INTERNATIONAL CIVIL AVIATION ORGANIZATION
ASIA AND PACIFIC OFFICE

REPORT OF

**THE ELEVENTH MEETING OF THE SOUTH EAST ASIA
AND BAY OF BENGAL SUB-REGIONAL ADS-B IMPLEMENTATION
WORKING GROUP**

(SEA/BOB ADS-B WG/11)

New Delhi, India
(17 to 19 November 2015)

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

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

1.   Introduction

1.1   The Eleventh Meeting of the South East Asia and Bay of Bengal Sub-regional ADS-B Implementation Working Group (SEA/BOB ADS-B WG/11) was held in New Delhi, India from 17 to 19 November 2015. The Meeting was hosted by the Airports Authority of India (AAI) at the Hotel IBIS.

2.   Attendance

2.1   The meeting was attended by 32 participants from Australia, Brunei Darussalam, India, Malaysia, Mongolia, Philippines, Singapore, Thailand, USA, CANSO and IATA. More than 30 additional participants from various places of India also attended the meeting as observers. List of participants is at **Attachment 1**.

3.   Opening of the meeting

3.1   The meeting was inaugurated traditionally by lighting the lamp by the dignitaries.

3.2   Mr. C.R. Sudhir Executive Director, CNS-OM of AAI extended warm welcome to all the Participants and the guests.

3.3   In his opening remarks, Mr. Mr. A K Dutta, Member ANS, highlighted the importance of air navigation surveillance system and India's active participation of the regional ADS-B Study and Implementation Task Force and the Working Group meetings. 2012. India is active in adopting the new technology for regional and global solutions. He encouraged co-operation and collaboration between States in the Sub-regions to ensure harmonious implementation of required navigation facilities and services. A collaborative and coordinated approach in planning and implementation of ADS-B is considered essential for a harmonious and universal development of application. On behalf Chairman of AAI, Mr. Ravi Prakash, ED, CNS wished all the participants a successful Meeting.

3.4   On behalf of Mr. Arun Mishra, ICAO Regional Director, Mr. Li Peng, Regional Officer CNS expressed deep appreciation and gratitude to the Airports Authority of India for their continuous support to ICAO regional activities particularly for hosting four ADS-B related meetings and seminars. He congratulated India for playing an active role at the Regional level in enhancing the air navigation infrastructure. He emphasized greater need for cooperation and collaboration between States to He also highlighted the outcome of APANPIRG/26 meeting and DGCA Conf/52 which urged States and Administrations to work together for the ADS-B implementation.

3.5   Mr. Greg Dunstone, Chairman of ADS-B Study and Implementation Task Force recalled achievements of ADS-B implementation in the APAC Region. He encouraged States for harmonious deployment of rules and procedures associated with ADS-B implementation. He called for translation of words into action on the ground to benefit the Industry.

3.6   Mr. K.V. Murali, Executive Director (ATM) AAI extended vote of thanks to the dignitaries and delegates for their support and co-operation.

4.   OFFICERS AND SECRETARIAT

4.1   Mr. Anurag Sharma, Joint General Manager (CNS) nominated by the host State chaired the meeting. The meeting was facilitated by Mr. Greg Dunstone, Chairman of ADS-B SITF of APANPIRG. Mr. Li Peng, Regional Officer CNS, Asia and Pacific Office acted as the secretary of the meeting.

5.   ORGANIZATION, WORKING ARRANGEMENTS AND LANGUAGE

5.1   The meeting met as a single body except on 18 November 2015, when two Ad hoc working groups (SEA WG & BOB WG) met to progress sub-regional implementation plans. A question/Answer session on issues/concerns of ADS-B implementation was also conducted by Mr. Greg Dunstone on Day 2 of the meeting.

5.2   The working language was English only, inclusive of all documentation and this Report. A total of Thirteen (13) Working papers and Seven (6) Information papers were considered by the meeting. A List of Working Papers and Information Papers presented at the meeting is at **Attachment 2.**

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Agenda Item 1: Adoption of Agenda

1.1 The tentative agenda items presented in WP/01 with addition of DGCA Conf/52 into the Agenda Item 2 were adopted as agenda for the meeting.

Agenda Item 2: Review the outcome of the ADS-B SIFT/14, APANPIRG/26 and DGCA Conf/52

2.1 The meeting noted the outcome of APANPIRG/26 meeting on ADS-B **(WP/02)**. The Reports of Fourteenth Meeting of ADS-B Task Force and Tenth Meeting of the SEA/BOB WG were also reviewed by the CNS SG/19 in July 2015. The meeting noted the conclusions on ADS-B adopted by APANPIRG/26**.** APANPIRG/26 appreciated the efforts and progress made by the ADS-B SITF and the SEA ADS-B WG. In response to a query, Australia further explained the reason why no operational approval is required based on experiences gained in Australia and Canada.

2.2 Regarding the draft Conclusion on the need for separation criteria using ground based ADS-B/CPDLC and ground based ADS-B/SATVOICE DCPC, the meeting noted that it was not adopted by APANPIRG because the ATM SG/3 Meeting did not support it. The meeting encouraged member Administrations to refer this separation issue again at ATS coordination groups meeting if necessary. The meeting was informed that SASP was studying the separation minima for using spaced based ADS-B with CPDLC or HF.

2.3 The meeting also noted the follow-up actions taken by the Secretariat and that the guidance materials including the revised AIGD adopted by APANPIRG/26 had been posted on the ICAO APAC website: http://www.icao.int/APAC/Documents/edocs

2.4 The meeting reviewed the ADS-B Implementation Status in the APAC Region. The updated Table is provided in **Appendix A** to this Report.

Review Outcome of DGCA Conf/52 (WP/05)

2.5 The 52nd Conference of Directors General of Civil Aviation (DGCAs), Asia and Pacific Regions, held in Manila, the Philippines in October noted ADS-B implementation related activities in a number of States/Administrations.

2.6 The Conference noted the encouraging results from the cost benefit analysis (CBA) presented by Singapore and CANSO. ICAO highlighted the need for close coordination among States concerned in order to support reduction of separation minima to realize operational benefits.

2.7 The Conference reaffirmed the need for expediting implementation of ADS-B and developed following action Item:

Action Item 52/12 - ADS-B implementation Plans

The Conference encouraged States with ADS-B implementation plans to explore ADS-B data sharing arrangements with their neighbors; and to expedite implementation of similar ADS-B collaboration over the areas of major traffic flows, remote and oceanic areas such as Bay of Bengal and the rest of the South China Sea.

2.8 The meeting discussed the slow progress for data sharing in the Bay of Bengal sub-region for example; MOU between India and Myanmar was signed earlier this year at CANSO meeting held in Japan but no further progress made. Although approval at higher level may be required by a number of agencies within a State, it was advised that some coordination progress can be achieved at working level as well. The meeting strongly encouraged States/Administrations concerned to take actions to follow up the Action Item formulated by the DGCA Conference**.**

Agenda Item 3: Review implementation and co-ordination activities and sub-regional implementation plans

Sensors Integration at Chennai ATM Automation System (IP/05)

3.1   The meeting noted the information about the implementation and integration of various ADS-B sensors in Chennai Automation System. The meeting discussed some issues and challenges highlighted in the paper.

3.1.1   The various sensors including radar and ADS-B from various locations had been integrated with the ATM Automation System in Chennai. ADS-B operational trials with integration of ADS-B data from Port Blair with Chennai Automation started from 30th June 2015 daily from 0430 to 1130 UTC. ADS-B sensors from Trivandrum, Cochin, Trichy and Mangalore Airports had been integrated with Chennai Automation Backup system and tested. The Automation System supports ADS-B ASTERIX Category 21 Version 0.23 format in MULTICAST addressing and is configured to process the ADS-B messages which the value of NUCp ≥ 5 is accepted and displayed on the Controller Work Stations.

3.1.2   There was a need to convert the ADS-B data from Port Blair in UNICAST into MULTICAST format through in–house developed software. Some modifications were made in automation system to enable association of ADS-B tracks and FPL data with Call sign / 24 bit aircraft address in Non–Radar region.

3.1.3   There is a plan to transport ADS-B sensors data from Calicut, Coimbatore and Vijayawada Airports to Chennai for integration with ATM Automation System. Provision of redundant media for ADS-B data delivered from various stations to Chennai is also being considered. It was also clarified the trial operation period would take about 5 to months.

3.2   Regarding reliability of transmission media using VSAT for critical application and separation purpose, the meeting was reminded of an APANPIRG Conclusion 11/15 adopted in year 2000 **-** alternative arrangements requirement for using single VSAT serving critical air/ground application. Australia advised that if ADS-B data is only used for situation awareness purpose, single VSAT connection would also be acceptable based on Australian experience. It was further advised that there would much less interruption for ADS-B tracks if NUCp value sets ≥ 4. Secretariat also reminded that using C-band VSAT instead of Ku band would be less sensitive for the rain interference during the raining season.

