_International Civil Aviation Organization_

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

Guangzhou, China, 08 – 10 November 2016

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

3.5)    Review outcome of Ad-hoc Working Group at previous meetings

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

(Presented by Secretariat)

**SUMMARY**

This paper reviews the outcome of the Eleventh Meeting of the South-East Asia and
Bay of Bengal Sub-regional ADS-B Implementation Working Group.

## 1.    Introduction

1.1        APANPIRG/18 in 2007 agreed to establish a South-East Asia sub-regional ADS-B
implementation working group (SEA ADS-B WG) and adopted Conclusion 18/38.

1.2        The following meetings of the WG have been held:
- SEA ADS-B WG/1                15-16 November 2007 in Singapore
- SEA ADS-B WG/2                27-29 February 2008 in Bali, Indonesia
- SEA ADS-B WG/3                2-3 July 2008 in Putrajaya, Malaysia
- SEA ADS-B WG/4                9-10 February 2009 in Melbourne, Australia
- SEA ADS-B WG/5                21-22 January 2010 in Jakarta, Indonesia
- SEA ADS-B WG/6                24-25 February 2011 in Singapore
- SEA/BOB ADS-B WG/7            28-30 November 2011 in Chennai, India
- SEA/BOB ADS-B WG/8            5-7 December 2012 in Yangon, Myanmar
- SEA/BOB ADS-B WG/9            30 Oct. - 1 Nov. 2013 in Beijing, China
- SEA/BOB ADS-B WG/10           11-13 November 2014 in Singapore
- SEA/BOB ADS-B WG/11           17-19 November 2015 in New Delhi, India
- SEA/BOB ADS-B WG/12           8-10 November 2016 in Guangzhou, China

1.3        The Eleventh Meeting of SEA/BOB ADS-B Working Group was held in New Delhi, India. 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.

1.4        The whole report of the meeting is available on the ICAO APAC website: http://www2010.icao.int/APAC/Meetings/Pages/2015-SEA-BOB-ADS-B-WG11--.aspx

## 2.        Discussion

### Significate development and achievements since last meeting (10th meeting)

2.1        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.

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

2.2        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 A** to this paper which was also noted by the ADS-B SITFé15 meeting.  This will serve as 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.

*Other information provided by States/Administration on ADS-B implementation and deployment for reference*

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

2.3         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.

2.3.1         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 $\geq$5   is accepted and displayed on the Controller Work Stations.

2.3.2         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.

2.3.3         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.

2.3.4         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 $\geq$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)**

2.4         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.

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

2.5         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.

2.6          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".

2.7          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.

2.8          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.

2.9          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.

2.10          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.

### Collaboration in South China Sea Region (WP/13)

2.11          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.

2.12          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.

2.13          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)

2.14          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.

2.15          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.

### ADS-B implementation in Mongolian (IP/04)

2.16          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.

2.17          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.

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

2.18        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.

2.19          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.

2.20          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)

2.21          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.

2.22          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.

2.23          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.

2.24        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.

2.25        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.

2.26        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.

2.27        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)**

2.28        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)**

2.29        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.

2.30        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.

2.31        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.

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

2.32        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.

2.33        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.

2.34        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.

### 3.        Action by the meeting

3.1        The meeting is invited to:

    a)  refresh relevant issues progressed by the SEA/BOB ADS-B WG/11 meeting;

    b)  review the outcome of Ad Hoc Groups as provided in  **Attachments A1 and A2**.

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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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**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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