



International Civil Aviation Organization

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



Kolkata, India, 15-18 April 2013

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

**REVIEW REPORT OF THE EIGHTH MEETING OF SOUTH-EAST ASIA  
BAY OF BENGAL SUB-REGIONAL ADS-B IMPLEMENTATION WORKING GROUP  
(SEA/BOB ADS-B WG/8)**

(Presented by the Secretariat)

**SUMMARY**

This paper presents the progress achieved by the eighth meeting of the South-East Asia and Bay of Bengal Sub-regional ADS-B Implementation Working Group.

Action by ADS-B SITF/12 is at Paragraph 3.

**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

1.3 The Eighth Meeting of the South East Asia and Bay of Bengal Sub-regional ADS-B Implementation Working Group (SEA/BOB ADS-B WG/8), hosted by the Department of Civil Aviation of Myanmar (DCA) was attended by 42 participants from Australia, Bangladesh, Hong Kong China, India, Indonesia, Malaysia, Myanmar, Republic of Korea, Singapore, Thailand, CANSO and IATA. Two industry representatives also attended the meeting.

1.4 The whole report of the Working Group is also available on the ICAO APAC website: [http://www.bangkok.icao.int/cns/meeting.do?method=MeetingDetail&meeting\\_id=247](http://www.bangkok.icao.int/cns/meeting.do?method=MeetingDetail&meeting_id=247)

1.5 Mr. Thet Lwin, Director of CNS Division, nominated by the host State acted as the moderator for the meeting. The meeting was also facilitated by Mr. Greg Dunstone ADS-B SITF of APANPIRG. The meeting considered 8 WPs, 9 IPs and 14 presentations.

1.6 The Working Group reports to APANPIRG through ADS-B Study and Implementation Task Force and CNS Sub-group.

## 2. DISCUSSION

2.1 Australia informed about their decision for forward fitment of SA Aware avionics from 2016.

2.2 Australia and Hong Kong China agreed to take lead to review the AIGD and report to ADS-B SITF/12. The Secretariat advised that Flight Plan guidance in the AIGD should be updated to align with Amendment 1 to the 15<sup>th</sup> Edition of PANS/ATM only, which became effective on 15 November 2012.

### Progress on deployment – India

2.3 India provided an update on ADS-B implementation status. The site acceptance test (SAT) had been successfully carried out at all the fourteen stations, including Agartala, Amritsar, Jaipur, Lucknow, Varanasi, Ahmedabad, Nagpur, Guwahati, Calicut, Cochin, Coimbatore, Mangalore, Port Blair and Trivandrum.

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

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

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

**Need for ADS-B Station at Car Nicobar to achieve more surveillance coverage in BOB**

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

**Decision 8/1 – Need for an ADS-B Ground Station on the Nicobar Islands**

That, Member of Working Group from India be urged to explore the possibility for installation of an ADS-B Ground station on the Nicobar Islands in order to enhance flight safety, efficiency and air space capacity over the eastern gateway of Bay of Bengal Sub-region.

2.8 Hong Kong, China asked if there would be any further guidance from the Task Force to States on ADS-B implementation on off-shore platforms. Many States would find this an attractive option, but States would need guidance on how to engage with platform operators for this purpose. It was informed that currently Australia was engaged in initial negotiations with only one operator, so it may be too early to develop any guidance material. It was recommended that States first initiate discussions with an offshore operating company to explore the possibility of ADS-B on offshore platforms. There were also difficulties for ANSPs in doing this work, as platform visits required significant specialized safety training. A possible deployment option would be to arrange an agreement with the platform operator to install and conduct Level 1 maintenance on the equipment, with the ANSP providing Level 2 and 3 maintenances.

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

**Progress on deployment – Myanmar**

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

### **Co-ordination for Data Sharing**

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

### **ADS-B Equipage Requirement**

2.12 **By the end of 2013**, DCA Myanmar will issue a mandate for ADS-B equipage of aircraft flying above FL260 on ATS routes M770 and L759 **with target date 2015**. ADS-B carriage for all aircraft, including general aviation aircraft and helicopter is expected by the end of 2015.

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

2.14 Australia reminded about the mandate for ADS-B equipage to be published. As with Australian experience, these matters were complex and time consuming. Myanmar advised that regulations would be formulated to support a 2015 mandate.