ADS-B Integration Functional Requirements (WP/07)

3.3   India presented their consideration for ADS-B integration with the ATM Automation System and a list of additional functional requirements that may need to be implemented for improved user interface and data integrity. As per the "ADS-B Implementation Operations Guidance Document" 8th Edition (para 5.1.4 Integration), special planning should be considered for the integration of ADS-B into the existing and foreseen CNS/ATM system.

3.3.1   The meeting recommended ADS-B Study and Implementation Task Force to consider a list of additional operational requirements provided in **Appendix B** to this report into the AIGD which would be useful for consideration by each individual Administration to see whether suitable or applicable for the local environment.

Operational Use of ADS-B in India (WP/10)

3.4   India presented updates on ADS-B implementation and highlighted some challenges faced by the ANSP.   Twenty ADS-B stations had been installed in the mainland and one station in Port Blair. They are located at Agartala, Ahmedabad, Amritsar, Calicut, Cochin, Coimbatore,

Guwahati, Jaipur, Lucknow, Mangalore, Nagpur, Port Blair, Thriuvananthapuram, Varanasi, Patna, Bhubaneswar, Dibrugarh, Mumbai, Vijayawada, Tiruchirappalli and Jaisalmer. The DGCA Certification for the ground receivers installed by the ANSP, has been obtained for 15 of the ground receivers, work is in progress to obtain the approval for 6 ground receivers.

3.5　　　　　The Regulatory Authority emphasized the need to address the security issues pertaining to the operational use of ADS-B information, especially listed in the ICAO APAC "GUIDANCE MATERIAL: SECURITY ISSUES ASSOCIATED WITH ADS-B". AAI issued an Air Traffic Management Circular (ATMC) 15 of 2014 to address ADS-B implementation in India, with a special emphasis and exhaustive details on "ADS-B Security related Vulnerabilities and Mitigation Measures".

3.6　　　　　The Trial Operations of ADS-B in NRA in both enroute Airspace at Port Blair and terminal Airspace in Tiruchirapalli had commenced and the results are encouraging. The integration of ADS-B data into the ATM Automation systems at Chennai, Kolkata, Nagpur, Ahmadabad, Tribandrum, Varanasi, Cochin, Coimbatore, Calicut, Tiruchirapalli, Lucknow, Guwahati, Agartala, Bhubaneswar and Patna had been completed. The integration of ADS-B sensors with Delhi ATM automation system is expected to be completed in Q1 2016 and with Mumbai ATM Automation system is expected in near term by the OEM.

3.7　　　　　The user benefits have been encouraging and India plans to install six additional ADS-B ground stations at vantage points including Agatti Island in the Arabian Sea and Cambell Bay in the Bay of Bengal, near the FIR boundaries of Chennai, Jakarta and Kuala Lumpur. The installation of an ADS-B receiver at Campbell Bay under the Indian Civil Military Cooperation Programme would enable seamless ATM across the three FIRs.

3.8　　　　　The ADS-B data sharing agreement between India and Myanmar has been signed in May 2015 at a CANSO meeting in Japan. In this connection, CANSO urged States concerned to take follow up actions and proposed to set up a small working group between States to facilitate the implementation of data sharing. India expressed that efforts being made with five different governmental agencies to get approval and will keep CANSO updated on the development.

3.9　　　　　The meeting also discussed the Indian requirement to compare radar performance against ADS-B performance at each site. It was noted by the meeting that usually it is only necessary to do this at one site and that if the same radar type/configuration is used at multiple sites it is unnecessary to repeat this work for multiple locations.

Review Outcome of SEA/BOB WG/10 (WP/06)

3.10　　　　The Secretariat presented WP/06 highlighting the important information contained in the report of last working group meeting. The Attachment A to this WP provided current information of Projects in the SEA and BOB sub-regions updated in April 2015. The meeting reviewed and updated the checklist of readiness of States/Administrations for ADS-B implementation which is provided in **Appendix C** to this report.

Collaboration in South China Sea Region (WP/13)

3.11　　　　Singapore and Philippines informed the meeting that the Philippines and Singapore signed an ADS-B collaboration agreement in October 2015 and the collaboration will help to cover part of the surveillance and DCPC gaps on routes N884 and M767.

3.12　　　　Singapore updated that discussions were on-going between Brunei and Singapore on ADS-B collaborations to cover surveillance gaps on routes N884 and M767. Further collaboration between Singapore and Vietnam to enhance existing ADS-B coverage was also under discussion.

3.13   The meeting noted that following the ADS-B collaboration between Indonesia and Singapore as well as between Vietnam and Singapore, aircraft separation had been reduced from procedural to 40NM since December 2013 and to 30NM since June 2014.

Safety Assessment for ADS-B under radar environment (WP/11)

3.14   Singapore recapped that Singapore has done a safety case for ADS-B under non-radar environment has since commenced ADS-B-NRA operations from 12 December 2013. The safety case for ADS-B under radar environment was not yet done because of the need to do additional safety assessment.

3.15   Singapore updated that the additional assessment was completed and it was shown that track fused with both radar and ADS-B is not worse off than tracks fused with radar only. With this positive result, Singapore will proceed to perform the safety case for ADS-B-RAD.

Review of Outcome of Ad Hoc Groups on South East Asia (SEA) and Bay of Bengal (BOB) projects

3.16   The meeting reviewed the reports on the Sub-regional ADS-B implementation plan/projects presented by SEA and BOB Ad Hoc working groups. The discussions were based on the outcome of previous meetings of the ADS-B SITF/14 and SEA/BOB ADS-B WG/10 and information made available to the meeting. The outcome of discussions by Ad Hoc groups is provided in **Appendix D** to this report which could serve as a basis for further development of the sub-regional implementation plans. States/Administrations concerned were urged to take follow-up actions to achieve harmonized implementation of the identified projects.

ADS-B implementation in Mongolian (IP/04)

3.17   Mongolia presented the recent activity of the ADS-B implementation in Mongolia. The Civil Aviation Authority of Mongolia (CAAM) installed 10 ADS-B stations along the main ATS routes. ADS-B data from all these stations are sent to the ATS automation system - AIRCON 2100 INDRA in order to perform monitoring trail till January 2016. CAAM plans to use ADS-B as back-up system for SSR system, except the Western area of Mongolian airspace where additional 5 ADS-B stations will be installed.

3.18   Provide ADS-B based surveillance services require CAAM to update its ATM automation system to be capable to process data compliant with DO260A and DO260B standards. The updates would be initiated by 2016. CAAM established an ADS-B implementation working group working with relevant agencies for collaboration. The team had visited Airservices Australia for studying the experience ADS-B implementation. The ADS-B implementation working group and the regulator plan to mandate ADS-B equipage by 2018. CAAM is studying how ADS-B could be used for ATC operation therefore CAAM is keen to participate in ADS-B related activities.

Agenda Item 4: Report on ground system and avionics performance monitoring and improvement in compliance

4.1   ATC Surveillance Activities in Australia (IP/02)

4.1.1   Australia made a presentation on ATC surveillance activities highlighting the following key points:

-   Radar replacement projects are completed or reaching completion. Airservices expects to decommission 3 radars after the ADS-B mandate is effective at all flight levels in 2017;

- WAM systems remain operational in Sydney & Tasmania but there are no plans for more;

- A-SMGCS is operational in Sydney, Brisbane, Melbourne & Perth using multilateration and ADS-B. Airservices is considering how it can avoid purchasing more multilateration and moving to an ADS-B only SURFACE SURVEILLANCE environment for some control towers. Some Australian towers already use ADS-B alone for surveillance of airborne aircraft;

- Australia now has more than 70 ADS-B receivers (43 ADS-B and 28 WAM based ADS-B receivers) and planning a further 15 sites. ADS-B has changed the nature of ATC across the continent. ADS-B is used for separation and vectoring. It is used in control towers and enroute centres. Changes to the Manual of ATC allow the use of ADS-B for 3 nautical mile separation in TCUs;

- A project to use ADS-B (to be seen by controllers as a radar input) is nearing completion in the Perth TCU;

- ADS-B data sharing continues with Indonesia and Australian envisages sharing with PNG in the next few years;

- ADS-B equipage rates continue to slowly improve as we approach critical mandate effective dates (All IFR in Feb 2017, All IFR near Perth in Feb 2016). 68% of all IFR flights are now ADS-B, and 99% of commercial jet flights are ADS-B capable. 80% are DO260. Australia emphasized the large amount of work that needs to be done between mandate publication and the effective date, to win "hearts & minds" , to convince and support Industry to equip;

- Australian Radars and ADS-B supports some DAPS. The use of Selected level is expected to commence in next weeks and may create some work as realities of implementation are discovered;

- Australia advise that they are working with Aireon to examine the benefits of space based ASD-B but have not yet committed to the technology; and

- Australia outlined that together with Industry they were considering options to equip the VFR fleet including TSO199 and also non certified products. The focus of VFR would be on air-air, but ATC could use the data for situational awareness purposes.

