



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

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

(SEA/BOB ADS-B WG/12)

Guangzhou, China
(8 to 10 November 2016)

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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1. Introduction

1.1 The Twelfth Meeting of the South East Asia and Bay of Bengal Sub-regional ADS-B Implementation Working Group (SEA/BOB ADS-B WG/12) was held in Guangzhou, China from 8 to 10 November 2016. The Meeting was hosted by the Air Traffic Management Bureau (ATMB) of the Civil Aviation Administration of China (CAAC) at the Guangzhou Baiyun International Convention Center.

2. Attendance

2.1 The meeting was attended by 44 participants from Australia, Bangladesh, China, Hong Kong China, Indonesia, Malaysia, Pakistan, Philippines, Singapore, Thailand, USA, and IATA. More than 15 additional participants from various places of China also attended the meeting as observers. List of participants is at **Attachment 1**.

3. Opening of the Meeting

3.1 The meeting was opened by Mr. Li Qiguo, Deputy Director General of ATMB. In his opening remarks, he extended welcome to all the participants to Guangzhou in this beautiful late autumn season to exchange views on technical developments of ADS-B and systematic implementation of the technology in the South East Asia and Bay of Bengal sub-regions. He emphasized the sound cost benefits and outstanding performance of the technology and highlighted ADS-B related trials and significant projects undertaken in China. CAAC hopes to strengthen the co-ordination and co-operation among the Civil Aviation Authorities in the region to facilitate the ADS-B implementation. He also expressed pleasure in hosting the meeting and wished the meeting full success in its deliberations.

3.2 On behalf of Mr. Arun Mishra, ICAO Regional Director, Mr. Li Peng, Regional Officer CNS extended warm welcome to all participants and expressed deep appreciation and gratitude to ATMB and CAAC for their continuous support to ICAO regional activities particularly for hosting ADS-B related meetings and seminars. He emphasized greater need for cooperation and collaboration between States to expedite implementation of air navigation service and infrastructure.

3.3 Mr. Alex Milns, Co-chair of Surveillance Implementation Coordination Group of APANPIRG (SURICG) and Chief Operating Authority – Surveillance, Airservices Australia thanked the hosts and acknowledged Mr. Greg Dunstone, who through his leadership in the ADS-B Study and Implementation Task Force had provided guidance and advice to this working group. He introduced SURICG and expressed the expectation from co-chairs of SURICG – “to ensure continuous and coherent development of the Surveillance parts of the Asia/Pacific Regional Air Navigation Plan in a manner that is harmonized with adjacent regions, consistent with ICAO SARPs, the Global Air Navigation Plan and the Global Aviation Safety Plan”.

3.4 Mr. M.H. Hui, another Co-chair of the SURICG and the Chief Electronics Engineer of HKCAD, had sent in his apologies to the meeting as HKCAD was currently occupied with cutover of the new ATC system.

4. Officers and Secretariat

4.1 Mr. Luo Yi, Director of CNS Division from Southwest Regional Air Traffic Management Bureau nominated by the host State chaired the meeting. 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 9 November 2016 when two Ad hoc working groups (SEA WG & BOB WG) met to progress sub-regional implementation plans.

5.2 The working language was English only, inclusive of all documentation and this Report. A total of Seven (7) Working Papers and Sixteen (16) Information Papers were considered by the meeting. A List of Working Papers and Information Papers presented at the meeting is at **Attachment 2**.

Agenda Item 1: Adoption of Agenda

1.1 The tentative agenda items presented in WP/01 were adopted as agenda for the meeting.

Agenda Item 2: Review the outcome of the ADS-B SIFT/15 and APANPIRG/27

2.1 The meeting reviewed the outcome of APANPIRG/27 meeting on ADS-B (**WP/02**). The meeting noted that the recommendations from the 11th meeting of the working group were endorsed by ADS-B SIFT/15 and CNS SG/20 and later adopted by APANPIRG/27. APANPIRG appreciated the efforts and progress made by the ADS-B SIFT including those from SEA/BOB ADS-B Implementation Working Group.

2.2 The meeting noted that SEA/BOB ADS-B Working Group will report its outcome and accomplishments to APANPIRG through SURICG. The meeting also noted the follow-up actions taken by the Secretariat and that the guidance materials including the revised AIGD adopted by APANPIRG/27 had been posted on the ICAO APAC website:
<http://www.icao.int/APAC/Documents/edocs>

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

Agenda Item 3: Review implementation and co-ordination activities and sub-regional implementation plans**ADS-B Implementation of South China Sea (IP/06)**

3.1 China updated on ADS-B ground infrastructure in South China Sea. 4 ADS-B ground stations made in China and one data station were deployed. The ADS-B data received from the 4 ground stations were integrated into the ATC automation systems which has enhanced the surveillance coverage of ATS routes M771 and L642 effectively.

3.2 China national ADS-B information network is configured in 3 levels i.e. the first-level - data processing center; second-level - regional data processing center and third level - data stations located throughout the countries. Three levels are interconnected with a dedicated data communication network. Sanya ADS-B data-centralized -processing system, a vital part of the three-level architecture was installed in November 2014 at Sanya Air Traffic Control Centre. Data from multiple ADS-B ground stations are collected, verified, fused by the processing system before sending to ATC automation system. The fusion data had been tested in the Thales system in Guangzhou ACC, LES system in Sanya Terminal and Telephonics system in Sanya ACC. The test results proved the expected functions. China is willing to share the ADS-B data from its ADS-B data processing Center with related parties in the sub-region.

Update on ADS-B Implementation in Thailand (IP/09)

3.3 Thailand informed the meeting of AEROTHAI's ADS-B implementation plan. Currently ADS-B target reports in ASTERIX CAT 21 (Version 1.4 or 2.1) format decoded from downlink messages are transmitted to central processing system using AEROTHAI Internet Protocol (IP) cloud network.

3.4 With 6 ADS-B ground stations installed throughout Thailand, the airspace at and above 20,000 feet is mostly covered, making it possible to provide ADS-B surveillance service for en-route operation in Bangkok FIR at 20,000 feet and above. The installed ADS-B ground systems are being certified by Civil Aviation Authority of Thailand (CAAT) with a target date by 2017.

3.5 Additional ground stations capable of dual functions, i.e. ADS-B and WAM, are planned to be deployed in Thailand, aiming at being able to provide ADS-B coverage from 13,000 feet to around 45,000 feet for en-route operation and from 2,000 feet to 11,000 feet for TMA operation at 8 airports. The installation of these ground stations is expected to start in mid or late 2017.

3.6 Multiple surveillance sensor data, including SSRs, ADS-B, and WAM, will be integrated into the new ATM system expected to be operational by the end of 2018.

3.7 Legal assessment regarding ADS-B data sharing between Thailand and neighboring States is being conducted. .

Update on ATC Surveillance Activities in Australia (IP/02)

3.8 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;
- 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;
- Australia now has more than 70 ADS-B receivers (45 ADS-B and 28 WAM based ADS-B receivers) and is planning additional 15 sites;
- A separate project is deploying ADS-B ground station to an offshore gas platform in Timor Sea Northwest of Australia to extend coverage beyond the mainland. Australia will make the data available to Indonesia under existing ADS-B data sharing agreement;
- A project to use ADS-B (to be seen by controllers as a radar input) is nearing completion at Melbourne and Perth TCU;
- The critical mandate effective date 2 February 2017 is approaching. 87% of all IFR flights are now ADS-B equipped. 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 to identify mismatch between ATC cleared level and pilot selected level in the FMS is in operation in Australia;

- Australia was working with Aireon to examine the benefits of space based ADS-B but has not yet committed to the technology; and
- Worked together with industry 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.

