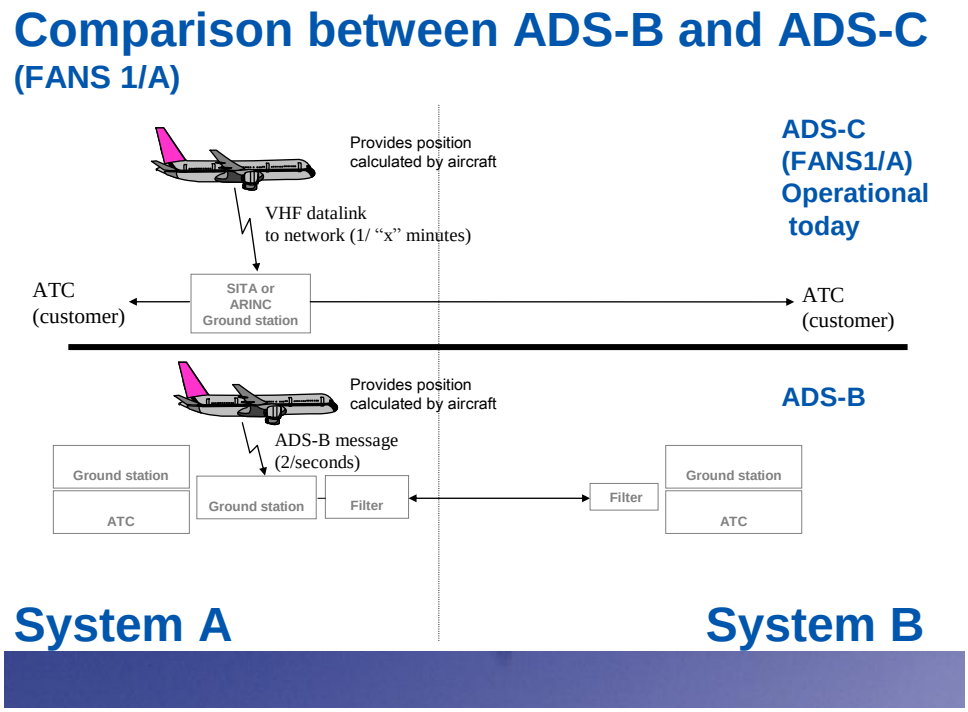
Appropriate firewalls and data security measures can also be implemented.

The decision to share ADS-B data or not, will have no impact on whether aircraft transmit ADS-B messages. ICAO standards already allow these transmissions and some states such as Australia have published regulations which mandate that ADS-B shall be transmitted by airliners.

[1] Low cost ADS-B receivers can be purchased on the internet

Is this concept new?

No, ADS-Contract (ADS-C) data exchange has been operational for more than 10 years for large international airliners like B747/B777 and A330/A340 aircraft. ADS-C data is received by VHF, satellite or HF receivers operated by commercial aviation communications companies in multiple countries and distributed to their ATC customers worldwide. This is a type of data sharing as a commercail service. ADS-B is different in that it is transmitted more frequently and can be received without the use of a 3rd party.



The concept of data sharing at the boundary between states or systems is not new and is very similar in concept to the operational use of ADS-C today.

Is there an existing precedence?

Australia and Indonesia currently share ADS-B data from 4 ground stations each. The operational experience has been overwhelmingly positive and has allowed the early recognition of ATC/pilot errors before they have become critical. A number of States in Asia-Pacific are planning ADS-B data sharing.

What is the cost?

The Air Traffic Control organisation bears a small additional cost to share ADS-B data. The ground stations to observe equipped aircraft are often already installed and operating for domestic use. The new infrastructure for sharing data includes the operation and maintenance of the link and any filtering devices.

There is normally no additional cost to the military organisation because the Air Traffic Control organisations normally fund the data sharing infrastructure.

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CONSOLIDATED REPORT OF AD HOC GROUPS
(26 April 2012)

REPORT OF THE REGULATORY AUTHORITIES
BREAKOUT WORKING GROUP

States/Industry Presented
Australia, China, Republic of Korea, USA; and
Boeing Company; Korean Airlines; Rockwell-Collins and Thales

GNSS Constellations Development

1.1 USA asked about the status of the COMPASS II constellation. It was noted that the US rule allows for any position sensor that can meet the performance requirements and does not require GPS. China responded that currently 11 satellites were in orbit with 13 planned for next year. The final number of satellites planned is 35 including the full 24 satellite constellation plus in-orbit spares. These satellites are planned to all be in orbit by 2020. The first COMPASS II receiver designed for civil aviation use is expected to be available in the 2020 time frame. China is also starting a GBAS program, but it is still in very early stages.