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

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

2.16 There have been multiple demands in Republic of Korea for the air safety improvement by filling radar coverage gap and surveillance performance upgrade. Republic of Korea (ROK) informed the meeting that an increase in the number of light aircraft flying in VFR is an issue for Korean Air Traffic Control. Light aircraft flying at low altitude in VFR would increase the risk of accidents. In addressing such challenges, Republic of Korea had been developing ADS-B system since 2010. The ADS-B development status was highlighted as follows:

#### **ADS-B plan and development**

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

2.18 UAT datalink, using frequency modulation, is designed to enhance receiver sensitivity and be robust against multipath fading. The UAT design scope also covers the weather and flight information service for light aircraft.

2.19 In the first phase of deployment by 2014, ADS-B ground prototypes will be installed at Gimpo International Airport, and UAT ground stations will be installed at airports mostly used by light aircraft to demonstrate detection of light aircraft operating under the VFR at low altitude.

2.20 In the second phase from 2015 to 2016, ADS-B ground systems will be used as a supplement to the conventional radar system which has been used for terminal control. ADS-B system will also be used for extension of the surveillance coverage by filling radar coverage gap and for redundancy purpose. For the last phase of the development from 2017 to 2020, ADS-B will be deployed for entire whole Incheon FIR.

2.21 In response to a query, ROK clarified that ADS-B ground stations were deployed at Incheon airport to evaluate surface surveillance performance. A prototype installation to be deployed at Gimpo airport will be used for research and development. The Secretariat commented that Korea was the only Asia/Pacific State conducting research for using both UAT and 1090ES, result of which would be provided for consideration by the decision maker in Republic of Korea.

2.22 IATA expressed concern that UAT was currently not fitted to any aircraft in Asia/Pacific, and that any fitment was unlikely until after 2020. UAT would potentially only be fitted to a few general aviation aircraft, and may not provide any appreciable benefit when compared to the widespread use of 1090ES.

2.23 Republic of Korea advised that the consideration of UAT as a technology was based on its signal characteristics potentially providing advantage over 1090 ES. UAT was being evaluated under a program of R&D, and the policy decision was yet to be made. Korea has mountainous terrain, and UAT was being considered for use as a surveillance technology for deployment in these areas. Korea's general aviation fleet currently numbered more than 300 aircraft. The number and variety of GA aircraft was increasing.

2.24 The co-Chair commented that the primary future benefit of ADS-B is for air-to-air surveillance applications, and the use of more than one technology would be complicated and limit the extent to which this benefit was available.

#### **ADS-B Updates by Australia**

2.25 Australia presented a paper on the current status of surveillance projects, including the Australian Mode S Terminal Radar Replacement (AMSTAR) project, En-route Radar Replacement Project (ERRP), which are replacing Mode A/C en-route radars with Mode S. A further 16 installations, including new and transportable radars, were to be deployed over the next few years.

2.26 A significant number of Elementary Surveillance (Flight ID) deficiencies had been encountered, and an AIC had been issued stressing the need for correct pilot entry. Some aircraft installations were also transmitting Flight ID incorrectly in Mode S SSR replies. Action is being taken to identify and rectify these issues. Flight ID data was not currently being delivered to the ATM system from these radars.

2.27 Advanced Surface Movement Guidance and Control Systems (ASMGCS) were operational in Melbourne and Sydney. Brisbane and Perth systems were in the deployment phase.

2.28 The Australian Civil Aviation Safety Authority (CASA) had issued new regulations mandating aircraft fitment of Mode S transponders to commence the transition to Mode S radar surveillance, moving progressively away from Mode A/C transponders.

2.29 29 ADS-B sites were currently operational, with additional ADS-B data provided to the ATM system from operational Wide Area Multilateration (WAM) sites in Tasmania (TASWAM), Sydney (SYDWAM). A number of new sites are being considered for ADS-B deployment. ADS-B was used operationally across the Australian continent. From December 2013 ADS-B would be mandatory at and above FL290. Following further consultation with industry and other stakeholders CASA had issued new regulations progressively mandating ADS-B equipage, culminating in the requirement for all IFR aircraft to be equipped with ADS-B Out by February 2017.

2.30 There was already a high level of ADS-B equipage among international airlines, but the Business Jet community had been very slow to equip. Of 178 aircraft on the Australian register operating above FL285 that were not yet equipped with ADS-B, among which 93 were Biz jets.