Implementation of ADS-B in Indonesian Airspace (IP/10)

3.9 Indonesia updated ADS-B implementation status. Areas of ADS-B implementation are in Jakarta FIR and Ujung Pandang FIR Class A airspace, from FL290 up to FL460 within ADS-B coverage. From June 2015 until 31 December 2017 carriage of ADS-B equipment for flight from FL290 up to FL460 is optional. However with ADS-B only surveillance coverage, priority will be given to aircraft which are ADS-B equipped over non-equipped aircraft. Starting 1st January 2018 the implementation of ADS-B in Class A airspace from FL290 up to FL460 is mandatory.

3.10 70% of Indonesia airspace was covered by surveillance (35 RADARs), since the implementation of ADS-B (30 ground stations), more than 90% of Indonesia airspace is covered by surveillance. Some ADS-B ground stations had been shared with Singapore and Australia.

3.11 90% of the aircraft operating in Indonesia airspace are equipped with ADS-B. To improve Level of Safety, Airnav Indonesia proposed the implementation of ADS-B within the controlled airspace below FL290. During the implementation phase, Airnav Indonesia observed a problem with aircraft of B787 which triggered a false alarm (transponder 7700) in MATSC ATC System.

3.12 As an archipelago country, using ADS-B gives Indonesia more benefits than RADAR, few RADAR gaps had been already covered by ADS-B. Airnav Indonesia was to upgrade ADS-B ground stations in 10 sites from type DO260A into DO260B THALES product that will be completed by the end of 2016.

ADS-B to Radar Format Converter- Implementation in Australia (IP/03)

3.13 Australia introduced the implementation of a new capability to convert ADS-B data into a 'radar like' format for the integration into ATM surveillance platforms which cannot process ADS-B data in Asterix Cat.21 format.

3.14 The ADS-B to Radar Converter (ARC) has been developed by Airservices Australia. The ARC converts the position information into bearing and distance from a specified 'radar centre'. By using multiple ADS-B ground stations in different locations, the coverage from the ARC will be much better at lower altitudes than a traditional radar. The rotation rate is configurable, but is set to 30 RPM (2 seconds rotation period).

3.15 This solution is 'sub optimal' compared to processing the ADS-B data as Asterix Category 21 directly in the ATM system; and only ADS-B equipped aircraft data can be processed by the ADS-B to Radar converter. Traditional radar is still required to support ATC operations, ARC is useful as risk mitigation against traditional radar failure.

Boeing 787 ADS-B Deficiency Update (IP/04)

3.16 This paper was presented by Australia, Singapore, Hong Kong China, and United States, with contribution from Boeing and Rockwell Collins. It provided an update on the ADS-B problem experience with Boeing 787 aircraft and detail of rectification plan.

3.17 FAA initially reported 2 fault instances, and a 3rd fault was seen some months later. It was subsequently identified as occurring when the internal timing between different elements of the Integrated Surveillance System became synchronized, resulting in data packets (for both GNSS position and also for altitude), not being distributed to the transponder. Software changes to elements of the Integrated Surveillance System (ISS) have been identified necessary to fix the root cause.

3.18 Rockwell Collins are progressing towards TSO certification of the complete software enhancements (expected during November 2016). Boeing will perform a change to the B787 Type Certificate for incorporation of the upgraded ISS, to be available from April 2017. In response to a query, Australia clarified that B787 with observed problem is still considered equipped and not blacklisted. This has been the subject of a risk assessment. States should be aware of the issue B787 and continue to follow up with the provided solution.

ADS-B OUT: Ensuring Preparedness for the 2020 Equipage Mandate (IP/05)

3.19 USA reminded the meeting about the ADS-B out mandate. From 1 January 2020, all aircraft operating within certain airspace are required to be equipped with Automatic Dependent Surveillance – Broadcast (ADS-B) Out avionics per Title 14 of the U.S. Code of Federal Regulations (CFR) part 91.225 and 91.227. This requirement will affect both U.S. and foreign operators.

3.20 To ensure preparedness throughout the aviation community and prevent any operational disruptions, the FAA is promoting awareness to the international community so that foreign aircraft intending to operate within the affected airspace will be sufficiently equipped with ADS-B Out technology by the time the requirements come into effect.

3.21 The FAA approved a five year limited exemption, applicable only from 91.227(c) (1) (i) & (iii) requirements under some given conditions. This exemption is applicable to both U.S. and foreign operators. Further detail can be found at: <http://www.faa.gov/nextgen/equipadsb/exemption/>

ADS-B Equipment Certification and Localization in China (IP/11)

3.22 China presented the meeting about its procedures on ADS-B equipment certification of CAAC to ensure the operational equipment in compliance with ICAO SARPs and meet the specific operational requirements of CAAC.

3.23 CAAC established its CNS equipment validation and certification system in 2002 and continued to improve it. According to relevant regulations, ADS-B equipment is required to be certified by CAAC before its operational use. Working procedure has been set up for the approval of ADS-B ground equipment. The established rules and procedures of certification provide means of factory acceptance checking and quality control system evaluation, design review and equipment factory testing, onsite stability and reliability testing to eliminate the potential defect issues at any stage of system development and production.

3.24 At present, 6 domestic manufacturers are officially certified by CAAC for ADS-B ground equipment supply and installation services to CAAC ADS-B projects. Meanwhile, ADS-B equipment certified by CAAC has been deployed in some other countries and regions. One such example is for the Kenya Civil Aviation Authority which awarded a project of 8 ground stations to a Chinese manufacturer, to improve the ATS surveillance capability in its airspace.

Equipage status of aircraft and monitoring of avionics performance (IP/14)

3.25 Based on statistics collected by the ADS-B stations used by Singapore, the distribution of DO-260, DO-260A and DO-260B avionics is about 82%, 6% and 12% respectively. It was also shared that, for the Singapore registered carriers, only the A350, A380 and B787 are DO-260B. The rest of the aircraft were DO-260. It was also noted that aircraft displaying low NUC and jumping NUC has reduced.

KL FIR ADS-B Ground Stations Coverage (IP/12)

3.26 Malaysia presented information on the current and future ADS-B system coverage in Kuala Lumpur Flight Information Region (KL FIR). The first Malaysian ADS-B system was installed in Kuala Terengganu (KT) in 2008 for study and monitoring purposes. Installation of two additional ADS-B ground stations in Langkawi and Genting will be completed by the end of January 2017.

3.27 KT ADS-B ground stations are the first generation of ADS-B sensor currently with DO-260 and DO-260A compliance. Langkawi and Genting ADS-B ground stations will be up to DO-260B compliance and will provide overlapping ADS-B coverage for KL FIR.