1.2 USA stated that the full dual-frequency US GPS constellation would not be complete until after 2019. Two dual frequency GPS satellites are currently in orbit.

1.3 The Boeing representative mentioned that it was understood the Galileo constellation was planned to be operational by approximately 2017.

ADS-B rulemaking by Regulators

2. IATA representative asked if China was considering an ADS-B mandate and what the timeframe would be. China responded that it was still early for certainty, but did not think any CAAC ADS-B rulemaking would require ADS-B equipage before 2016. (Rules published this year for 260B equipage compliance around 2016/17). China responded that no Op-Spec would be required for ADS-B Out in China.

3. Australia reviewed the recent Australian ADS-B rulemaking - summarized here:

December 2013	ADS-B Out required for aircraft above FL 290
February 2014	ADS-B Out required for forward fit all IFR aircraft
February 2016	ADS-B Out required for all IFR aircraft in the Western Australia mining region operating controlled airspace.
February 2016	GNSS navigation required for all IFR aircraft.
February 2014	GNSS navigation required for all forward fit IFR aircraft.
February 2017	ADS-B Out required for all IFR aircraft.

3.1 Australia stated that Air Services Australia intends to transition from using a White List (which allows ADS-B data to be used from identified aircraft) to using a Black List (which prohibits ADS-B data from being used from identified aircraft) in August 2012 estimated timeframe. At that time, CASA will no longer require foreign carriers to get an ADS-B Op-Spec to enter ADS-B airspace. Instead, it will be sufficient for the aircraft to have an Airplane Flight Manual (AFM) statement of compliance to AMC 20-24 or other evidence of compliance with the CASA standards for ADS-B equipment (or the FAA or EASA standards.)

4. The Korean Air representative asked if Singapore or Hong Kong required an ADS-B Op-Spec approval to enter their defined ADS-B airspace. He recommended that all Air Navigation Service Providers (ANSP) adopt a common stance regarding ADS-B Out equipage with respect to AFM statements and Op-Specs.

4.1 It was recommended that this question be discussed in the general session on Friday morning as there were no Singapore or Hong Kong representatives participating in the regulator breakout session.

4.2 Australia informed the Group that Australia may need to include foreign aircraft operating to Australia at low levels in the 2017 ADS-B mandate. Such aircraft could include turboprop aircraft from close neighboring countries but otherwise would not have an impact.

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REPORT FROM BAY OF BENGAL SUB GROUP

States Presented
Bangladesh, India, Malaysia, Myanmar, Nepal

1. **Updates from States**

1.1 **Bangladesh**

Bangladesh intimated that they are upgrading their Radar system at Dhaka airport. At present they do not have any plan to install ADS B system. Bangladesh expressed their interest in installing ADS-B system in future at Chittagong Airport after studying its feasibility and as back up for radar at Dhaka airport.

1.2 **India**

Updates from India have been already presented in WP-17 at SITF/11. During the informal meeting India offered to share ADS B data with Bay of Bengal states.
In the recently concluded BOBASIO/2 held in Chennai, India from 11-13 April 2012, Maldives informed their plan for two ADS-B stations. Maldives expressed their willingness to share ADS-B data with India and Sri Lanka. During the discussion, Maldives informed that ADS-B station is proposed to be installed at Hanimadhoo so as to have overlapping coverage with Chennai Upper ACC and Trivandrum ACC. This will not only provide redundancy of surveillance data to Chennai Upper ACC and Trivandrum ACC, but also permit reduction of separation in the area. India also announced its willingness to share ADS-B data with Indonesia and Maldives to enhance the surveillance capability in the Bay of Bengal and Indian Ocean.

1.3 **Nepal**

Nepal intimated that at present do not have ADS-B installation plan. However they are interested in initiating the programme in future.