- The video on the implementation benefits and status presented to the meeting can be accessed at the following link:
  https://www.**youtube**.com/watch?v=J6P7xjqCT_0

Monitoring of ADS-B Equipage status and Avionics Performance (WP/12)

4.2   Singapore provided updates on ADS-B equipage status based on observations from the ground stations in 2015: about 84% of the aircraft population is equipped with DO-260 avionics, 10% is equipped with DO-260A and 6% is equipped with DO-260.

4.2.1   For the Singapore registered aircraft, only A380s are equipped with DO-260B avionics and only B787s are equipped with DO-260A. The rest are equipped with DO-260.

4.2.2   Singapore also shared with the meeting other issues found, including toggling between high and low NUC, consistent low NUC, B787 position error and multiple tracks.

Boeing 787 ADS-B Deficiency Update (WP/09)

4.3   Australia provided an update on the ADS-B deficiency identified in Boeing 787 aircraft with DO-260A ADS-B, which had been observed by ATC to be transmitting inaccurate ADS-B positional data while declaring the data as having high integrity. The error had also been observed in several other aircraft, by other ANSPs such as WP/12 by Singapore. Australia had coordinated the capture of relevant ADS-B data with Boeing who had identified the root cause, which required a software fix.

4.4   The solution being implemented by Boeing is to retrofit new software simultaneously with the software update which will provide the new DO260B Surveillance processor capability for the B787. Boeing and Rockwell Collins had finalized development of the DO-260B upgrade for the B787 fleet. As well as correcting the extrapolation issue, and supporting DO-260B, the upgrade will provide other reliability benefits for the avionics. The B787 Type Certification has been amended to include the software upgrade. The upgraded ADS-B Out function is compliant with FAA AC 20-165A, EASA CS-ACNS Subpart D (Surveillance) and TSO-C166b.

4.5   Boeing has issued a Fleet Team Digest article (787-FTD-34-15001) which was recently revised to include the following information and action:

- Incorporation of Service Bulletin (SB) B787-81205-SB340005-00 will correct this issue; and

- The DO-260B compliant software installed by SB 34-0005 will process the position data correctly, even if it is contained in multiple messages. This processing difference was already included as part of original SB 34-0005 package, prior to the identification of the erroneous position report problem.

4.6   Boeing will encourage the operators to accomplish the upgrade as soon as possible after the Service Bulletin release (expected in December 2015) but the times will vary from operator to operator. Boeing expects the fleet upgrades to take place through 2016. Australia will progressively remove B787 aircraft from A-SMGCS "blacklist" when information is received that aircraft have been upgraded. It should be noted that this blacklist is essentially a ground surveillance system protection, and does not affect ATC services to these aircraft.

4.7   It was also recommended that if ANSPs other than Australia and Canada have implemented blacklist action in response to this issue, they should contact Boeing to ensure they are notified of fleet upgrade action.

4.7.1   Australia noted the seriousness of the deficiency and that these aircraft were transmitting misleading data. In some environments all B787s had been "blacklisted" and not displayed to ATC. Australia also indicated that it was considering blacklisting if the Service bulletin was not implemented promptly by the airlines after publication.

4.8   IATA expressed concerns on the ground time required for such updates. The meeting requested IATA to convey this information to the relevant member airlines to take early action for the required upgrade upon the Service Bulletin release is issued. Airlines should be reminded that some ANSPs may not compromise for B787 with observed erroneous position transmission to fly in the defined airspace after 6 months from Service Bulletin issued by Boeing.

IFR Flight to Australia post February 2017 (WP/03)

4.9   Through this WP, Australia reminded States that IFR flights to Australia on or after Feb 2017 must be ADS-B equipped. On 15 May 2014, the Australian regulator issued a number of Instruments that require all foreign operators of IFR flights to be equipped with ADS-B commencing

2 February 2017. ADS-B transmitters compliant with DO260, DO260A or DO260B are permitted. Australia also requested the ICAO Secretariat to include this advice in all relevant regional meetings before February 2017.

System Specifications for developing an ADS-B Monitoring System (WP/08)

4.10   Through the WP, Malaysia proposed a holistic set of system specifications to monitor the ADS-B system. The first part of the proposal analyses ADS-B system infrastructures /architecture/performance requirement. The second part of the proposal includes a systematic review on the existing ADS-B monitoring systems. The set of specifications for developing an ADS-B monitoring system are useful for consideration by each individual administration. The recommended system specifications may serve as a basis or minimum requirement for ANSPs or Original Equipment Manufacturers (OEMs) to develop an ADS-B monitoring system.

4.11   The meeting appreciated the initiative and efforts taken by Malaysia. Australia and Singapore expressed their concerns that each State/Administration may have different requirements and specifications for monitoring. Such kind of checklist for monitoring should not bring constraints to Administrations as monitoring some items would be costly. The most important is to monitor operational integrity then for maintenance and support. Singapore suggested conducting a survey for items and parameters being monitored by the concerned States/Administrations. The checklist would be developed based on the outcome of the survey picking up the most important common items/parameters for the required monitoring.

4.12   Therefore, the meeting requested Malaysia taking the lead to develop a checklist for performance monitoring in coordination with Australia, India, Hong Kong China and Singapore. A WP on this subject needs to be prepared by Malaysia for the next ADS-B Study and Implementation Task Force meeting scheduled for April 2016.

Australian Plans to Decommission Three Radars (IP/3)

4.13   Australia shared with the meeting about its intension to decommission three radars in 2017. The Australian Surveillance deployment strategy calls for the decommissioning of 3 monopulse SSR radars and plans to use ADS-B instead. Previous advice was that 4 radars would be decommissioned.

Monitoring and Black Listing non Performing ADS-B Avionics (IP/06)

4.14   India presented information about the software based monitoring and blacklisting of non performing ADS-B avionics system being developed for the effective implementation and monitoring of the promulgated ADS-B avionics transmission mandate. AAI will soon implement ADS-B based surveillance in the defined airspace. So it is necessary to implement a system to detect any violation of the mandated ADS-B transmission requirements by aircrafts. It is possible that the aircrafts are unaware that their position information transmitted by them are not complying to the reported accuracy and integrity quality factors and they may not have means to verifying them. Therefore complying with the mandate would be difficult unless the ANSP assess with the Reference RADAR and intimate them. The paper introduced the monitoring flow of the software that assesses the ADS-B position reports with the reference RADAR. It was also informed that the performance monitoring data derived from the software programme had facilitated the regulator to issue certificates for the ADS-B receiving stations.

4.15   It was reminded that using NUC values to determine accuracy of the aircraft position should only be done with considerable care and knowledge. NUC is primarily a measure of the system resilience to GPS satellite geometry. It is an "integrity measure". However some knowledge regarding accuracy bounds is conveyed by the value.

4.16.   India informed the meeting the result derived from monitoring facilitated certification of ground stations from the regulator. The similar practice may be considered by other Administration. India is willing to share the software tool with other Administrations if so required.

Agenda Item 5:   Review TOR of the SEA/BOB ADS-B Working Group

Review TOR of the WG (WP/04)

5.1   The meeting reviewed the TOR of the SEA/BOB ADS-B Working Group updated at its previous meeting (Decision 10/6). The meeting also recalled the discussions on the future focus of the working group at the tenth meeting of the WG. The slow response on regional collaboration on ADS-B data sharing was one the concerns. The working group was expected to gather difficulties and assist States in resolving them. The meeting was reminded at least the reporting path of the Working Group to the ADS-B Study and Implementation Task Force need to amended to Surveillance Implementation Coordination Group from 2017 onwards. The meeting also identified the need to keep the ADS-B Working Group to promote implementation in two sub-regions. Whether the TOR of the WG needs to be enhanced to cope with other tasks subject to consideration by the first meeting of SURICG in April 2016.

Action Items (Subject/Tasks) List

5.2   The meeting discussed and updated action items as part of its work programme for the Working Group which is provided in the **Appendix E** to this Report.

Agenda Item 6:   Date and venue for the next meeting and Any Other Business

Date and Venue for the Next Meeting

6.1.   The meeting identified the need to organize another meeting to further progress implementation of the sub-regional plan. The Secretariat will coordinate with member States of the Working Group for hosting the next SEA/BOB Sub-regional ADS-B Working Group meeting in November 2016. The exact dates will be coordinated with host State and informed to the members States by the Secretariat in due course of time. (Potentially to be in SEA sub-region).