2.31 Australia had published AIP SUP H96/12, dealing with the management of aircraft without ADS-B capability post December 2013. Key points included the requirement for exemptions to be requested at least 4 weeks before the flight, accompanied by a safety impact assessment. Any exemption granted would be subject to ATC clearance at the time of flight, and aircraft equipped with ADS-B would be afforded priority. Hong Kong China asked and Australia agreed to provide more detailed information on implementation of exemption by ATC.

2.32 Australia and Indonesia continued to enjoy the benefits of sharing ADS-B data, with the ongoing exchange of data from 4 Australian and 4 Indonesian ground stations. Indonesia advised that the cross boundary data sharing arrangement had provided significant operational benefits. Indonesia further advised that they were making efforts in providing stable shared ADS-B data, and they have provided an alternate solution in case one ground station failed as mentioned in the paper.

2.33 CASA had approved a relaxed ADS-B integrity parameter (HPL) for provision of 5NM separation, and this was operationally introduced in February 2011. Inclusion of a requirement for 3NM separation in the standard is also expected. The result was an increase in service availability and reliability resulted from the reduction in ADS-B outages due to GPS satellite geometry issues. Currently, Australia was using ADS-B data for RVSM height monitoring.

2.34 Seed funding has been approved for a proposed project deploying a number of additional ADS-B ground stations, to back-up and supplement existing radar and ADS-B coverage.

2.35 The meeting was advised that Australia had found that not all ground vehicle ADS-B equipment was suitable for surface movement control purposes, as these installations largely had no GPS integrity monitoring (without HPL) or reporting capability. Such basic GPS units were not being approved by CASA.

2.36 In answer a question for the reason, Australia advised that Flight ID extracted in Mode S SSR interrogations were not currently being provided to ATC due to the number of incorrect Flight ID, caused by pilot input and/or transponder design errors. Until these errors were addressed Mode S, SSR Flight ID would not be used. However, Flight ID from ADS-B and the TASWAM system are being used by the ATM system.

### **ADS-B Implementation Plan in Bangladesh**

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

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

2.39 The near term ADS-B implementation plan include installation of ADS-B ground stations at the following four locations depending on further cost benefit study.

- a) Hazrat Shahjalal International Airport, Dhaka.to provide supplementary surveillance coverage and as standby to radar systems ;
- b) Cox’s Bazar Airport to provide surveillance coverage over Bay of Bengal up to the FIR boundary of Dhaka and Yangon;
- c) Barisal Airport, to provide surveillance coverage over Bay of Bengal up to the FIR boundary of Dhaka and Kolkata; and
- d) Saidpur Airport, to provide surveillance coverage up to the FIR boundary of Kolkata.

2.40 ADS-B ground stations will be integrated with the new ATC Automation system to be installed at Dhaka. Bangladesh has a plan to commission all ADS-B ground stations by December 2015 as per the Asia/Pacific regional plan.

2.41 In response to a query, Bangladesh advised that the business case decision for the ADS-B deployment was expected to be taken by end of 2012. After discussion with Myanmar and India, Bangladesh agreed to review its ADS-B implementation plan.

#### **Experience of transition from Whitelist to Blacklist**

2.42 Australia presented a paper on the transition from a “whitelist” pre-approval process for individual aircraft access to ADS-B services, to a “blacklist”, whereby all aircraft transmitting ADS-B data were considered to be compliant with regulations, and only known non-compliant aircraft were excluded.

2.43 The whitelist process had been developed as a result of the conservative approach necessary in 2005, when there was no regulatory basis for ADS-B avionics approval. Since that time the regulations had been developed, and the world community had embraced ADS-B technology.

2.44 A critical factor in the move away from the whitelist had been the 2007 publication by CASA of regulations requiring domestic and foreign operators to disable ADS-B transmissions before flight if the avionics were not compliant with the CASA regulations. In addition, APANPIRG provided further support by agreeing to amend ICAO Document 7030 Regional Supplementary Procedures to also require that ADS-B transmissions are disabled before flight if they are not compliant with the standards.

2.45 In September 2012 Australia had removed the whitelist and hence removed all involvement by the ANSP in ADS-B avionics fitment. On transition there were 62 known problem aircraft on the ADS-B blacklist. All ADS-B data with acceptable quality indicators was now presented to ATC, except for that from a small number of aircraft listed in a blacklist. This change had brought ADS-B processes into alignment with Industry standard practices for avionics approval, and aligned with ATC practices today, whereby data from existing surveillance avionics was used without maintenance of an approved list.

2.46 Since September 2012, after further communication with blacklisted operators and discussions with Gulfstream, the blacklist had been reduced to 33 airframes. Operators had expressed a desire to be removed from the blacklist. Some blacklisted operators had been granted a time-limited exemption by CASA.