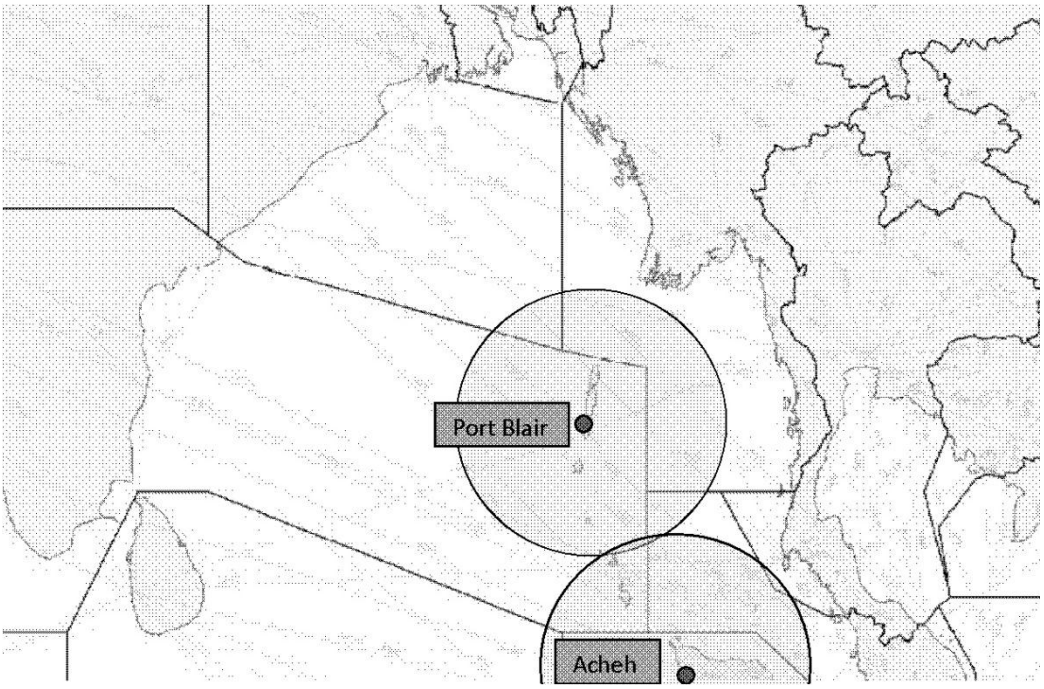
1.4 **Malaysia**

1.4.1 Malaysia has started upgrading the ATM System which will be able to integrate all surveillances data inclusive of ADS-B. The project was completed and operational on 13 December 2011.

1.4.2 Currently the process of integration of ATM System throughout Kuala Lumpur FIR and Kota Kinabalu FIR is ongoing.

1.4.3 The ADS-B data from station installed in 2010 at Terengganu, Malaysia is still on research and study phase to be included in the Malaysia's ATM system integration process.

1.4.4 An additional ADS-B coverage from Banda Acheh ADS-B Station and Port Blair ADS-B Station would enhance the safety at FIR boundary between the states as shown in the fig below.



1.4.5 A reply to India & Indonesia regarding the proposed of ADS-B data sharing from Port Blair & Banda Acheh ADS-B Station will be sent by end of January 2013 after the upgraded and the integration process of ATM System at KL ATCC goes operational and stabilized.

1.4.6 Malaysian airspace (Kuala Lumpur FIR) is fully covered by radar except for a small portion in the Bay of Bengal area which at the moment is covered by ADS-C (surveillance) and CPDLC (Communication) as main and VHF & HF as backups.

1.4.7 Using the current ADS-C/CPDLC systems installed and operational since August 2011, has enabled Malaysia to implement the Reduced Horizontal Separation 50/50 on RNAV routes N571/L510 and P628 on November 2011.

1.4.8 DCA Malaysia plans to install more ADS-B stations and ADS-B mandatory equipage in Kuala Lumpur and Kota Kinabalu FIRs before 2020. These stations may be shared in future.

1.5 **Myanmar**

Myanmar is in the process of installing ADS B system at two sites i.e. Coco Island and Sittwe. The installation is scheduled to be completed by end of 2012. After that they will be ready for sharing ADS B Data. ADS-B data sharing between Portblair and COCO Island will provide Surveillance coverage on airways L510, L759, M877, P628 and P762.

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REPORT FROM EAST ASIA SUB GROUP

States/Administrations Presented
Macao China, Japan and Republic of Korea

- East Asia sub group met and discussed the ADS-B implementation issue in the East Asia.

- Japan and Republic of Korea already had significant radar coverage, the implementation of ADS-B would be considered as just one of surveillance system of the conventional surveillance system and the future surveillance system.