Significate development and achievements since last meeting

6.2   The meeting noted the following significant developments and achievement since SEA/BOB WG/10 meeting held in November 2014 and during this meeting:

-    In May 2015, India and Myanmar signed MOU on ADS-B data sharing;

-    In October 2015, Singapore and the Philippines signed an MOU to share ADS-B data and VHF facilities. The project is expected to be completed by early 2017;

-    Brunei and Singapore started discussions on data sharing, the MOU is expected to be signed in early 2016;

-    SEA/BOB WG/11 endorsed the draft contributed by India on the additional functional requirements for ADS-B Integration from HMI perspective for consideration by ADS-B SITF;

- SEA/BOB WG/11 appreciated contribution by Malaysia on consolidation of a set of monitoring requirements/specification for further refinement and presentation to ADS-B SITF for consideration as a regional guidance;
- Input to updates the ADS-B Implementation status in APAC region;

- Exchange information on monitoring avionics performance; and

- Updates on action being taken by Boeing mitigating ADS-B error from B787 fleet.

6.3   The working group noted that an ongoing theme of ANSPs is the lack of engagement by regulators in ADS-B implementation. Regulators need knowledge about the risks and benefits that ADS-B can bring to the safety of aviation. The meeting noted that previously SITF had conducted "regulator focused" workshops. Nevertheless around the world, regulators seem slower than ANSPs to embrace the technology.

6.4   Importantly it was also noted that failure to deploy the safety improvements enabled by ADS-B could bring criticism and liability in the event of an adverse outcome. Whilst there are risks and mitigations required to deploy ADS-B, equally there are risks in doing nothing and continuing to rely on procedural ATC with its dependency on voice report of position and lack of automation.

6.5   Therefore, the meeting formulated the following draft Conclusion for consideration by ADS-B Study and Implementation Task Force:

Draft Conclusion 11/1 - Regulators active support and engage with ADS-B Implementation and Data sharing

That, States (regulatory authorities) be strongly encouraged to actively engage with ANSPs to support the examination of risks, hazards, mitigations and benefits of ADS-B in the knowledge that any delay in ADS-B deployment and operational use brings risks, liability and addition regulator responsibility as traffic grows in areas without surveillance and automated safety nets. There is a risk in doing nothing.

Note of appreciation

6.6   The meeting expressed its appreciation and gratitude to the Airports Authority of India for hosting the Working Group meeting. The participants appreciated activities organized by the AAI during the meeting including the technical visit to the ATS Complex IGIA New Delhi.

6.7   The meeting thanked Mr. Greg Dunstone for his valuable support to the meeting in particular for conducting the question/answer session.

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ADS-B IMPLEMENTATION STATUS IN THE APAC REGION

State/ Administration	ADS-B Ground Infrastructure and ATC System readiness or Implementation plan	Date of issue/effectiveness date of equipage mandate	Mandated Airspace and/or ATS-routes	Intended separation criteria to be applied	Remarks
AFGHANISTAN	ADS-B & Multi Lateration system installed.				subject to safety assessment
AUSTRALIA	A total of 43 ADS-B ground stations and 28 WAM stations are operational (Total 71) ATC readiness since 2004 ADS-B data sharing with Indonesia operational since 2/2011. ADS-B data sharing planned with PNG ASMGCS using multilateration and ADS-B is operational in Brisbane, Sydney, Melbourne and Perth An additional 15 ADS-B ground stations are planned in 2016-2017 period, Onesky replacing the current ATM system is expected to be fully operational in 2020 period.	2009/effective date of mandating in UAP 12/12/2013. A forward fit ADS-B mandate also applies from 2/2014 for all IFR aircraft at all flight levels. An ADS-B for all IFR aircraft applies from 2/2017.	at/above FL290 UAP from 12/2013 for domestic & foreign aircraft. WAM is operating in Tasmania since 2010 delivery 5 NM separation service. WAM is also operating in Sydney for 3 Nm separation service in TMA and for precision runway monitoring function.	5 NM Manual of ATC updated to include 3 nautical mile separation using ADS-B in terminal control unit. Vectoring allowed using ADS-B 3 NM SYDWAN	

State/ Administration	ADS-B Ground Infrastructure and ATC System readiness or Implementation plan	Date of issue/effectiveness date of equipage mandate	Mandated Airspace and/or ATS-routes	Intended separation criteria to be applied	Remarks
BANGLADESH	Bangladesh has a plan to commission four ADS-B ground stations to be installed at Dhaka, Cox's Bazar, Saidpur and Barisal Airports by 2016. ADS-B data will be integrated with new ATS system at Dhaka.				
CAMBODIA	3 ADS-B ground stations installed at Phnom Penh, Siem Reap and Stung Treng City since 2011 and able to provide full surveillance coverage for Phnom Penh FIR. Cambodia is willing to share data with others.				
CHINA	5 UAT ADS-B sites are used for flight training of CAFUC. 8 ADS-B stations installed by end of 2012. 200 ADS-B stations nationwide will deployed as 1st phase. 1 ADS-B station operational in Sanya FIR since 2008. Sanya ATC system ready since July 2009 to support L642 nd M771. Chengdu-Jiuzhai project finished in 2008 with 2 ADS-B stations and	NOTAM issued on ADS-B trial operation			ADS-B signal alone won't be used for ATC separation

State/ Administration	ADS-B Ground Infrastructure and ATC System readiness or Implementation plan	Date of issue/effectiveness date of equipage mandate	Mandated Airspace and/or ATS-routes	Intended separation criteria to be applied	Remarks
	additional site is planned to enhance the surveillance coverage. Chengdu - Lhasa route surveillance project completed with 5 ADS-B stations using 1090ES since 2010. Trials planned from May 2011. 1 ADS-B site installed in Sanya FIR since 2008. 3 additional ground stations planned, Trial planned for Jun, 2011.				
HONG KONG CHINA	A larger-scale A-SMGCS covering the whole Hong Kong International Airport put into operational use in April 2009. Data collection/ analysis on aircraft ADS-B equipage in Hong Kong airspace conducted on quarterly basis since 2004. ADS-B trial using a dedicated ADS-B system completed in 2007. ADS-B out operations over PBN routes L642 and M771 at or above	AIP supplement issued on 29 Oct.2013/12 Dec. 2013 as effective date.	L642/M771 ATS routes.	To be determined.	ADS-B signals being fed to ATC controllers under an operational trial programme. ADS-B operation in Hong Kong FIR re-scheduled for Dec. 2016. An AIP Supplement was issued on 29 Aug. 2014.

State/ Administration	ADS-B Ground Infrastructure and ATC System readiness or Implementation plan	Date of issue/effectiveness date of equipage mandate	Mandated Airspace and/or ATS-routes	Intended separation criteria to be applied	Remarks
	FL 290 within HK FIR was effective in December 2013 and within HK FIR at or above FL 290 is planned for December 2016. ADS-B ground station infrastructure completed in 2013. ADS-B trial using ADS-B signal provided by Mainland China to cover southern part of Hong Kong FIR commenced in 2010.				
MACAO, CHINA	Mode S MSSR coverage available for monitoring purposes.				
DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA	ADS-B has been used as back-up surveillance of SSR since 2008.				
FIJI ISLANDS	ADS-B /multilateration ground stations installed. Situations awareness service will be provided in 2013.	ADS-B mandate commencing form 31st December 2013			
FRANCE (*French Polynesia)*	ATM system is ready for ADS-B sensors/Installation of 5 first GS expected at beginning of 2017. 2nd stage with implementation of 7 GS and associated VHF coverage.			5 NM for airspace under coverage.	