ADS-B Implementation Plan in Bangladesh (IP/15)

3.28 Bangladesh updated their ADS-B Implementation Plan. CAA Bangladesh has taken a Public Private Partnership (PPP) project that includes a Multi-Mode Surveillance System (RADAR, ADS-B and Multilateration (MLAT)) along with CNS/ATM system. The installation of ADS-B ground stations throughout the country as back up to the present and proposed new Mode S radars and as a means of filling the gap in radar coverage over the Bay of Bengal area. The PPP project is expected to be completed by December 2019.

3.29 The ADS-B implementation plan includes installation of four ADS-B ground stations at: Dhaka, Cox's Bazar, Saidpur and Barisal Airports. Each ADS-B station would provide coverage of at least 250NM line of sight. Bangladesh is willing to share ADS-B data and VHF RCAG communications with neighboring States to enhance the safety and surveillance capability in the sub-region.

3.30 The PPP project also includes installation of number of MLAT stations to provide surface movement control at HSIA, Dhaka as well as TMA coverage as a backup and complimentary RADAR coverage to the Dhaka MSSR. Bangladesh will replace the existing Mode A/C radars by installing new Mode S Radars in Hazrat Shahjalal International Airport, Dhaka. Another installation work of new Mode S Radar is in going on at Shah Amanat International Airport, Chittagong.

3.31 The ADS-B ground stations, MLAT and Radar systems will be integrated with the new ATM Automation system to be installed at Dhaka.

Review of Avionics Requirements Template (WP/06)

3.32 This paper was jointly presented by Australia, Hong Kong China, Singapore and USA. It invited the Working Group to discuss changes to the Requirements Template adopted by APANPIRG, following the issuance of the FAA AC No. 20-165B.

3.33 A meeting reviewed the proposal attached to the paper. The changes impact three document namely: the agreed APANPIRG mandate template agreed by APANPIRG/26 in 2015; relevant updates to the APAC ADS-B Implementation and Operations Guidance Document (AIGD Section 9.11 and Appendix 3); and the SUPPs (Doc.7030) approved in 2013. The meeting discussed the proposal and generally supported to the following changes which are more flexible to accommodate updated version in the requirements:

- EASA AMC 20-24, or , or EASA CS-ACNS;
- FAA AC No. 20-165A or later – Airworthiness Approval of ADS-B; or
- meets the equipment configuration standards in Appendix XI of Civil Aviation Order 20.18 of the Civil Aviation Safety Authority of Australia.

3.34 China considered that the requirements in the template were too specific and prevented other Administrations from making reference of their own requirement with the equivalent requirement. The requirement might be same with different names of document. Therefore, China initially proposed to add: “....the relevant requirements such as (list all of above three). After explanation and clarification given by the Secretariat of the above three regional documents, China alternately propose additional 4th bullet:

- any relevant national requirement equivalent to any of above rule specifications.

3.35 The meeting could not reach an agreement on the proposal, so the meeting agreed to refer this to SURICG/2 meeting scheduled for June 2017 in Ulaanbaatar, Mongolia. Australia, China, Hong Kong China, Singapore and USA were requested to review the proposal and develop a common proposal. Accordingly the following Action Item was agreed:

ACTION ITEM 12/1 – Common Proposal for changes to Requirement Template

That, Australia, China, Hong Kong China, Singapore (as lead) and USA develop a common proposal for updating regional three Documents i.e. a) APANPIRG Conclusion 26/42; b) AIGD; c) SUPPs (SUPPs for PAC Region may also be expected to be draft based on the agreed wording).

Review Outcome of SEA/BOB ADS-B Implementation WG/11 (WP/04)

3.36 The Secretariat presented WP/04 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 November 2015. The achievements by SEA/BOB ADS-B WG/11 were also noted.

ADS-B collaboration in South China Sea Region (WP/07)

3.37 Following the collaboration between Indonesia and Singapore and between Singapore and Viet Nam, the surveillance and DCPC gaps on some major air routes (M753, L642, M771 and N892) are covered. This enabled reduction of separation to 20NM from 10th Nov 2016. Discussion with neighbouring FIR was on going to reduce separation on L625 and M758.

3.38 There was new collaboration between the Philippines and Singapore where ADS-B data and VHF will be made available from Bataraza, the Philippines. There was also new collaboration between Singapore and Viet Nam where ADS-B data and VHF will be made available from Ca Mau, Viet Nam.

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

3.39 The meeting reviewed the reports on the Sub-regional ADS-B implementation plan/projects presented by SEA and BOB Ad Hoc working groups (Singapore was Rapporteur for SEA while Thailand was for BOB). The discussions were based on the outcome of previous meetings of the SEA/BOB ADS-B WG/11 and information made available to the meeting. The outcome of discussions by Ad Hoc groups is provided in **Appendix B** to this Report which could serve as a basis for further development of the sub-regional implementation plans and follow-up actions for coordination by States/Administrations. States/Administrations concerned were urged to take follow-up actions to achieve harmonized implementation of the identified projects.

Agenda Item 4: Report on ground system and avionics performance monitoring and improvement in compliance**ADS-B Update Rate Performance Monitoring Tools (WP/05)**

4.1 Indonesia informed the meeting that Indonesia has been implementing ADS-B Tier-1 within Jakarta and Ujung Pandang FIR between FL290 and FL460 since 25 June 2015. In this connection, the meeting reviewed the concept of Tier 1 endorsed at Sixth meeting of ADS-B SITF held in 2007. Indonesia considered important to monitor ADS-B update rates to ensure safety and for ADS-B data sharing and proposed to develop standard framework for monitoring ADS-B update. The “in-house” monitoring tool for “Aircraft Update” between ADS-B ground station and the Surveillance Data Processor (SDP) stations developed by AirNav Indonesia was introduced. The tool monitors ADS-B report in one second interval. When no updates from an aircraft has not received for more than 15 seconds, the call sign of the aircraft would be highlighted in black background.

4.2 It was noted that the rate of aircraft updates are reduced at the coverage edge of an ADS-B Station. Therefore in such airspace, the separation using ADS-B in Tier 1 should not be introduced where adequate update rate is not guaranteed. Other integrity parameters are also monitored. The meeting noted that the existing ATM automation system has no such monitoring function for updates from aircraft, however track updates and track coasting will give the controller an indication that a track update is received or not. States were asked to discuss with ATM system suppliers for such functions in the future. It was also clarified the updates rate in an overlapping airspace, update rate is assessed as combined output from all ground stations, but this can be configured to check single ground stations only. Indonesia proposed to set up a small working group to facilitate the development of framework for ADS-B Update Rate monitoring.

4.3 Singapore stated that the lower detection or un-detection is unnecessarily resulted from aircraft/avionics and could be caused by ground station. Australia also suggested that the requirement for updates rate monitoring between States should be addressed in the bilateral agreement for surveillance data sharing. It was also recognized that many monitoring tools developed by a number of States/Administration now are available. The design concept for the monitoring tool may also be different. Therefore, the meeting was not in favour of setting a working group for development of ADS-B update rate monitoring framework, preferring that each state consider its own methodologies.

Reasonable Periodic Reporting Mode (IP/08)

4.4 China introduced two methods to deal with periodic reporting mode, compared to their advantage and disadvantage, and determined which one is more reasonable.