- The data sharing project in region is not initiated. But, the group agrees that data-sharing could increase the safety and efficiency of air traffic control in the region

- The group discussed and shared the information about the ADS-B implementation status of each country.

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REPORT FROM SOUTHEAST ASIA SUB GROUP

States/Administrations Presented
Australia, Cambodia, China, Hong Kong, China, Macao, China, Malaysia, Indonesia, the Philippines, Thailand and Singapore

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, 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) (To be installed by 2H 2012)

VHF radio communication services (DCPC) would be provided from the following stations to Singapore. This is to enable implementation of radar-like separations in the non-radar areas within the Singapore FIR.

- Natuna VHF (Install in Jan 2012)
- Matak VHF (Install for Singapore by Indonesia) (To be installed by 2H 2012)
- Con Son VHF (Install for Singapore by Viet Nam) (To be installed by 2H 2012)

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.

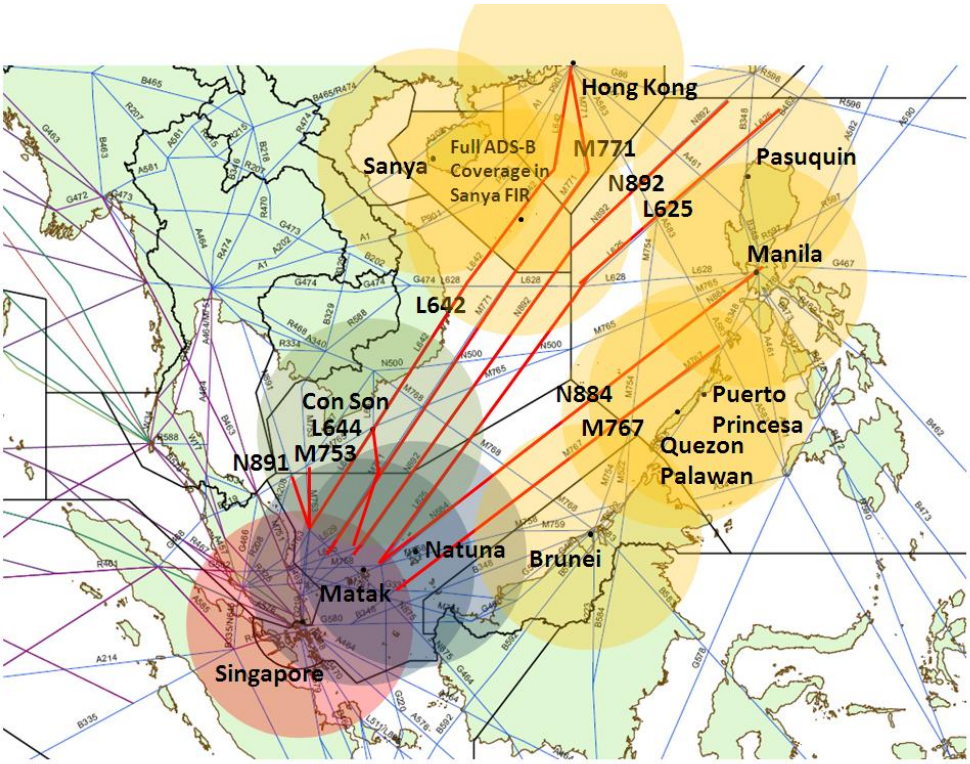
Initial Benefits
The above sharing arrangement will benefit L642, M771, N891, M753 and L644. Enhanced safety and reduced separation may be applied. Mandate will be effective in 2013.

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. They will consider sharing ADS-B data and VHF radio services with neighbouring States. Singapore is currently engaging Brunei to install ADS-B to help cover N884 and M767.

The Chairman urged to States to expedite the process as the project was initiated two years ago at SITF/9.

Phase 3
The group will further explore other possibilities to cover L625 and N892 in future discussions.

Additions to this project
China expressed the possibility of sharing data from an ADS-B station in Sanya FIR with Philippines. Currently, the ADS-B data is shared with Hong Kong, China. China will install 3 more ADS-B stations (1 in Sanya FIR and 2 in Sanya) to enhance surveillance by end of 2012. Eventually, the additional ADS-B stations may be available for sharing as well.



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.

Malaysia will confirm whether or not to receive the ADS-B data by 31 Jan 2013.