2.47 ATC reaction to the blacklist transition had been very positive as a significant number of equipped (but not whitelist-approved) aircraft were now visible. No negative impacts had been observed.

2.48 IATA expressed a strong preference for a blacklist process, and that this was supported by ICAO Annex 6. A whitelist process imposed a heavy administrative process on States and Operators. While this was necessary circumspection in the initial operational implementation in Australia, subsequent mandates by States did not need a whitelist process.

2.49 Hong Kong, China asked what criteria were used to identify that aircraft should be placed in the blacklist. Australia responded that compliance with the regulation for operation of ADS-B equipment was the only criteria. Hong Kong China expressed that they had different interpretation on blacklisting criteria. They opinioned there was no need to blacklist those aircraft that failed to meet avionics standards because by rule these aircraft should not be granted ADS-B operational approval and operators should have switched off misleading ADS-B transmission before flying into one's airspace according to the rule. Breaking of rule needed to be tackled by regulators but not by ANSP. Hong Kong, China further requested further information on how a blacklist process could be standardized across the region, and blacklist information shared between the States which could be further discussed at next ADS-B SITF meeting

#### **Report of CANSO Focus Group meetings**

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

2.51 The meeting noted the outcome of the two focus group meeting as provided in the report. The action taken by the eighth meeting of the SEA/BOB ADS-B working group on report was summarized under agenda item 4 of this report.

2.52 India added that as mentioned in IP/06, 14 ADS-B stations had been installed, and Site Acceptance Tests for these stations completed. The Port Blair site was providing Bay of Bengal coverage of 250 – 300 nautical miles. India's intention was to implement radar-like separation using ADS-B by second half 2013.



2.53 Myanmar reconfirmed their intention to install an ADS-B site in Coco Island by the end of 2013, with the further intention to engage in data sharing with India.

**Readiness of ADS-B Enabler for Consideration by ATM groups of APANPIRG**

2.54 CANSO asked which body would undertake further work to implement the service improvements which will become available with the new ADS-B coverage. The Secretariat advised that the South East Asia ATM Coordination Group (SEACG) and South Asia – Indian Ocean ATM Coordination Group (SAIOCG) groups were working on implementation of surveillance separation standards in current radar airspace and in ADS-B airspace. This work would also be driven by the over-arching plan being developed by the Asia/Pacific ATM Seamless ATM Planning Group (APSAPG).

2.55 IATA stated its concern that the implementation of technology did not necessarily lead to operational improvement, and that surveillance based separation standards should be the planned outcome of the deployment

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

2.57 Singapore commented that there would be benefit in terms of priority of access to airspace on the basis of equipage i.e. better equipage, better served and first come, first served. IATA responded that the end benefit of radar or ADS-B surveillance is the implementation of surveillance separation standards.

2.58 The Secretariat further advised the meeting that the issue of introducing surveillance separation within existing surveillance coverage was a high priority ATM issue for the Asia/Pacific Regional Office, and there would be further work on this topic at the combined meeting of SEACG/SAIOCG in early 2013. The outcome of ADS-B Task Force and SEA/BOB ADS-B Working Group will be provided to that meeting for their consideration on the separation minimum to be applied.

**ADS-B Data Sharing between States**

2.59 India presented a paper highlighting an insight into the possible exchange of ADS-B data between India and its neighboring States. The paper also proposed to finalize a time bound action plan for resource sharing (ADS-B/VHF) among the States in the Bay of Bengal Sub-region in order to enable ANSPs of adjacent airspaces to realize Seamless ATM objectives.

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

2.61 The successful ADS-B data sharing programs between some of the APAC States and the development of a template for a "Letter of Agreement" between the sharing nations has inspired India to make progress in similar lines with its neighbouring States.

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

2.63 Singapore commented that there may be some restrictions on information which they may be able to share, but any other non-sensitive information has been shared.

2.64 The Secretariat advised that APANPIRG had adopted a conclusion providing a sample agreement on data sharing. The sample template had been modified after experience gained by Singapore and Indonesia in their agreement. Singapore clarified that the template itself is an agreement with sensitive information removed. CANSO added that the sample agreement was shared at the Focus Group Meeting.

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

2.66 India proposes to have a purposeful dialogue with neighbouring States to study and determine mutually, the data format, filters, interface and media requirement to enable successful ADS-B data sharing and to finalize a time bound action plan for resource sharing (ADS-B/VHF) among the states in the Bay of Bengal Sub-region.