4.5 Normally, 1090 ES ADS-B ground station (receiver) equipment provides ADS-B service to display terminal at a given reporting mode (data driven or periodic). When periodic reporting mode is applied, ADS-B ground station (receiver) equipment will generate ASTERIX Category 021 reports with a given reporting rate. The disadvantage of this mode is increasing transmission delay, and its advantages are maintaining appropriate reporting rate, saving transmission resources, reducing communication load and bandwidth occupation. Therefore it is helpful for station sites where the transmission resources are insufficient. States/Administrations were encouraged to take appropriate site-specific solutions to resolve this concern.

ADS-B Tracks Verification on Precise Timing and Multilateration Algorithm (IP/07)

4.6 China made a presentation regarding an approach of position checking of ADS-B tracks based on precise timing and multilateration algorithm. It can be used to identify false tracks and determine the position deviation of real tracks by comparing the reported position from airborne ADS-B equipment and the calculated position.

4.7 ADS-B ground stations record the Time Of Arrival (TOA) of airborne position message when receiving it, and send it to the data processing center. The data processing center calculates the real position of an aircraft using multilateration algorithms according to the TOA of airborne position messages which are transmitted by the same aircraft at the same time and received by different ground stations. By comparing the position calculated and that in the data packages, the data processing center can identify whether the target is real and whether the position is correct.

Demonstration on ADS-B Avionics Problem Reporting Database (APRD)

4.8 In accordance with directive of the the 51st DGCA Conference in 2014, ICAO RSO had initiated development of the database based on the technical requirements for the database confirmed by the fourteenth meeting of ADS-B SITF held in 2015. The development of APRD requirement was led by Hong Kong China in collaboration with Australia and Singapore. The technical programme work of the databased had been carried out by the ICAO Regional Sub-office (ICAO RSO, Mr. Hou Zhenghao) with successful support from Network Communication Centre of Middle and Southern Regional ATMB.

4.9 A demonstration on the APRD was jointly presented to the meeting by Mr. Hoang Baosheng, a database expert from the regional administration of ATMB and Mr. Ho Wee Sin CAAS. The presentation included a work flow of problem reporting and phases of processing, and also highlighted the roles of the reporting States/Administration, ICAO, verifying and follow-up parties, as well as a prototype of the database and human-machine interface (HMI) design. The participants at

the meeting were happy with the successful demonstration. Some suggestions for improvement of the HMI to facilitate some mandatory reporting elements input were consolidated and provided to the developer for further follow-up.

4.10 The issue of B787 was input into the testbed as an example. The lead State for ADS-B implementation was requested to input some generic ADS-B avionics performance problems commonly encountered and reported in the last few years as examples for other States/Administrations to follow. The States/Administrations including the registered operators will be encouraged to make best use of the database to improve the quality of avionics equipage in ADS-B mandated airspace, to report and share ADS-B avionics problems with others, to keep abreast of the latest reported problems, and to exchange among themselves the lists of airframes exhibiting the problems for civil aviation authorities to follow-up with airline operators concerned for remedial action.

4.11 The meeting noted the significant progress on the program and asked the secretariat to coordinate with ICAO ICT section to have it implemented on the ICAO APAC webpage once the improvement is done. Necessary guidance on use of the APRD was also requested to inform Administrations through a State Letter.

4.12 The meeting appreciated the contribution to the development of APRD by all stakeholders and coordination on this matter was done between China/Hong Kong China and Australia/Singapore/ICAO RSO. The meeting also thanked ICAO RSO for the initiative made and good and continuous support provided by Middle and Southern Regional ATMB. Their further support from ATMB towards full implementation of the APRD is expected.

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

Review TOR of the WG (WP/03)

5.1 The meeting reviewed the TOR of the SEA/BOB ADS-B Working Group. The meeting also recalled the discussions on the future focus of the working group at the tenth and eleventh meeting of the WG. The slow response on regional collaboration on ADS-B data sharing was one of the concerns. The working group was expected to gather difficulties and assist States in resolving them. The meeting noted that APANPIRG already agreed to change the reporting path of the Working Group to Surveillance Implementation Coordination Group. The meeting also identified the need to keep the SEA/BOB ADS-B Implementation Working Group to promote implementation in two sub-regions. As result of review, the meeting confirmed the updated TOR provided in **Appendix C** through the following Decision:

Decision 12/1 – Revised TOR of SEA/BOB ADS-B Implementation WG

That, the revised Terms of Reference of SEA/BOB ADS-B Implementation Working Group provided in the **Appendix C** is adopted.

5.2 The meeting noted that the Performance Based Communication and Surveillance (PBCS) is becoming standard. In this connection, the meeting recalled the Guidelines of performance parameters for using ADS-B managed service adopted by APANPIRG in 2007. States were advised to consider the performance parameters provided in Appendix F (Baseline ADS-B Service performance Parameters) to the Sixth meeting Report of ADS-B SITF as service performance guidelines while finalizing acquisition of an ADS-B managed service agreement with a service provider. The baseline parameters in the table provide guidelines for various performance requirements of ADS-B Category (Tier) 1, 2 or 3 services that States may consider when acquisition of an ADS-B managed service. The meeting therefore recommended that the performance requirements of ADS-B management service may be reviewed by SURICG to see if they are still valid or need to be upgraded or replaced.

Action Items (Subject/Tasks) List

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

5.4 The meeting also reviewed the table of readiness status of ADS-B Ground Stations which are able to receive Version 2 (ADS-B DO260B) compliant ADS-B Data. The updated Table is provided **Appendix E** to this Report.

Agenda Item 6: Date and venue for the next meeting and any other business**Use of ADS-B under Radar Environment (IP/13)**

6.1 Singapore initially planned to use ADS-B in both radar and non-radar environment. However, due to the requirements stated in EUROCAE ED-161 for the radar-environment, Singapore only started the use of ADS-B in non-radar environment on 12 Dec 2013.

6.2 Subsequently, Singapore studied the effect of ADS-B on fused tracks in Radar environment and found that radar track fused with ADS-B is more stable. It was also considered that the addition of ADS-B into the fused radar track hardly bring any additional risk. Taking these into consideration, Singapore included ADS-B into the fused track on 22 August 2016. It was noted that, in the event of total radar failure, procedural separation will still be applied.

6.3 Subsequent study will involve the assessment of using ADS-B for radar-like separation services in the event of total radar failure.

ADS-B equipage Flight Plan supplementary indication proposal (IP/16)

6.4 The meeting noted the information provided the Secretariat and presented by Mr. Ho Wee Sin from Singapore and Mr. Li Xin from China who participated the second meeting of the Surveillance Panel held in Montreal Canada from 11 to 19 October 2016. The information paper provides a consolidated proposal for supplementing the existing ADS-B equipage indication in the flight plan. The paper is “as revised” following discussion by the SP/2 AIRB WG/2 meeting in October 2016. It was informed that this IP was forwarded to ATM Requirement and Performance Panel ATMRPP secretary for their further considerations (since this task is under their responsibility). ATMRPP they would discuss a related job card at the next meeting.

Date and Venue for the Next Meeting

6.5 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 2017. 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 BOB sub-region).