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)

Thailand will discuss the data sharing with Cambodia.

Initial benefits
Situational awareness

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

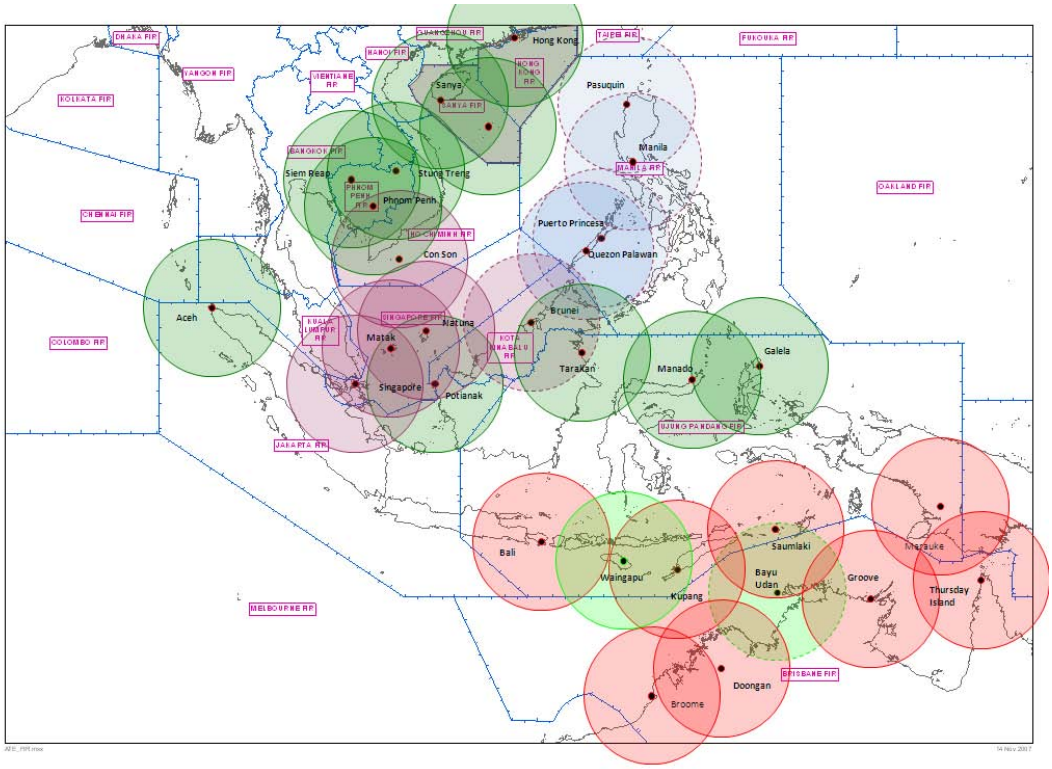
Indonesia is willing to share the ADS-B data from the following stations:

- 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.

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 : 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 HK - CASA or AMC2024 VN - CASA or AMC2024 CN - CASA or AMC2024	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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9. Template of Harmonization Framework for ADS-B Implementation

9.1 Background

9.1.1 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.

9.1.2 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 9.2 shows the detailed framework.

9.2 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	SG, HK, CN : 12 Dec 2013 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 HK - CASA or AMC2024 VN - CASA or AMC2024 CN - CASA or AMC2024	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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Automatic Dependent Surveillance – Broadcast (ADS-B)
Seminar and the Eleventh Meeting of ADS-B Study and
Implementation Task Force of APANPIRG (ADS-B SITF/11)

Jeju, Republic of Korea, 24 – 27 April 2012

Attachment 1 to the Report

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International Civil Aviation Organization

AUTOMATIC DEPENDENT SURVEILLANCE – BROADCAST SEMINAR AND ELEVENTH MEETING OF AUTOMATIC DEPENDENT SURVEILLANCE – BROADCAST (ADS-B) STUDY AND IMPLEMENTATION TASK FORCE (ADS-B SITF/11)