2.67 CANSO commended India for the leadership shown in the working paper. CANSO proposed that if there were no bi-lateral or multilateral forums between India, Sri Lanka and Maldives then CANSO would be prepared to facilitate such a forum.

### **The proposed Harmonization Framework for ADS-B Implementation in Bay of Bengal**

2.68 It is obvious that full benefits of ADS-B will only be achieved by its harmonized implementation and seamless operations. Further to discussions on the outcome of the focus group meetings under agenda item 4, the meeting endorsed the in-principle agreement on the milestones for ADS-B data sharing between States in Bay of Bengal area as provided in **Appendix A** to this report and formulated following draft Conclusion:

#### **Draft Conclusion 8/2 - Milestone for Data-sharing between India and Myanmar**

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

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

### **South China Sea ADS-B Project Updates**

2.70 Singapore updated the meeting on the progress of the South China Sea project since the last task force meeting. As in the previous update, the ADS-B stations in both Matak and Natuna are installed. The VHF radio in Natuna is also installed. However, the VHF radio in Matak is delayed due to the change in the radio site. VHF radios in Matak are expected to be ready by early 2013 and that end-to-end comms checks on both Matak and Natuna VHF to commence in early 2013.

2.71 Viet Nam installed the ADS-B station at Con Son in November 2012. The VHF radios and the VSAT links are expected to be ready by early 2013. **Operational trials are planned for 2Q 2013 onwards.**

### **Need for Adequate Logistics and Spares Support for ADS-B Ground Stations**

2.72 Australia presented information on the need for ADS-B system duplication to achieve acceptable operational availability in the event of failure of one half of the duplicated system. It was noted that unduplicated operation was only acceptable for a short period while the faulty element was repaired, as the probability of a second failure during a short time window was low. A long repair window would increase the risk of an unexpected service failure, with subsequent safety impact and loss of operational efficiency.

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

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

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

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

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

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

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

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

**Draft Conclusion 8/3 - Need for adequate Logistics and Spares Support for ADS-B service**

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

**Barometric and Geometric altitude Information in ADS-B message**

2.81 Through a paper, Hong Kong China highlighted the technical difference between barometric altitude and geometric altitude, both of which are categorized as operationally desirable items in the APAC “Guidance Material on Generation, Processing and Sharing of ASTERIX Category 21 ADS-B Messages”. These two items are down linked together with other ADS-B data from aircraft to ATM automation system. It is essential to understand the technical differences and make proper use of the altitude information available from ADS-B messages in various ATC applications. The meeting discussed the safety implications in processing and displaying geometric altitude information to air traffic controllers by ATM automation system. The meeting concluded that the geometric altitude information shall not be provided to air traffic controller unless intentionally required by air traffic controllers. It was considered important for Administrations to be fully aware of this safety issue about processing and displaying altitude information in ADS-B messages. The meeting also considered it necessary to amend relevant guidance in the AIGD. In view of foregoing, the meeting formulated following draft Conclusions:

**Draft Conclusion 8/4 – Processing altitude information in ADS-B Message**

That, States/Administrations implementing ADS-B based surveillance service be urged to be fully aware of the safety implication issue if geometric altitude is displayed to air traffic controllers. Geometric altitude information shall not be displayed to the ATM system unless intentionally required by air traffic controllers in accordance with ADS-B Implementation Guidance Document (AIGD).

**Draft Conclusion 8/5 – Amendment to ADS-B Implementation Guidance Document (AIGD)**

That, the amendment to AIGD regarding processing and displaying altitude information at ATC automation system as shown in **Appendix C** to the report be adopted.

### **Proposal for Amendment to Supplementary Procedures**

2.82 A Proposal for Amendment (PfA) to Regional Supplementary Procedures (SUPPs – ICAO Doc 7030) on the operation of ADS-B transmitting equipment was developed in accordance with APANPIRG Conclusion 22/36 (5 – 9 September 2011). As part of the established procedure the PfA was coordinated with ICAO Headquarters in May 2012. The proposal was circulated on 18 December 2012. Up to Mid. February 14 responses were received. Currently it is in course of approval process.