Significant development and achievements since last meeting

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

- updated the ADS-B Implementation status in APAC region;
- Exchanged information on monitoring avionics performance;
- Successful Demonstration of APAC ADS-B Problem on-line Reporting databases initiated by ICAO RSO and completed with support by the Middle and Southern Regional ATMB; and
- Updated the status of readiness of ADS-B Ground Station for receiving DO260B data.

Note of appreciation

6.7 The meeting expressed its appreciation and gratitude to the Air Traffic Management Bureau of China for hosting the Working Group meeting and excellent working arrangement made. The participants appreciated activities organized by the ATMB during the meeting including further development of the Asia and Pacific ADS-B Problem Reporting data base and a culture visit.

6.8 A number of Chinese ADS-B ground stations makers/vendors who have received products certificates from CAAC including Jezetek ATC science company limited, Sichuan Sino-Technology Development Co., Ltd., Nanjing LES Information Technology Co. Ltd.; Chengdu Civil Air Traffic Control Science & Technology Co. Ltd.; Technology Equipment Development Co. Ltd. etc. demonstrated their equipment during the meeting at coffee/tea breaks.

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	<p>A total of 45 ADS-B ground stations and 28 WAM stations are operational (Total 73)</p> <p>ATC readiness since 2004 ADS-B data sharing with Indonesia operational since 2/2011.</p> <p>ADS-B data sharing planned with PNG</p> <p>ASMGCS using multilateration and ADS-B is operational in Brisbane, Sydney, Melbourne and Perth</p> <p>An additional 15 ADS-B ground stations are planned in 2017-2020 period.</p> <p>November 2016 – ADS-B converted to “radar like” Cat 48 for use in Melbourne Terminal Area. Perth to follow in 2017.</p> <p>Onesky replacing the current ATM system is expected to be fully operational in 2020 period.</p>	<p>2009/effective date of mandating in upper airspace 12/12/2013.</p> <p>A forward fit ADS-B mandate also applies from 2/2014 for all IFR aircraft at all flight levels.</p> <p>An ADS-B mandate for all IFR aircraft applies from 2/2017.</p>	<p>At/above FL290 from 12/2013 for domestic & foreign aircraft.</p> <p>All airspace for IFR aircraft from 2/2017</p>	<p>3NM and 5 NM surveillance separation.</p> <p>3/2016 - Manual of ATC updated to include 3 nautical mile separation using ADS-B in terminal control unit.</p> <p>Vectoring allowed using ADS-B</p> <p>Precision Runway Monitoring for Sydney WAM</p>	<p>WAM is operating in Tasmania since 2010 with 5 NM separation service.</p> <p>WAM is also operating in Sydney for 3 NM separation service in TMA and for precision runway monitoring function.</p>
BANGLADESH	<p>Bangladesh has a plan to install four ADS-B ground stations to be installed at Dhaka, Cox’s Bazar, Saidpur and Barisal Airports by 2019.</p> <p>ADS-B data will be integrated with new ATM system at Dhaka.</p> <p>Bangladesh has also a plan to install MLAT stations to provide surface movement control at HSIA, Dhaka as well as TMA coverage as a backup and complimentary RADAR coverage to the Dhaka MSSR.</p>				<p>Bangladesh is willing to share ADS-B data with neighbouring States to enhance the safety and surveillance capability in the sub-region.</p>

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
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	<p>5 UAT ADS-B stations used for flight training at CAFUC to be upgraded to support 1090ES by 2017.</p> <p>308 ADS-B stations nationwide will deployed as 1st phase by the end of 2018.</p> <p>1 ADS-B station operational in Sanya FIR since 2008. Sanya ATC system ready since July 2009 to support L642 & M771. Additional 4 ground stations deployed in 2015.</p> <p>Chengdu-Jiuzhai project finished in 2008 with 2 ADS-B stations</p> <p>Chengdu - Lhasa route surveillance project completed with 6 ADS-B stations using 1090ES since 2010. Trials operated from May 2011.</p> <p>9 ADS-B stations deployed on the routes H15 and Z1 in 2015</p>	NOTAM issued on ADS-B trial operation			
HONG KONG CHINA	<p>A larger-scale A-SMGCS covering the whole Hong Kong International Airport put into operational use in April 2009.</p> <p>Data collection/ analysis on aircraft ADS-B equipage in Hong Kong airspace conducted on quarterly basis since 2004.</p> <p>ADS-B trial using a dedicated ADS-B system completed in 2007.</p> <p>ADS-B out operations over PBN routes L642 and M771 at or above FL 290 within HK FIR was effective in December 2013 and within HK FIR at or above FL 290</p>	AIP supplement issued on 29 Oct.2013/12 Dec. 2013 as effective date.	L642/M771 ATS routes.	To be determined.	<p>ADS-B signals being fed to ATC controllers under an operational trial programme.</p> <p>ADS-B operation in Hong Kong FIR re-scheduled for Dec. 2016. An AIP Supplement was issued on 29 Aug. 2014.</p>

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
	<p>is planned for December 2016.</p> <p>ADS-B ground station infrastructure completed in 2013.</p> <p>ADS-B signal provided by Mainland China to cover southern part of Hong Kong FIR commenced in 2010 and will be put in operation use after commissioning of the new ATMS planned for November 2016.</p>				
MACAO, CHINA	Mode S MSSR coverage available for monitoring purposes.				Airspace – ATZ only
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 provided in 2013. BY EMAIL	ADS-B mandate commencing from 31 st December 2013			
FRANCE (<i>French Polynesia</i>)	ATM system is ready for ADS-B sensors/Installation of 5 first GS expected at beginning of 2017. 2 nd stage with implementation of 7 GS and associated VHF coverage.			5 NM for airspace under coverage.	
INDIA	<p>ASMGCS (SMR + Multilat) is operational at Delhi, Mumbai, Chennai, Kolkata, Bangalore and Hyderabad Airports.</p> <p>ASMGCS is also being installed at 05 more international airports.</p> <p>ADS-B Ground Stations were installed at 21 locations across continental airspace and including Oceanic airspace at Port Blair.</p> <p>Procurement of 10 more ADS-B Ground stations is under consideration in 2016..</p> <p>ATM automation systems at 22 ATC Centres are capable of processing ADS-B data and provide the</p>	AIP supplement issued on 17 th April 2014 with effective date of implementation from 29 th May 2014.			<p>ADS-B in India to provide redundancy for radar and filling the surveillance gaps.</p> <p>ADS-B data trial operations commenced in 2015 in both Non-radar and radar environment, in Enroute & Terminal phases of flight for ATC purposes.</p> <p>AIP SUP 18 of 2014 issued</p>

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
	information on Display.				
INDONESIA	<p>30 Ground Station successfully installed.</p> <p>An additional 7 locations are planned for Papua region.</p> <p>ADS-B data sharing with Australia and Singapore.</p>	<p>24 July 2014 AIP Supplement No. 10/14 for using ADS-B for situation awareness effective from 18 Sep. 2014.</p> <p>25 June 2015 AIP Supplement 08/15 on ADS-B Implementation (Tier-1) published with effective date on 25 June 2015.</p>	Mandate from January 2018 for Class A airspace from FL290 to FL460	Intended to use for 5 NM separation	
JAPAN	<p>Multilateration Systems for surface monitoring have been implemented at eight airports</p> <p>PRM (WAM) has been implemented at Narita Airport.</p> <p>En-route WAM system is manufacturing and will be put into operation in FY2018</p> <p>Plan to evaluate accuracy of ADS-B information and has intension to introduce ADS-B to the oceanic direction.</p>				
LAO PDR.	<p>2 ADS-B ground stations were installed in Vientiane and Luangprabang Int'l Airport in 2015 and the ADS-B data is fused with MSSR data target in the ATM Automation system.</p> <p>3 additional ADS-B ground stations (DO-260B compliant) will be completed the installation at existing MSSR sites (Xiengkhouang, Savannakhet and Champasack) by 2016 to Q1 of 2017 to enhance the full ADS-B coverage of Lao FIR.</p>				