State/ Administration	ADS-B Ground Infrastructure and ATC System readiness or Implementation plan	Date of issue/effectiveness date of equipage mandate	Mandated Airspace and/or ATS-routes	Intended separation criteria to be applied	Remarks
INDIA	ASMGCS (SMR + Multilat) is operational at Delhi, Mumbai, Chennai, Kolkata, Bangalore and Hyderabad Airports. ASMGCS is also being installed at 05 more international airports. ADS-B Ground Stations were installed at 21 locations across continental airspace and including Oceanic airspace at Port Blair. Procurement of 10 more ADS-B Ground stations is under consideration in 2016.. ATM automation systems at 22 ATC Centres are capable of processing ADS-B data and provide the information on Display.	AIP supplement issued on 17th April 2014 with effective date of implementation from 29th May 2014.			ADS-B in India to provide redundancy for radar and filling the surveillance gaps. ADS-B data trial operations commenced in 2015 in both Non-radar and radar environment, in Enroute & Terminal phases of flight for ATC purposes. AIP SUP 18 of 2014 issued
INDONESIA	30 Ground Station successfully installed. Since 2009, ATC Automation in MATSC has capabilities to support ADS-B application. ADS-B Task Force team established to develop planning	On 24 July 2014 DGCA published AIRAC AIP Supplement No. 10/14 for using ADS-B for situation awareness effective from 18 Sep. 2014 to 25 June 2015. AIP Supplement on ADS-B Implementation			ADS-B Task Force Team is considering a mandate in 2016. Mandate for 3 ATS routes: B472, M768, R592 from 25 June 2015 subject to safety

State/ Administration	ADS-B Ground Infrastructure and ATC System readiness or Implementation plan	Date of issue/effectiveness date of equipage mandate	Mandated Airspace and/or ATS-routes	Intended separation criteria to be applied	Remarks
	and action concerning ADS-B Implementation within Indonesia FIR ADS-B data sharing with Australia and Singapore.	(Tier-1)(mandate) being published with effective date on 25 June 2015.			assessment process.
JAPAN	Multilateration Systems for surface monitoring have been implemented at seven airports and are being implemented at another one airport. PRM (WAM) is planned to be implemented at Narita Airport. (Operation will start in 2014). Basic design of en-route WAM system completed in FY2013. Plans to start manufacture in FY2014 and estimated operational in FY2018. Plan to evaluate accuracy of ADS-B information and has intension to introduce ADS-B to the oceanic direction.				
MALAYSIA	Malaysia planned to start mandate ADS-B requirement in KL FIR in 2018 and full implementation of	Plan to issue mandate with target effective date end of 2018.			

State/ Administration	ADS-B Ground Infrastructure and ATC System readiness or Implementation plan	Date of issue/effectiveness date of equipage mandate	Mandated Airspace and/or ATS-routes	Intended separation criteria to be applied	Remarks
	ADS-B service at specific routes/exclusive airspace by end of 2020. One station at Terrengganu. Plan to install two ADS-B stations at Pulau Langkawi and Genting Highland and new ATM centre being built for KL FIR. The project expected to complete by end of 2019.				
MALDIVES	4 ADS-B stations installed in Nov. 2012 (2 at Male' Ibrahim Nasir Intl Airport, 1 at Kulhudhuffushi Island in the North and 1 at Fuah Mulah Island in the South to cover 95% of the FIR at/above FL290. Maldives' ADS-B is integrated with the ATM system (in November 2013), and under observation prior to commencing trials. Maldives has planned to share ADS-B data with its adjacent FIRs.				Seaplane in Maldives equipped with ADS-B for AOC purpose. These seaplanes have ADS-B IN functions as well.
MONGOLIA	Ten ADS-B ground stations for combination SSR and filled the surveillance gaps implemented in 2015 and integrated with ATM system and trial operation in early 2016.				

State/ Administration	ADS-B Ground Infrastructure and ATC System readiness or Implementation plan	Date of issue/effectiveness date of equipage mandate	Mandated Airspace and/or ATS-routes	Intended separation criteria to be applied	Remarks
MYANMAR	ADS-B ground stations to be installed at Sittwe, Co Co Island by end of 2014 as 1st phase Yango , Lashio and Myeik - 2015 as 2nd phase; Kengteng, Myitkyina in 2016. Completion of integration to Euro Cat. C. in 2014. Agreed to share ADS-B data with India, agreement on sharing being negotiated.				Supplement radar and fill the gaps to improve safety and efficiency. ADS-C/CPDLC integrated in Yangon ACC since 2010.
NEPAL	ADS-B feasibility study conducted in 2007.				
NEW CALEDONIA	Three ADS-B ground stations commissioned in 2010 to cover international traffic at La tontouta airport serving Tontouta ACC & APP. It is used for Situation awareness and SAR.				
NEW ZEALAND	MLAT and ADS-B data is being used from the WAM system centered in the Queenstown area to provide surveillance coverage and surveillance separation (5 nm) over the southern half of the South Island of New Zealand.			5 NM Surveillance Separation	

State/ Administration	ADS-B Ground Infrastructure and ATC System readiness or Implementation plan	Date of issue/effectiveness date of equipage mandate	Mandated Airspace and/or ATS-routes	Intended separation criteria to be applied	Remarks
	Additionally MLAT data from the Auckland MLAT system is used to provide airport surface movements at NZAA.

The New Zealand Navigation and Airspace and Air Navigation Plan "New Southern SKY" issued in May 2014 | | | | |
| **PAKISTAN** | Tender for procurement of 5 ADS-B stations issued to be installed at Pasni, Lakpass, Rojhan, Dalbandin and Laram-top. Contract expected to be finalized by end of 2015. These stations will be DO260B compliant and operational by end of 2016. | | | | |
| **PAPUA NEW GUINEA** | Legislation mandating ADS-B and guidelines for aircraft equipage and operational approval to be issued by 31/12/2011 with target mandatory date by mid-2015 and plans to provide ADS-B service above FL245 within Port Moresby FIR and also in specific higher traffic areas domestically. | | | | |

State/ Administration	ADS-B Ground Infrastructure and ATC System readiness or Implementation plan	Date of issue/effectiveness date of equipage mandate	Mandated Airspace and/or ATS-routes	Intended separation criteria to be applied	Remarks
PHILIPPINES	Four (4) ADS-B ground stations (Manila, Palawan, Pangasinan and Ilocos Norte) with target date to complete by end 2016. ATM Center expected to be available in 2016.				
REPUBLIC OF KOREA	ADS-B implemented 2008 for SMC in Incheon International Airport. ROK is developing ADS-B system since 2010 through R&D group. The testbed at Gimpor Airport supporting both 1090ES and UAT, undergoing operational testing (2013-16). At Incheon Intl Airport, promotion of surface surveillance (2014-17) In 2nd phase from 2015 to 2016, ADS-B ground stations will supplement to the radar in the terminal area and fill up the gap between radar coverage. The last phase from 2017 to 2020, ADS-B will be deployed for entire Incheon FIR.				
SINGAPORE	The airport MLAT system was installed in 2007 and "far-range" ADS-B sensor was installed in 2009. ATC system has	AIC was issued on 28 December 2010/effective from 12 Dec.2013. AIP supplement published in Nov 2013 to remind	L642 and M771. At and above FL290. Also affect the following	40nm on ATS routes L642, L644, M753, M771, N891 and N892	Safety case was completed end of November. 2013.

State/ Administration	ADS-B Ground Infrastructure and ATC System readiness or Implementation plan	Date of issue/effectiveness date of equipage mandate	Mandated Airspace and/or ATS-routes	Intended separation criteria to be applied	Remarks
	been processing ADS-B data since 2013.	operators of ADS-B exclusive airspace implementation. AIP updated in Jan 2015 to remove the need for ops approval and to include the FAA standard as an additional accepted means to meet the equipage requirements.	ATS routes N891, M753, L644 & N892	30nm implemented on 26th June 2014 on ATS routes L642, M753, M771 and N892; 20nm planned for end 2015	
SRI LANKA	ADS-B Trials planned for 2012 and implementation in 2013. 5 ADS-B ground station was planned and willing to share ADS-B data with neighbouring States through a cenral processor which is ready for trial in 4th Quarter 2014.				An AIC on ADS-B services with TMA of Colombo FIR issued on 10 Nov. 2014 (A02/14) with effective 1 Sep. 2015.
THAILAND	Multilateration implemented at VTBS in 2006, to be installed at VTBD starting in Q1 of 2016, and to be installed at VTCC and VTSP in 2017. ADS-B ground stations (DO-260B compliant) installed in Thailand for internal research and development project. Thailand is currently undergoing the operational approval process to have ADS-B as part of surveillance				

State/ Administration	ADS-B Ground Infrastructure and ATC System readiness or Implementation plan	Date of issue/effectiveness date of equipage mandate	Mandated Airspace and/or ATS-routes	Intended separation criteria to be applied	Remarks
	infrastructure. New ATM System to be operational in 2017 will be capable of processing ADS-B data.				
TONGA	Trial planned for 2017				
UNITED STATES	As of 1 April 2015, the "baseline" set of Service Volumes planned by the FAA in 2007 are operational, using data from 634 radio sites installed by Exelis. Since 2007, FAA has planned and funded activities to activate additional Service Volumes that Exelis will service using and additional 29 radio sites; 9 of these radio sites have been installed by Exelis as of 1 April 2015. As of 1 April 2015, 123 of the 231 U.S. air traffic control facilities are using ADS-B for ATC separation; all facilities are planned to be using ADS-B by 2019.	The U.S. ADS-B Out rule (14 CFR 91.225 and 14 CFR 91.227) was issued in May 2010 and specifies that the ADS-B Out mandate is effective on 1 January 2020.	Class A, B, and C airspace, plus Class E airspace above 10,000 ft MSL. See 14 CFR 91.225 for details.	The U.S. is using both terminal and en route (5nm) separation criteria, depending on the specific airspace and available surveillance information. Terminal separation includes the following separation criteria: - 3nm - 2.5nm - independent parallel approach operations down to 4300 ft centreline separation - dependent parallel approach operations down to 2500 ft centreline separation (currently 1.5 nm diagonal distance).	