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

2.83 The meeting noted that European Aviation Safety Agency (EASA) proposed through Notice of proposed amendment (NPA 2012-19) to remove requirement and provision including part of for AMC20-24. Considering AMC 20-24, Certification Considerations for the Enhanced ATS in Non-Radar Areas using ADS-B Surveillance (ADS-B-NRA) Application via 1090 MHZ Extended Squitter has been recognized as one of regional equipage standards for implementation of ADS-B in the ASIA/PAC Region. Australia therefore recommended that States consider sending an objection to the EASA web site <http://hub.easa.europa.eu/crt/> by closing date of 14 January 2013.

### **ADS-B Station and Avionics Performance Monitoring**

2.84 The meeting was updated on the measures that Singapore has put in place to monitor the performance of the ADS-B stations and the ADS-B avionics of aircraft operating in Singapore Flight Information Region (FIR).

2.85 Singapore acquired a surveillance monitoring system (SMS) to monitor the performance of the surveillance sensors supporting its operations. Although it is primarily used to monitor the performance of radars, it can also be used to monitor the performance of the ADS-B ground stations and to indirectly measure the performance of the ADS-B avionics of aircraft operating in our FIR.

2.86 Using targets of opportunity, the SMS can monitor the ADS-B coverage and generate various performance figures such as probability of detection.

2.87 It can also monitor whether the positions reported by the aircraft's avionics are reasonably accurate. To do so, the ADS-B aircraft positions are compared with their respective positions derived from radar, if available.

2.88 The SMS also generates statistics on probability of detection per aircraft. When the probability of detection of an aircraft goes too low, it may be worthwhile to investigate the cause of such low probability of detection.

2.89 It was further informed that the tool is provided by Intersoft and the interval for probability of detection is 4 seconds. The meeting considered the information provided by Singapore quite important and useful and therefore suggested that ADS-B avionics performance monitoring be included as separate agenda for the next ADS-B SITF meeting. States were encouraged to prepare relevant paper to share their experience in this regard. Hong Kong China also shared with meeting their ADS-B avionics performance monitoring and will present a working paper for the next ADS-B SITF Meeting. Australia also volunteered to write a paper for the ADS-B SITF/12 meeting.

2.90 In response to a query regarding whether guidance material for validation before commissioning is in place, Australia informed that there is comprehensive checklist in place for commissioning any important ANS system in Australia.

2.91 The meeting agreed to the action items of the Working Group as provided in the **Appendix E** to the Report of the WG.

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

2.92 The meeting reviewed the updates of the Sub-regional ADS-B implementation projects as presented by the Ad Hoc working groups at SEA/BOB WG/8 meeting. The discussions were based on the outcome of previous meetings of the SEA/BOB WG/7. The outcome of discussions by Ad Hoc working groups is provided in **Appendix F** to the report of the ADS-B WG which could serve as a basis for further development of the sub-regional implementation plans at its next meeting.

#### **Next ADS-B Working Group Meeting**

2.93 The meeting identified the need to organize another meeting to progress implementation of the sub-regional plan. The Secretariat will coordinate with member States of the Working Group for hosting the Ninth SEA/BOB ADS-B WG meeting in second half 2013. The exact dates and venue will be informed to the members States by the Secretariat at due course.