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
MALAYSIA	<p>Malaysia installing two (2) ADS-B ground stations in Genting Highland and Langkawi. The said ADS-B are expected to be commissioned by end of January 2017.</p> <p>Malaysia revised the plan to start mandate ADS-B requirement for implementation of ADS-B service for exclusive airspace/route without radar coverage within KL FIR by the end 2022.</p> <p>Specific Routes for ADS-B Implementation Plan: P574, N571, L510, P628, L645 & P627.</p>	Revised Plan to issue mandate with target effective date by end of 2022.		ICAO approved surveillance separation.	
MALDIVES	<p>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.</p> <p>Maldives' ADS-B is integrated with the ATM system (in November 2013), and under observation prior to commencing trials.</p> <p>Maldives has planned to share ADS-B data with its adjacent FIRs. Updated by email</p>				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.				
MYANMAR	<p>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.</p> <p>Completion of integration to Euro Cat. C. in 2014.</p> <p>Agreed to share ADS-B data with India, agreement on sharing being negotiated.</p>				Supplement radar and fill the gaps to improve safety and efficiency ADS-C/CPDLC integrated in Yangon ACC since 2010.

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
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	<p>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.</p> <p>Additionally MLAT data from the Auckland MLAT system is used to provide airport surface movements at NZAA.</p> <p>The New Zealand Navigation and Airspace and Air Navigation Plan “New Southern SKY” issued in May 2014</p>	<p>New Zealand has plans to introduce ADS-B OUT mandates as follows: ADS-B OUT equipment requirement for all aircraft operating in controlled airspace above FL 245 from 1 January 2019</p> <p>ADS-B OUT equipment requirement for all aircraft operating in controlled airspace from 1 January 2022. A forward fit requirement for ADS-B equipage on all newly registered aircraft in 2017.</p> <p>The Rule will not specify particular Technical Standing Orders (TSO), or transponder GNSS receiver models for position input into ADS-B.</p>		5 NM Surveillance Separation in en-route airspace, and 3NM surveillance separation in terminal airspace.	

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
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 2016. These stations will be DO260B compliant and operational by end of 2017.				
PAPUA NEW GUINEA	<p>Initially 8 ADS-B sites to be deployed across PNG to provide seamless coverage above FL285.</p> <p>First site to be installed May/June 2016, with remainder to be completed between May-July 2017.</p> <p>Up to an additional 7 sites to be rolled-out in the 2018/19 timeframe. Site location will be dependent on infrastructure, security and an analysis of Phase 1 site performance.</p> <p>In late 2016, PNGASL (ANSP) will be implementing a replacement ATM automation system.</p> <p>The system will support fusion of ADS-B and RADAR data.</p> <p>From 2017 onwards, PNGASL will be looking to share ADS-B data with Indonesia and Australia.</p>	<p>An ADS-B mandate is on CASA PNG roadmap, however legislation yet to be developed.</p> <p>The Australian mandates will largely drive equipage for overflights (e.g. East-Asia to Australia/South Pacific).</p> <p>Expectation is that PNGASL (the ANSP) will lead development of ADS-B mandate framework.</p> <p>Initial steps may include mandate above F245 – but will depend on performance of Phase 1 ADS-B deployment. Country-wide mandate not envisaged before 2021/22.</p>	None	<p>Air Traffic Control</p> <p><u>Approach/Arrivals</u></p> <p>2017 – 5NM 2018 – 3NM (approach)</p> <p><u>Upper Airspace (>FL245)</u></p> <p>2017/18 – Situational awareness.</p> <p>2018/19 – 5NM</p> <p>Note: Implementation dictated by training requirements and new ATM system transition priorities.</p> <p>Flight Service</p> <p><u>Directed Traffic (FIS)</u></p> <p>2017 – Situational awareness</p>	

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	<p>1. Manila ATM Center ADS B ground station</p> <p>2. Phase 1 Projects:</p> <p>a. Bataraza, Palawan (Data sharing with Singapore and Philippines)</p> <p>b. Kalayaan Island, Palawan</p> <p>c. Iba, Zambales</p> <p>d. Bolinao, Pangasinan</p> <p>3. Phase 2 Projects:</p> <p>a. Puerto Princesa, Palawan</p> <p>b. Jomalig Island</p> <p>c. Tumbler Airport, GenSan</p> <p>d. Bojeador, Ilocos Norte</p>				<p>This should be completed and will be available on Q3 2017 for assessment / training purposes</p> <p>These four (4) ADS B ground stations will be completed in 2017.</p> <p>These four (4) ADS B ground stations will be completed in 2018.</p>
REPUBLIC OF KOREA	<p>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 Gimpo 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.</p>				
SINGAPORE	<p>The airport MLAT system was installed in 2007 and “far-range” ADS-B sensor was installed in 2009.</p> <p>ATC system has been processing ADS-B data since 2013.</p>	<p>AIC was issued on 28 December 2010/effective from 12 Dec.2013.</p> <p>AIP supplement published in Nov 2013 to remind operators of ADS-B exclusive airspace implementation.</p>	<p>L642 and M771.</p> <p>At and above FL290. Also affect the following ATS routes N891, M753, L644 & N892</p>	<p>40nm on ATS routes L642, L644, M753, M771, N891 and N892</p> <p>30nm implemented on 26th June 2014 on ATS routes L642, M753, M771 and N892;</p>	<p>Safety case was completed end of November. 2013.</p>

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
		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.		20nm implemented on 10 Nov 2016 on ATS routes L642, M771, M753 and N892	
SRI LANKA	Installation of five (05) ADS-B Ground Receiving stations have been re-planned to be completed by end of November 2016, with its commissioning & ATM System Readiness by end of December 2016.	Revised Date of Equipage mandate 31 st Dec. 2016	All ATS Routes within Colombo TMA	Initially 5 nm within Approach Radar Coverage, 8 nm within Area Radar Coverage & Procedural Separation minima outside Radar Coverage.	Reduction of Terminal/En-route separation to 30 nm & Use of ADS-B alone for vectoring & separation only after safety assessment.
THAILAND	<p>MLAT has been in operation at VTBS since 2006 and was installed at VTBD in 2016 with the expectation to be operational in 2017. At VTCC and VTSP, it is planned that MLAT will be installed in 2017.</p> <p>ADS-B ground stations (DO-260B compliant) have been installed in Thailand for research and development purpose and are being undergone the certification process, expected to finish by 2017.</p> <p>WAM and ADS-B ground stations are planned to be installed nationwide, starting from mid or late 2017 to provide coverage for en-route and TMA operations.</p> <p>New ATM system to be operational in 2018 will be capable of fusing multi-sensor data, including SSR, ADS-B, and WAM.</p>	Aircraft equipage mandate is being planned with the expected target effective date around the end of 2018.			
TONGA	Trial planned for 2017				