Jeju, Republic of Korea, 24-27 April 2012

LIST OF WORKING/INFORMATION PAPERS AND PRESENTATIONS

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		WORKING PAPERS	
WP/1	-	Provisional Agenda	Secretariat
WP/2	2	Outcome of ADS-B SITF/10 and APANPIRG/22 on ADS-B	Secretariat
WP/3	2	APANPIRG/22 Outcomes – ATM Perspective	Secretariat
WP/4	4	Review Terms of Reference and Tasks List of ADS-B Study and Implementation Task Force	Secretariat
WP/5	2	Review Report of the Seventh Meeting of South East Asia Bay of Bengal Sub-regional ADS-B Implementation Working Group (SEA/BOB ADS-B WG/7)	India and Secretariat
WP/6	5	Guidance Material on Generation, Processing & Sharing of Asterix Category 21 ADS-B Messages	Australia and Hong Kong, China
WP/7	6	Guidance Material relating to Sharing ADS-B data with the Military	Australia
WP/8	6	AMC-20-24 in a RADAR Environment	Australia
WP/9	7	ADS-B Implementation over the South China Sea and the Bay of Bengal	CANSO
WP/10	5	ADS-B SITF Task No. 13 – Amendments to the Australia ADS-B Rule	Australia
WP/11	7	CASA Update on Regulatory Developments and Further Avionics Mandates Applicable to Australian Aircraft	Australia
WP/12	2, 3	ATM and PBN Developments Relevant to the ADS-B SITF	Secretariat

WP/IP/ SP No.	Agenda	Subject	Presented by
WP/13	6	Review of Performance Framework Form for ADS-B	Secretariat
WP/14	8	Asia Pacific Regional Long Term Height Monitoring	IATA
WP/15	7	Status of ADS-B Avionics Equipage along ATS routes L642/M771 for Harmonized ADS-B Implementation	Hong Kong, China
WP/16	6	Success of ADS-B Data Sharing between Indonesia and Australia	Australia and Indonesia
WP/17	6	India's Preparedness towards Implementation of ADS-B and Outcome of BOBASIO/2 on ADS-B Data Sharing	India
WP/18	5	Difference between DO-260, DO-260A and DO-260B	Hong Kong, China & Singapore
WP/19	5	ADS-B Data Collected and NUC Analysis	Singapore
WP/20	6	Update on the ADS-B Collaboration Project in the South China Sea Area	Indonesia, Singapore and Viet Nam
WP/21	6	ADS-B avionics Issues Experienced	Australia
INFORMATION PAPERS			
IP/1	-	Meeting Bulletin	Secretariat
IP/2	7	Making Operators aware of the Australian ADS-B Fitment Mandate applying in 2013	Australia
IP/3	2 & 3	Outcome of DGCA CONF/48 on ADS-B	Secretariat
IP/4	6	Surveillance Systems in Cambodia	Cambodia
IP/5	6	Review of Current ADS-B installation in Republic of Korea	Republic of Korea
IP/6	6	ADS-B Validation System Development Progress in Korea	Republic of Korea
IP/7	6	Update Surveillance Activities in Japan	Japan
IP/8	6	Progress on Possible Project: Papua New Guinea (PNG) & Australia & Indonesia	Papua New Guinea and Australia
IP/9	6	Report of FAA ADS-B Activities	USA
IP/10	6	Potential ADS-B Ground station to be shared in Indonesia	Indonesia

WP/IP/ SP No.	Agenda	Subject	Presented by
IP/11	6	Introduction to Automatic Dependent Surveillance-Broadcast (ADS-B) in China	China
IP/12	8	CAAC TEDC WAM/MLAT and ADS-B Security	China
IP/13	6	ADS-B Surveillance Implementation in Fiji	Fiji

PRESENTATIONS

SP/1	ADS-B in Context	Australia
SP/2	ADS-B in APAC and ADS-B Benefits	CANSO
SP/3	IATA View on ADS-B	IATA
SP/4	ADS-B Development and Implementation Plan	Republic of Korea
SP/5	Regulatory Plan to support the future ATM system in Australia – Update on CASA Rulemaking in the year since SITF/10	Australia
SP/6	ADS-B Regulations, Standards and Guidance	FAA/USA
SP/7	A Briefing of ADS-B (OUT) Applications/Projects in China	China
SP/8(A)	ADS-B Out (Airborne Dependent Surveillance Broadcast)	Airbus
SP/8(B)	ATSAW (Airborne Traffic Situational Awareness)	Airbus
SP/9	ADS-B - A Boeing Perspective	Boeing
SP/10	ADS-B Out, In and GNSS Requirements Update	Rockwell Collins
SP/11	ADS-B Avionics Solutions	Thales

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