#### **Note of appreciation**

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

### **3. ACTION BY THE MEETING**

3.1 The meeting is invited to:

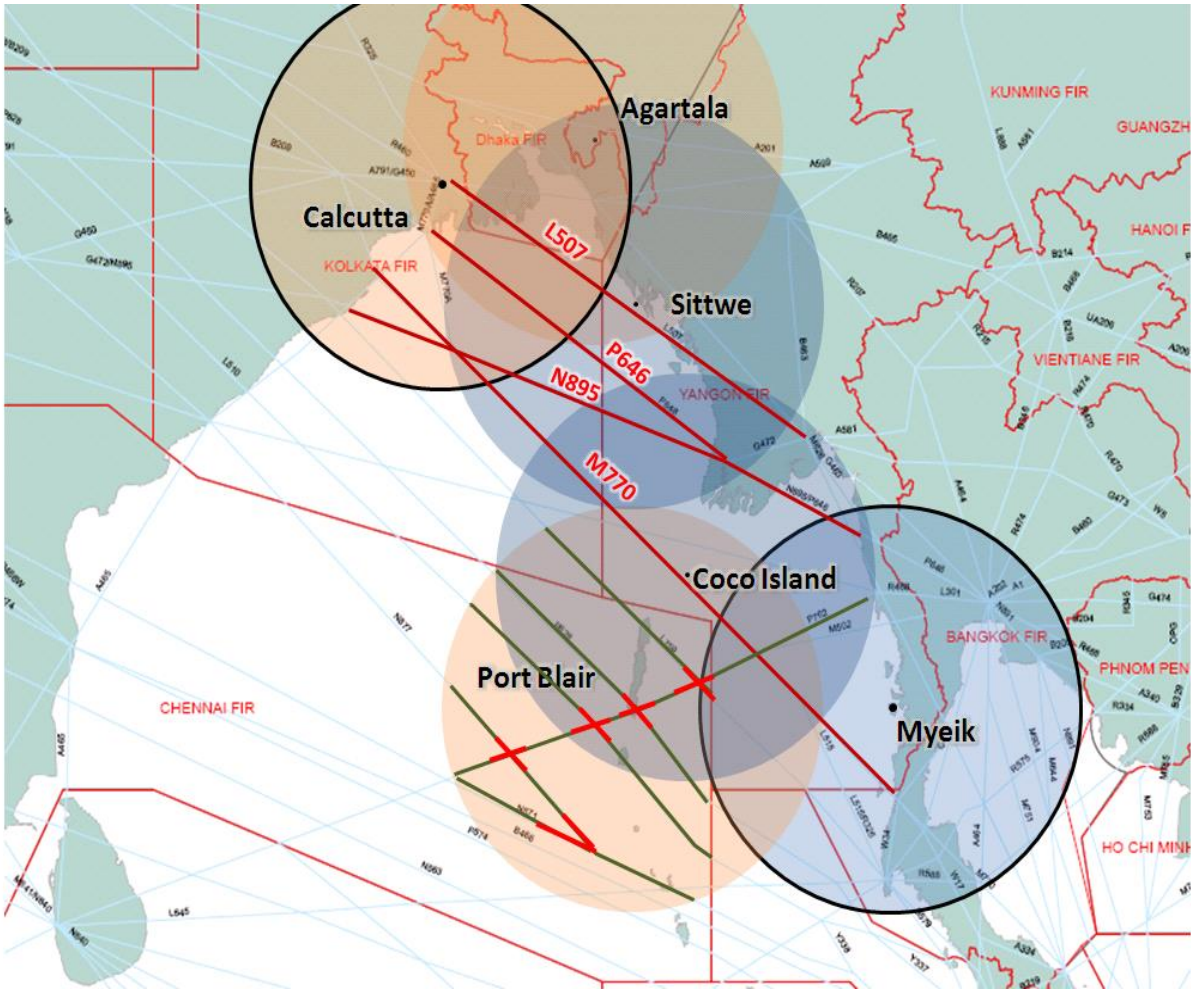
- a) note activities and efforts being made by SEA/BOB ADS-B WG;
- b) further develop the harmonized equipage requirements and timelines based on work done by the SEA/BOB ADS-B WG/8;
- c) note the relevant action items formulated by the WG; and
- d) encourage States concerned to expedite implementation of the project in the Bay of Bengal area with target date of implementation by December 2015.

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

(Between India and Myanmar)

<b>Milestone / Issues</b>	<b>India</b>	<b>Myanmar</b>
Agree in principle to share data from sites	Agreed during SEA/BOB ADS-B WG/7	Agreed during SEA/BOB ADS-B WG/7
Nominated sites	Agartala & Port Blair	Sittwe & Coco Island
Objectives	<ul style="list-style-type: none"> <li>• Reduce separation through enhanced surveillance / communication coverage</li> <li>• Enhance safety and capacity over crossing routes</li> <li>• Back-up surveillance / communication coverage</li> <li>• Enhancement of surveillance coverage at lower altitude</li> </ul>	
Benefits	<ul style="list-style-type: none"> <li>• End-to-end coverage on M770 and other trunk routes (refer to chart).</li> </ul>	
Date to sign data sharing agreement	1H 2013	1H 2013
Date to issue NOTAM/AIC for ADS-B mandate	Publish in 1H 2013 Effective from 1H 2015	Publish in 1H 2013 Effective from 1H 2015
Date to sign operational Letter of Agreement	2H 2013	2H 2013
Date to test inter-FIR VSAT link	1H 2014	1H 2014
Date to commission VSAT link	1H 2014	1H 2014
Date to commission ADS-B ground stations	2H 2012	1H 2013
Date to commence testing of ADS-B data from other FIR	1H 2014	1H 2014
Date to complete installation of VHF radio for the other party	1H 2014	1H 2014
Date to commence testing of VHF radio	2H 2014	2H 2014
Date to commence testing of VHF by the other party	2H 2014	2H 2014
Date to commission ADS-B & VHF service	2H 2014	2H 2014





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

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

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

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

\* \* \* \* \*

**The proposed change to AIGD on altitude information for separation**

5.4.4.1 Introduction

The ADS-B level data presented on the controllers situation display shall normally be derived from barometric pressure altitude. In the event that barometric altitude is absent, geometric altitude shall not be presented on the situation display unless intentionally requested by the air traffic controllers. The geometric altitude so displayed shall be in a distinguishable format from barometric altitude. The air traffic controller should be alerted to the fact that the displayed geometric altitude data shall ~~could~~ not be used for vertical separation.