SEA/BOB ADS-B WG/12
Appendix A to the Report

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
UNITED STATES	<p>As of 1 April 2016, the “baseline” set of Service Volumes planned by the FAA in 2007 are operational, using data from over 600 radio sites installed by Harris. Since 2007, FAA has planned and funded activities to activate additional Service Volumes that Harris will service using additional radio sites; all but 16 of these radio sites have been installed and are operational as of 1 April 2016.</p> <p>As of 1 April 2016, 135 of the 226 U.S. air traffic control facilities are using ADS-B for ATC separation; all En Route Centers and major Terminal facilities are using ADS-B for ATC separation; all remaining facilities are planned to be using ADS-B by 2019.</p>	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.	<p>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:</p> <ul style="list-style-type: none"> - 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). 	
VIET NAM	Two phases ADS-B implementation plan adopted. Phase 1 implemented in March 2013. Phase 2 commenced in 2015 for whole lower and upper Hanoi FIR and 2018 for Ho Chi Minh FIR	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.

REPORT FROM SOUTHEAST ASIA SUB GROUP

Guangzhou, China, 8-10 November 2016

States Present

Australia
China
Hong Kong China
Indonesia
Malaysia
Singapore
The Philippines
USA

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 ADS-B data from the following sites:

- Saumlaki (Indonesia) (Installed)
- Merauke (Indonesia) (Installed)
- Waingapu (Indonesia) (Installed)
- Kintamani - Bali (Indonesia) (Installed)
- Thursday Island (Australia) (Installed)
- Gove (Australia) (Installed)
- Broome (Australia) (Installed)
- Doongan (Australia) (Installed)

Data Sharing Agreement signed in Nov 2010;

Communications links between Australia and Indonesia were upgraded from VSAT to terrestrial links in Mar 2016. The service quality were improved.

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 ADS-B data from the following additional sites:

- 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 by 2018**)

Data Sharing Agreement signed on 18 Jun 2014;

Indonesia announced the use of ADS-B for situational awareness on 24 July 2014. Indonesia announced on 30 Apr 2015 that ADS-B will be used for separation from FL290 to FL460 (tier-1) with effect from 25 June 2015. The carriage of ADS-B equipment for flights between FL290 and FL460 remain optional until Dec 2017.

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

Phase 1

Under the near term implementation plan, the parties have commenced ADS-B data sharing from the following sites:

- Singapore (Singapore provide data to Indonesia)
- Natuna (Indonesia provide data to Singapore)
- Matak (Indonesia provide data to Singapore)
- Con Son (Viet Nam provide data to Singapore)
- Sanya FIR (China provide **fused data from four ADS-B stations** 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 Viet Nam and have commenced on ADS-B operations. Singapore updated they have commenced 30nm separation between Singapore and Ho Chi Minh FIR. **Further reduction to 20nm longitudinal separation was implemented on 10 Nov 2016.**

All 4 administrations (China, Hong Kong China, Singapore and Viet Nam) 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 from Dec 2013. China will publish the mandate in May 2017.

Phase 2

The Philippines will install five ADS-B stations within Manila FIRs (Manila ATM Centre, and two stations in Palawan, Bolinao Pangasinan, and Iba Zambales). These ADS-B stations are targeted to complete by end 2017.

Subsequently, the Philippines will install four more ADS-B stations (Puerto Princesa Palawan, Jomalig Island, Tambler Airport General Santos and Bojeador Ilocos Norte).

Singapore and the Philippines signed an MOU in Oct 2015 to make available ADS-B data and VHF facilities at Bataraza, Palawan for Singapore. The project is expected to be completed by early 2017.

The Philippines indicated that there is a surveillance gap at Northwestern part of Manila FIR. China mentioned that the four ADS-B ground stations deployed in Sanya FIR may be able to cover parts of the surveillance gap. China is prepared to share the ADS-B data via the ADS-B data processor with neighbouring states. The Philippines will initiate discussion after establishment of its own ADS-B stations.

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 2017.

Singapore and Viet Nam signed an MOU in Jul 2016 to make available ADS-B data and VHF facilities at Ca Mau for Singapore.

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 initiate discussion in 2017 after establishing their own ADS-B stations.

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

Indonesia and Malaysia are willing to share the ADS-B data from the following sites:

- Aceh (Indonesia) (installed) - to help cover Kuala Lumpur FIR
- Genting (Malaysia) – To be installed by 2017
- Langkawi (Malaysia) – To be installed by 2017

Malaysia and Indonesia will discuss after the installation of the Malaysian ADS-B stations.

Malaysia is planning to install four more ADS-B stations in East Malaysia.

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 sites:

- Phnom Penh International Airport (installed)
- Siem Reap International Airport (installed)
- Stung Treng City (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 sites:

- Manado (installed)
- Galela (installed)
- Tarakan (installed)

The Philippines will initiate discussion after establishing its own ADS-B ground stations.

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.

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 Dima Dima (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. **Awaiting the installation of new ATM system in Papua New Guinea, the parties will probably sign direct bi-lateral agreements.**

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

Malaysia currently has one ADS-B station at Terengganu. 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. **Discussions are expected to take place in 2017.**

REPORT FROM BAY OF BENGAL AD HOC WORKING GROUP

SEA/BOB ADS-B WG/12

Guangzhou, 7-11 November, 2016

States Presented:

Bangladesh
Indonesia
Malaysia
Pakistan
Thailand

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

Implementation Updates

1. Bangladesh has a plan to install four ADS-B ground stations at Dhaka, Cox's Bazar, Saidpur and Barisal Airports by 2019.-ADS-B data will be integrated with new ATM system at Dhaka.

Bangladesh has also a plan to install MLAT stations to provide surface movement control at HSIA, Dhaka as well as TMA coverage as a backup and complimentary RADAR coverage to the Dhaka MSSR.

Bangladesh is willing to share ADS-B data with neighbouring States, India and Myanmar, to enhance the safety and surveillance capability in the sub-region.

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 when India is ready).
4. Malaysia updated the meeting that they are installing two ADS-B ground stations at Langkawi and Genting, both compliant with DO-260B. Data from these two ADS-B ground stations being installed will be integrated to the existing Air Traffic Control Centre (ATCC) by end of January 2017.

Malaysia is currently in the progress of building new Air Traffic Control Centre for KL FIR and upgrading current CNS/ATM System. (Installation of the two ADS-B ground stations is part of this project.) The project is expected to be completed by the end of 2019. Data from these two ADS-B ground stations will also be integrated to the new KL ATCC).

Data sharing with neighbouring countries is possible after the completion of new ATCC system installation.

5. 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.

6. 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.
7. 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.

Pakistan 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.