State/ Administration	ADS-B Ground Infrastructure and ATC System readiness or Implementation plan	Date of issue/effectiveness date of equipage mandate	Mandated Airspace and/or ATS-routes	Intended separation criteria to be applied	Remarks
VIET NAM	Two phases ADS-B implementation plan adopted. Phase 1 implemented in March 2013. Phase 2 for whole lower and upper airspace of Ha Noi and Ho Chi Minh FIR to be completed by 2016.	AIC issued on 20 June 2013/ADS-B mandating effective from 12 December 2013 in Ho Chi Minh FIR.	M771, L642, L625, N892, M765, M768, N500 and L628 At/above FL290.		Operators required to have operational approval from State of aircraft registry.

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ADDITIONAL FUNCTIONAL REQUIREMENTS FOR ADS-B INTEGRATION

These additional functional requirements are for consideration by each individual Administration to see whether suitable/applicable for local environment from ADS-B integration point of view:

- The priority of ADS-B sensor data vs RADAR data should be adaptable;

- For ADS-B aircraft, receipt of the Mode S conspicuity code should trigger use of the Target ID / Target Address for flight plan correlation;

- If, due to sensor or aircraft capability limitation, no SSR code is received for an aircraft, the system should use Target ID/ Target Address for track correlation;

- For correlation based on Target ID, the received ID should exactly match the ACID of the flight plan;

- For correlation based on Target Address, the received address should match the address entered in the flight plan field 18 CODE/ keyword;

- The system should generate an alert for a correlated flight for which the Target ID from the track does not match the flight plan ACID and/or the Target Address from the track does not match the code given in the flight plan field 18 CODE/ keyword;

- The system should allow the setting of ADS-B above or below the RADAR sources within the SDP Tile Set on a per-tile basis;

- Priority should only apply to data received at or above the adapted NUCp, NACp, NIC, and/or SIL thresholds;

- The system should be configurable to either discard ADS-B data or display the track with an indication of ADS-B degradation if the received NUCp, NACp, NIC, or SIL is below an adapted threshold;

- If the system is configured to display the degraded track, the degraded position and status should only be displayed if there are no other surveillance sources available;

- The system should allow the adaptation of ADS-B emergency codes to map to SPC Mnemonics;

- The system should include an adaptable Downlinked Aircraft Parameters (DAP) field that invokes a popup with the following information from Mode-S and ADS-B aircraft:

    - Magnetic Heading
    - True Track Angle
    - Indicated Airspeed/Mach Number
    - Groundspeed
    - Track Angle Rate
    - True Airspeed
    - Roll Angle

- Selected Altitude
- Vertical Rate

▪ The system should generate a conformance alert if the Selected Altitude and the CFL do not match.

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READINESS CHECKLIST TABLE

Readiness	AUS	SING	INDO	VIET	CHINA	HK	INDIA	MAL	BAN
ADS-B targets displayed on operational ATC screen?	✓	✓	✓	SEP	✓	○	✓	Nov13	✓
Blacklist filtering system & procedures	✓	✓	○	○	TBC	✓	○	✗	✓
Foreign Filter system and Datasharing capability/willingness	✓	✓	✓	✓	TBC	✓	✓	✗	✓
ATC procedures & ATC training 7 ATC manual	✓	✓	○	✓	✓	○	✓	✗	✓
Maintenance support contract or arrangements	✓	✓	○	✓	TBC	✓	✓	✓	✓
Maintenance staff training & certification	✓	✓	✓	✓	TBC	○	✓	✓	✓
Mandate & process for ADS-B avionics failure	✓	✓	○	✓	✓	✓	○	✗	✓
Extensive publicity about mandate	✓		○	○	✗	✓	○	✗	✓
Recording, monitoring, analysis and feedback capability?	✓	✓	✓	✓	TBC	✓	✓	✓	✓
Avionics installer community engaged (GA &/or Bizjet)	✓		○	○	TBC	Biz	○	✗	NA
Contacts in Airlines, A/C Manufacturers, Avionics Co	✓	AL	○	AL	○	✓	✓	✓	A/L
Regulator & ATC management of Exemption flights inc state aircraft	✓	✓	○	○	✓	✗	○	✗	TBD
Fitment rate (do NOT include NUC=0 aircraft)	>90%	75	NA	60	85	85	60	75	
Remove display if without "operational approval"	✗	✗	✗	✗	✗	✗	○	✗	✗
AIP SUP or AIC	✓	✓	○	✓	✗	✓	soon	✗	✓
Flight ID correction & pilot performance	✓	✓	○	○	✓	○	✓	✗	✓
Has State given operational approval to own aircraft	✗	✓	✗ will	✓	✓	✓	✗ will	TBD	✗ will
Airline Flight planning OK	✓	✓	○	✓	○	○	○	adhoc	✓

REPORT FROM SOUTHEAST ASIA SUB GROUP
(India, New Delhi, 17-19 November 2015)

States Present
Australia
Brunei
Malaysia
Singapore
The Philippines
Thailand

Observers
IATA

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)
- Waingapu ADS-B (Indonesia) (Installed)
- 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;
Comms links between Australia and Indonesia were being upgraded from VSAT to terrestrial links. This is expected to be completed by 2016. This will improve the service quality.

Benefits
Data used for air situational awareness and safety nets.
Enhanced Safety at FIR boundary.
Operational service commenced by Australia in Feb 2011.
Indonesia has been using the data for Tier 2 services since Sep 2014

Phase 1b
Indonesia and Australia sharing data from the following additional stations:
- Semarang (Indonesia) (Installed) – Yet to share
- Alor (Indonesia) (Installed) – Yet to share
- Timika (Indonesia) (Installed) - Commenced data sharing
- Kupang (Indonesia) (Installed) - Commenced data sharing
- Christmas Island (Australia) (Not yet installed)
- Browse Basin oil rig (Australia) (will be installed probably in 2017)

Data Sharing Agreement signed on 18 Jun 2014;

Indonesia published mandate on 24 July 2014 for situation awareness. The effective date of this mandate is from 18 Sep 2014 to 25 June 2015. Subsequently, Indonesia published mandate on 30 April 2015 for ADS-B operations (Tier 1 services) above FL290. The effective date of this mandate is from 25 June 2015.

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

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

- Singapore ADS-B (Singapore provide data to Indonesia)
- Natuna ADS-B (Indonesia provide data to Singapore)
- Matak ADS-B (Indonesia provide data to Singapore)
- Con Son ADS-B (Viet Nam provide data to Singapore)
- Sanya FIR ADS-B (China provide data to Hong Kong China)

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

- Natuna VHF (Install for Singapore by Indonesia) (Installed)
- Matak VHF (Install for Singapore by Indonesia) (Installed)
- Con Son VHF (Install for Singapore by Viet Nam) (Installed)
- Sanya VHF (Install for Hong Kong China by China) (Installed)

ADS-B Data sharing and DCPC services agreement between Singapore and Indonesia signed in Dec 2010.

ADS-B Data sharing and DCPC services agreement between Singapore and Vietnam signed in Nov 2011.

DCPC services agreement between China and Hong Kong China signed in 2005.

ADS-B Data sharing agreement between China and Hong Kong China signed in 2013.

Operational Status
Singapore agreed on separation minima with Vietnam and have commenced on ADS-B operations. Singapore updated they have commenced 30nm separation between Singapore and Ho Chi Minh FIR. The plan is to further reduce to 20nm separation.

All 4 administrations (China, Hong Kong China, Singapore and Vietnam) agreed that operational approval is not required.

Initial Benefits
The above sharing arrangement will benefit L642, M771, N891, M753, N892 and L644. Enhanced safety and reduced separation has been applied. Mandate was effective in Singapore FIR 2013. Sanya will publish Mandate with effect from Jul 2015. [Information based on past meetings]

Phase 2

The Philippines will install 4 ADS-B stations (Manila, Quezon Palawan, Pangasinan and Ilocos Norte). These ADS-B stations are targeted to complete by end 2016

Singapore had an MOC with the Philippines agreeing in-principle to share ADS-B data with Singapore and provide the VHF facilities for Singapore ATC use. In October 2015, Singapore and the Philippines signed an MOU to share ADS-B data and VHF facilities. The proposed site at Quezon Palawan is not able to provide surveillance for Singapore FIR effectively. Both parties are exploring a site in the South of Palawan, in addition to the above four sites. The project is expected to be completed by early 2017.

The Philippines indicated that there is a surveillance gap at north western of Manila FIR. China mentioned that ADS-B stations in Sanya FIR will be able to cover part of the surveillance gap. China is prepared to share ADS-B data with neighbouring states. The Philippines will discuss internally to assess the need for the ADS-B data from China.