8. 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.
9. Thailand provides update on the installation and related activities regarding ADS-B and other surveillance system as follows:

ADS-B Ground Infrastructure and ATC System Readiness or Implementation Plan

- MLAT has been in operation at VTBS since 2006 and was installed at VTBD in 2016 with the expectation to be operational in 2017. At VTCC and VTSP, it is planned that MLAT will be installed in 2017.
- ADS-B ground stations (DO-260B compliant) have been installed in Thailand for research and development purpose and are being undergone the certification process, expected to finish by 2017.
- WAM and ADS-B ground stations are planned to be installed nationwide, starting from mid or late 2017 to provide coverage for en-route and TMA operations.
- New ATM system to be operational in 2018 will be capable of fusing multi-sensor data, including SSR, ADS-B, and WAM.

Date of Issue/Effectiveness Date of Equipage Mandate

- Aircraft equipage mandate is being planned with the expected target effective date around the end of 2018.

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 (2H2022)

Expected benefits: Enhanced safety at FIR boundary

BANGLADESH – MYANMAR

Cox's Bazar and Sittwe (2H2022)

Expected benefits: Enhanced safety at FIR boundary

INDIA – MYANMAR

Agartala – Sittwe (2H2016) Agreement already signed on 06th May 2015.
Portblair – Coco Island (2H2016) Agreement already signed on 06th May 2015.
Expected benefits:

INDIA – INDONESIA
Nicobar Island – Aceh (Late 2016 or Early 2017)
Expected benefits: Enhanced safety at FIR boundary

INDIA – MALDIVES
Trivandrum – Kulhudhuffushi (2H2016)
Expected benefits:

MALDIVES – SRI LANKA
Male – Colombo (2H2016)
Expected benefits:

INDIA – SRI LANKA
Trivandrum – Colombo (2H2016)
Expected benefits:

MALAYSIA – INDONESIA
Genting - Aceh (2H2022)
Expected benefits: Enhanced safety at FIR boundary

Important Notes

1. **IFALPA – a pilot’s perspective**
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.
2. **Airlines:**
Operators and Pilots should be well aware of the importance of setting correct Flight ID in FMS same as that of ACID.
3. Terminology used in the region should be standardised and consistent, and recognise what crew need to know.
4. 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.
5. The QNH error detection feature is an important safety net feature particularly when conducting a non-precision approach.
6. 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.

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

D) Slightly revised TOR of SEA/BOB ADS-B Implementation Working Group

TERMS OF REFERENCE

**SOUTHEAST ASIA AND BAY OF BENGAL SUB-REGIONAL
ADS-B IMPLEMENTATION WORKING GROUP**

Terms of Reference

APANPIRG18 Conclusion 18/38 agreed to the establishment of a sub-regional ADS-B implementation Working Group in the South-East Asia area (SEA ADS-B WG) by the end 2007 to develop the *terms of cooperation* and an *implementation plan* for near-term ADS-B applications in the sub-region.

APANPIRG/22 Decision 22/34 agreed to rename the Southeast Asia Sub-regional ADS-B Implementation Working Group to “South East Asia and Bay of Bengal Sub-regional ADS-B Implementation Working Group” and tasked the new Working Group to develop a revised Terms of Cooperation and work programme in the sub-regions.

The outcome of the ADS-B Working Group will report to APANPIRG through the [Surveillance Implementation Coordination Group](#).

The SEA/BOB ADS-B WG shall

(a) Develop **Terms of Co-operation** 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.

(b) Develop an **implementation plan** for near term ADS-B application which will delivery efficient airspace and increased safety on a regional basis that include :

- 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 and associated VHF radio voice communication facilities.
- consideration of major traffic flows

- (c) Coordination for implementation of the plan and identify implementation issues and solutions

Composition: The Group will be composed of experts nominated by States in the Sub-region including: Australia, Bangladesh, Brunei Darussalam, China, Hong Kong China Cambodia, India, Indonesia, Malaysia, Maldives, Myanmar, Nepal, Pakistan, Philippines, Singapore, Sri Lanka, Thailand, Vietnam, IATA and CANSO.

Reporting: The Group will present its report to [Surveillance Implementation Coordination Group](#)

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, agreement for 20 NM was signed Oct. 2016)	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		Nov. 2016	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 SURICG	Table updated by SEA/BOB ADS-B WG/12 and to be maintained by Task Force SEA/BOB WG and SURICG
8.	General ADS-B Avionics Problem Reporting Database (APRD) (being implemented)	SEA/BOB WG/9	Specification and database at ADS-B SITF/15 Successful demonstration at SEA/BOB WG/12	further improvement to be made	China, 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. Administrations were also requested to provide update whether their registered B787 has applied service bulletin	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) Agreed checklist was included into AIGD Edition 9	SEA/BOB WP/11	ADS-B SITF/15	Coordination and prepare a WP for review by the Task Force Completed	Malaysia

ADS-B SITF TASK 7/36 – States to advise when their ground stations can be upgraded to receive ADS-B D0260B compliant ADS-B data					
State or Administration	No. of ADS-B Ground Stations Installed	D0260B Compliant?			
		Yes (all)	Yes (some)	No	If <i>some</i> or <i>No</i> , planned date of full D0260B capability
Australia	45	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	All ADS-B and WAM systems upgraded.
Bangladesh	Nil	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
China	27	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	All stations have 260B ADS-B OUT Compliant, not yet for TIS-B.
Hong Kong, China	9	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Macao, China	Nil	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	No current plans for ADS-B
France (French Polynesia)	Nil	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	No current GS
Fiji	??	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Upgrade TBD
India	21	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Indonesia	30	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Planned for upgrading 10 Stations in 2017
Japan	Nil	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	No operational GS yet.

ADS-B SITF TASK 7/36 – States to advise when their ground stations can be upgraded to receive ADS-B D0260B compliant ADS-B data					
State or Administration	No. of ADS-B Ground Stations Installed	D0260B Compliant?			
		Yes (all)	Yes (some)	No	If <u>some</u> or <u>No</u> , planned date of full D0260B capability
Malaysia	1	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	2 new DO-260B compliant GS to be installed.
Maldives	4	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Not yet determined.
Myanmar		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Nepal	Nil	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
New Zealand	22	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	May 2015 (software upgraded by end of 2015) Software release is ready
Pakistan	1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Test basis.
Papua New Guinea	Nil	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	ADS-B planned but no current GS.
Philippines	Nil	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	No GS yet
Republic of Korea	2	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	2020
Singapore	1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

ADS-B SITF TASK 7/36 – States to advise when their ground stations can be upgraded to receive ADS-B D0260B compliant ADS-B data					
State or Administration	No. of ADS-B Ground Stations Installed	D0260B Compliant?			
		Yes (all)	Yes (some)	No	If <u>some</u> or <u>No</u> , planned date of full D0260B capability
Thailand	6	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Test basis
USA	634	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Viet Nam	3	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

**TWELFTH MEETING OF THE SOUTH EAST ASIA AND BAY OF BENGAL
SUB-REGIONAL ADS-B IMPLEMENTATION WORKING GROUP
(SEA/BOB ADS-B WG/12)**

Guangzhou, People's Republic of China (8 – 10 November 2016)

Attachment 1 to the Report

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International Civil Aviation Organization

**TWELFTH MEETING OF THE SOUTH EAST ASIA
AND BAY OF BENGAL SUB-REGIONAL ADS-B
IMPLEMENTATION WORKING GROUP
(SEA/BOB ADS-B WG/12)**

Guangzhou, China, 08 – 10 November 2016



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