Brunei had a high level MOC with Singapore agreeing in-principle to share ADS-B data with Singapore and provide the VHF facilities for Singapore ATC use. The Brunei CNS ATM project includes five ADS-B stations at Lugu, Sungei Akar, Andulau, Bukit Puan and Seria. Brunei and Singapore have started discussions and Singapore is exploring to use two of the five sites to install VHF facilities and possibly additional ADS-B stations to cover Singapore FIR. The detailed MOU is expected to be signed by early 2016.

Phase 3

Vietnam has ADS-B coverage at the Southern part of L625 and N892 and Vietnam is willing to share the ADS-B data with the Philippines and Singapore. The discussion between Singapore and Vietnam is in progress.

The Philippines will discuss internally to assess the need for the ADS-B data from Vietnam.

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

Indonesia and Malaysia are willing to share the ADS-B data from the following stations:
- Aceh ADS-B (Indonesia) (installed) - to help cover Kuala Lumpur FIR
- Genting (Malaysia) – To be installed by 2019

The project is still under discussion between Malaysia and Indonesia.

Malaysia is planning to install one more at Langkawi by 2019. The data from Langkawi ADS-B may also be shared in future.

Initial benefits
Enhanced Safety at FIR boundary

Project 4 – ADS-B data sharing between Cambodia, Thailand and Viet Nam
(no updates, info based on previous reports)

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)

Vietnam is planning to install stations in the south of HCM FIR from 2015 to 2016. Vietnam is willing to share with Cambodia and Thailand.

Discussions between the three States are on-going.

Initial benefits
For redundancy

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

Indonesia is willing to share the ADS-B data from the following stations:
- Manado ADS-B (installed)
- Galela ADS-B (installed)
- Tarakan ADS-B (installed)

The Philippines will discuss internally to assess the need for the ADS-B data from Indonesia.

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 South-eastern part of Manila FIR.

Initial benefits
Situational awareness

Project 6 – ADS-B data sharing between Australia, Indonesia and Papua New Guinea

Data Sharing between Australia and Papua New Guinea
- Thursday Island (Australia) (installed)
- Gove (Australia) (installed)
- Kintore (Australia) Not yet installed – Target to be installed by 2018
- Burns Peak – Port Moresby (PNG) (tender awarded)
- Mt Dimo Dimo (PNG) (tender awarded)
- Mt Robinson (PNG) (tender awarded)

Data Sharing between Indonesia and Papua New Guinea
- Burns Peak (PNG) (tender awarded)
- Mt Nauwein (PNG) (tender awarded)
- Mt Robinson (PNG) (tender awarded)
- Merauke (Indonesia) (installed)
- Timika (Indonesia) (installed)
- Biak (Indonesia) (installed)

The project is still under discussion between Australia, Indonesia and Papua New Guinea. They will probably sign a three-party agreement for data sharing.

Project 7 – ADS-B data sharing between Malaysia and Singapore

Malaysia currently has one ADS-B station at Terrengganu. Malaysia is willing to share the ADS-B data from Terengganu station with Singapore for technical evaluation. Singapore also expressed willingness to share data from Singapore ADS-B station with Malaysia.

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No.	What to harmonize	What was agreed	Issue / what needs to be further discussed
	Harmonization Plan for L642 and M771		
1	Mandate Effective	SG, HK, VN: 12 Dec 2013 CN: Jul 2015.	
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	All states agreed that there is no need for operational approval	
5	Flight Level	SG, HK, VN: - At or Above FL290 (ADS-B airspace) - Below FL290 (Non-ADS-B airspace) CN: To be confirmed SG: AIC issued 28 Dec 2010, AIP Sup issued 6 Nov 13 VN: AIP Sup issued 31 Oct 13 HK: AIC issued 24 May 2011, AIP Sup issued 29 Oct 13	
6	Avionics Standard (CASA/AMC2024)	SG,HK,VN,CN allow CASA or AMC2024 or FAA (ES) SG, HK and VN confirmed that their ADS-B GS can accept DO260, DO260A and DO260B.	States should include supplement to include the FAA standard. Status for CN to be confirmed. Indonesia is planning to upgrade their stations by end of 2016
7	Aircraft Equipage		
7a)	Procedures if Aircraft not equipped with a Serviceable ADS-B Transmitting Equipment before Flight	SG: FL280 and below. HK, CN, VN: Dependent on situation. ADS-B equipped aircraft will be given priority to operate above FL280.	

7b)	Aircraft equipped Approved but Transmitting Bad Data (Blacklisted Aircraft)	For known aircraft, treat as non ADS-B aircraft. (China, Hong Kong - China and Singapore)	Share information on aircraft observations among concerned States/Administration.(Hong Kong China, Singapore and Vietnam) China to be confirmed.
8	Contingency Plan		
8a)	Systemic Failure such as Ground System / GPS Failure	Revert back to current procedure.	
8b)	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.
9	Commonly Agreed Route Spacing	SEACG	Need for commonly agreed minimal in-trail spacing throughout.

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REPORT FROM BAY OF BENGAL AD HOC WORKING GROUP
(Updates based on previous reports)
(New Delhi, 17-19 November, 201)5

States Presented:
India
Malaysia
Thailand

The participants met to update the status of implementation of ADS-B and possible Data sharing between the neighbouring States.

1. Bangladesh has planned to install ADS-B ground stations at four locations i.e. Dhaka, Barisal, Saidpur and Cox's Bazar by 2H2016. Bangladesh is willing to share ADS-B data with India and Myanmar.

2. India informed that 21 ADS-B ground receivers have already been installed and AIP SUPP has been published to use ADS-B in the provision of ATS surveillance service. The AIP Supplement 18 of 2014 has been issued. The data sharing agreement between India and Myanmar has been signed on 06th May 2015. India is willing to share ADS-B data with Bangladesh, Indonesia, Maldives and Sri Lanka. The possibility of sharing data with Malaysia is being explored. India is planning to install 10 more ADS-B ground stations (DO260B compliant) across Indian Airspace. Locations are being finalized based on operational requirement.

3. Indonesia earlier informed that ADS-B ground station at Aceh is already operational and will share data with India (It was earlier decided to have Port Blair-Aceh data sharing, but for better coverage and usability it was suggested in the meeting to have data sharing of upcoming Campbell Bay ADS-B - Aceh by 2H2016).

4. Maldives has installed and commissioned ADS-B ground stations at three locations. The integration of data to the ATM systems has already been completed. Maldives is willing to share ADS-B data with India and Sri Lanka (Expected date: 2H2016). Also, Maldives has planned to implement exclusive ADS-B airspace at and above FL290 by 2016.

5. Nepal is planning to install ADS-B ground stations in future. New MSSR system is going to install and the project will be completed by 2015. MLAT is under the process for a tender.

6. Pakistan has informed the meeting that most of the Pakistan airspace currently is already under RADAR surveillance; some gaps in the West, Northern mountain regions and some portion in the South and the South-West airspace need to be brought under positive feasibility or surveillance. PCAA considers ADS-B, a potential option to fill up the gaps in radar surveillance and also considers using ADS-B to provide partial back-up to the existing radar. Regarding data sharing neighbouring countries will be coordinated through PCAA.

7. Sri Lanka is planning to install ADS-B ground stations at five locations and the system will be ready for test operations by October, 2015. AIC has been recently issued. Sri Lanka is willing to share data with India and Maldives.

8. Thailand informed that a new ATM system with capability of processing ADS-B data is expected to be operational in 2017.

9. **Malaysia updated the meeting that they are installing two ground ADS-B stations at Langkawi and Genting, both compliant with DO-260B, and likely to be completed by the end of 2019**.

ADS-B DATA SHARING
The following locations for data sharing were agreed/suggested upon during the sub-group (Ad hoc) Meeting:

INDIA – BANGLADESH
Agartala and Dhaka (2H2016)

BANGLADESH – MYANMAR
Coxs Bazaar and Sittwe (2H2016)

INDIA – MYANMAR
Agartala – Sittwe (2H2016) Agreement already signed on 06th May 2015.
Portblair – Coco Island (2H2016) Agreement already signed on 06th May 2015.

INDIA – INDONESIA
Campbell Bay – Aceh (2H2016)

INDIA – MALDIVES
Trivandrum – Kulhudhuffushi (2H2016)

MALDIVES – SRI LANKA
Male – Colombo (2H2016)

INDIA – SRI LANKA
Trivandrum – Colombo (2H2016)

MALAYSIA – INDONESIA
Genting - Aceh (2H2020)

Following three States updated information at ADS-B SITF/14 meeting

States Present: Pakistan, Malaysia and Thailand
(Bangladesh, India, Maldives, Nepal, Sri Lanka and Myanmar were not present in the meeting)
The participants met to update the status of implementation of ADS-B and possible data sharing between the neighboring States.

1. Bangladesh has planned to install four ADS-B ground stations at Dhaka, Barisal, Saidpur and Coxs Bazaar by 2H2016. (Note: Information as presented at the ADS-B SITF/13)

2. India informed that 21 ADS-B ground receivers have already been installed and AIP SUPP has been published to use ADS-B in the provision of ATS surveillance service. The data sharing agreement between India and Myanmar has been signed in 1H2015. (**Note**: Information as presented at the ADS-B SITF/13)

3. Maldives has installed and commissioned ADS-B ground stations at three locations. The integration of data to the ATM systems has already been completed. Maldives is willing to share ADS-B data with India and Sri Lanka (Expected date: 2015). Also, Maldives has planned to implement exclusive ADS-B airspace at and above FL290 by 2016. (**Note**: Information as presented at the ADS-B SITF/13)

4. Nepal is planning to install ADS-B ground stations in future. New MSSR system is going to install and the project will be completed by 2015. MLAT is under the process for a tender. (**Note**: Information as presented at the ADS-B SITF/13)

5. Pakistan informed that it has invited open tender action for procurement of five ADS-B Ground Stations for installation at Pasni, Lakpass, Rojhan, Dalbandin and Laram-top. The contract is expected to be finalized by the end of 2015. The objective is to provide ADS-B coverage in areas where there is no or limited Secondary Surveillance Radar (SSR) coverage. The data from the above ADS-B ground stations will be integrated with existing ATM systems at both Area Control Centres in Karachi and Lahore. Pakistan expects the ground stations to be DO-260B compliant and operational by the end of 2016.

WG SEA-BOB 11 – further updates

6. Malaysia is currently in the progress of building new Air Traffic Control Centre for KL FIR and upgrading current CNS/ATM System, including installing two ADS-B ground stations. The project is expected to be completed by the end of 2019, compliant with DO-260B.

7. Thailand informed that ADS-B Ground Stations (DO-260B compliant) have been installed in Thailand for internal research and development project Thailand is currently undergoing the operational approval process to have ADS-B as part of surveillance infrastructure. New ATM System with the capability of processing ADS-B data is expected to be operational in 2017.

IFALPA – a pilot's perspective (extracted from Pacific ad hoc group during ADS-B SITF/14)
Acknowledged that ADS-B delivers that cost effective surveillance system that provides significant benefits to airline users and operators. Education is required for some operators: pilots need to understand the implications of ADS-B being on or off; and some operators are good at educating crew while others need to do more.

Airlines
SEA/BOB WG/11: **Operators and Pilots should be well aware of the importance of setting correct Flight Id in FMS same as that of ACID**.

Terminology used in the region should be standardised and consistent, and recognise what crew need to know.

States need to develop procedures for the use of DAPS in relation to operating procedures, for example the use of selected altitude information being displayed on the controllers' screens and related pilot practices: pilots and controllers need to be aware of each other's operating practices.

The QNH error detection feature is an important safety net feature particularly when conducting a non-precision approach.

There is a need to consider the capture, storage, and potential uses of ADS-B data. For example, in some states those data might be used to draw premature conclusions about the causes of an accident or incident and result in inappropriate or unwarranted enforcement action. In addition, there were concerns about who can access ADS-B data and for what purposes. Examples of inaccurate data being used by members of the public to make complaints about aircraft flight paths and noise impost are a concern.

System redundancy was highlighted as an issue in an environment increasingly dependent on GNSS.

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

No.	Subject	Forum Raised	Status / Target Date	Remarks / follow-up	Action Party
1.	Prepare a paper on the plans for and status of ADS-B data sharing between Indonesia-Malaysia	SEA ADS-B WG/4	Updated in ADS-B SITF/8; SEA/BOB WG/12	On-going	Malaysia
2.	ATS operational letter of agreements between neighboring FIRs among South China Sea States for radar-like surveillance service (Operational agreement between Singapore and Viet Nam was signed first in Nov. 2013 and later updated in July 2014 for 30 NM separation)	SEA ADS-B WG/6	Ongoing – Reports at each meeting	Report progress	China, Hong Kong China, Viet Nam and Singapore On-going needs seamless agreement for the minima – major traffic flow
3.	Harmonize process of detection bad TX for inclusion into "Blacklist"	SEA/BOB ADS-B WG/8	ADS-B SITF/15	Review and update on the monitoring mechanism	Singapore & Hong Kong China, RSO Requirements for monitoring items identified – on going
4.	Update "harmonization Framework Document" for BOB	SEA/BOB ADS-B WG/8	ADS-B SITF/15	Report progress – on going	India, Myanmar On-going
5.	In MEL not included the effect of GNSS failure on ADS-B output which should be included.	SEA/BOB WG/9	ADS-B SITF/15 (confirmation)	Contact Boeing and Airbus through operators	IATA and Hong Kong China Initial result based on contact with AIRBUS & BOEING subject to confirmation

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

No.	Subject	Forum Raised	Status / Target Date	Remarks / follow-up	Action Party
6.	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. Status updated at WG/11 A simple document containing projects for BoB data sharing to be prepared by India		May 2015	Develop and implement sub-regional ADS-B collaboration projects. On-going	Bay of Bengal States Detailed needs to be finalized by SEA/BOB
7.	States to advise when their ground stations can be upgraded to receive ADS-B DO260B compliant ADS-B data. A survey was conducted during ADS-B SITF/13 (Appendix E). On-going bases	SEA/BOB WG/9	On-going	Further updates the Table and report to ADS-B SITF	Table updated by ADS-B SITF/14 and to be maintained by Task Force
8.	General ADS-B Avionics Problem Reporting Database (APRD) (being implemented)	SEA/BOB WG/9	Specification and database at ADS-B SITF/15	Further updates on the status and improvement to be made	Hong Kong China and RSO On-going - being progressed
9.	Inform member airlines about the B787 ADS-B Deficiency and the service Bulletin (SB) B787-81205-SB340005-00 and accomplish the upgrade as soon as possible after the Service Bulletin release.	SEA/BOB WP/11	ADS-B SITF/15	Inform member airlines	IATA
10.	Further develop a checklist for performance monitoring in coordination with Australia, India, Hong Kong China and Singapore. A WP on this subject prepared for consideration by next ADS-B SITF meeting (AIGD)	SEA/BOB WP/11	ADS-B SITF/15	Coordination and prepare a WP for review by the Task Force	Malaysia

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**ELEVENTH MEETING OF THE SOUTH EAST ASIA AND BAY OF BENGAL
SUB-REGIONAL ADS-B IMPLEMENTATION WORKING GROUP
(SEA/BOB ADS-B WG/11)**

New Delhi, India (17 – 19 November 2015)

ATTACHMENT 1 TO THE REPORT

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International Civil Aviation Organization

**ELEVENTH MEETING OF THE SOUTHEAST
ASIA AND BAY OF BENGAL SUB-REGIONAL
ADS-B IMPLEMENTATION WORKING GROUP
(SEA/BOB ADS-B WG/11)**

New Delhi, India 17 – 19 November 2015

LIST OF WORKING AND INFORMATION PAPERS

WP/IP No.	Agenda	Subject	Presented by
		LIST OF WORKING PAPERS	
1	-	Provisional Agenda	Secretariat
2	2	Outcome of ADS-B SITF/14 and APANPIRG/26 on ADS-B	Secretariat
3	4	IFR Flight to Australia post February 2017	Australia
4	5	TOR, Action Items and Focus of the Working Group	Secretariat
5	2	Outcome of DGCA Conf/52 on ADS-B	Secretariat
6	3.7	Outcome of the Tenth Meeting of South-east Asia Bay of Bengal Sub-regional ADS-B Implementation Working Group (SEA/BOB ADS-B WG/10)	Secretariat
7	3.6	ADS-B Integration Functional Requirements	India
8	4	System Specifications for Developing an Automatic Dependent Surveillance Broadcast (ADS-B) Monitoring System	Malaysia
9	4	Boeing 787 ADS-B Deficiency Update	Australia with contribution from Boeing
10	3.1	Operational Use of ADS-B in India	India
11	3	Safety Case for ADS-B under Radar Environment	Singapore
12	4	Equipage Status of Aircraft	Singapore
13	3	ADS-B Collaboration in South China Sea Region	Philippines and Singapore
		LIST OF INFORMATION PAPERS	
1	-	Meeting Bulletin	Secretariat

WP/IP No.	Agenda	Subject	Presented by
2	4	Update on ATC Surveillance Activities in Australia	Australia
3	4	Australian plans to Decommission some Radars	Australia
4	3.4	ADS-B Implementation progress in Mongolia	Mongolia
5	3.1	Implementation of ADS-B Sensors at Chennai Airport, India	India
6	4	Monitoring and Black Listing Non Performing ADS-B Avionics	India

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