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

<b>No.</b>	<b>Subject</b>	<b>Forum Raised</b>	<b>Status / Target Date</b>	<b>Remarks / follow-up</b>	<b>Action Party</b>
1.	Prepare a paper on the plans for and status of ADS-B data sharing between Indonesia-Malaysia	SEA ADS-B WG/4	Updated in ADS-B SITF/8 ; SEA/BOB WG/9	On-going	Malaysia
2.	Increase awareness of Airlines' responsibility to get operational and airworthiness approval from State of registry and the urgency required to meet various regional 2013 mandates.	SEA ADS-B WG/6	ADS-B SITF/11 Revised target SITF/12	Reminder to airlines and feedback to TF	IATA
3.	To examine existing air-ground communication and surveillance capability in the boarder area between China and Myanmar and identify the need and possibility for sharing ADS-B data from potential ADS-B ground station at Lashio.	SEA ADS-B WG/6	On going ADS-B SITF/12	Report status and position (ADS-B GS to be installed at Lashio has been identified)	China & Myanmar
4.	To exam possibility of sharing ADS-B data from potential ADS-B ground station from Coco and Sittwe.	SEA ADS-B WG/6	On going ADS-B SITF/12	Report status and possibility Completed	Myanmar & India
5.	ATS operational letter of agreements between neighboring FIRs among South China Sea States for radar-like surveillance service	SEA ADS-B WG/6	Ongoing – Reports at each meeting	Report progress	China, Hong Kong China, Viet Nam and Singapore
6.	India to coordinate with Myanmar, Bangladesh Maldives and Sri Lanka for ADS-B data sharing	SEA ADS-B WG/7	SEA ADS-B WG/8 On-going revised target SEA/BOB WG/9	Coordination	India
7.	A survey be conducted for ADS-B certificate/operational approval issued by Administrations	SEA ADS-B WG/7	ADS-B SITF/12	Survey	ICAO Regional Office

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

<b>No.</b>	<b>Subject</b>	<b>Forum Raised</b>	<b>Status / Target Date</b>	<b>Remarks / follow-up</b>	<b>Action Party</b>
8.	Update AIGD to current	SEA/BOB ADS-B WG/8	ADS-B SITF/12	Review and Update	Australia, Hong Kong China
9.	Harmonize process of detection bad TX for inclusion into “Blacklist”	SEA/BOB ADS-B WG/8	ADS-B SITF/12	Review and prepare a paper	Singapore & Hong Kong China
10.	ADS-B data sharing agreement for BOB	SEA/BOB ADS-B WG/8	ADS-B SITF/12 (31 Dec. 2012)	Report progress	Myanmar, India
11.	Update “harmonization Framework Document” for BOB	SEA/BOB ADS-B WG/8	ADS-B SITF/12 (31 Dec. 2012)	Report progress	India, Myanmar
12.	Explore possibility for installation of an ADS-B ground station on the Nicobar Islands to cover eastern gateway of BOB Sub-region	SEA/BOB ADS-B WG/8	ADS-B SITF/12	Report result of study	India
13.	Review ADS-B deployment plan in Bangladesh with consideration of comments received during the WG/8 meeting	SEA/BOB ADS-B WG/8	SEA/BOB ADS-B WG/9	Report result of deployment plan review	Bangladesh
14.	Include ADS-B avionics performance monitoring as separate agenda item for ADS-B SITF/12	SEA/BOB ADS-B WG/8	ADS-B SITF/12	Add as separate Agenda Item	Secretariat

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**REPORT ON HARMONIZATION PLAN**  
**FOR IMPLEMENTATION OF ADS-B ALONG ATS ROUTES L642 AND M771**  
**OF SOUTH EAST ASIA AD HOC WORKING GROUP**

**States Present:**

Hong Kong, China  
Indonesia  
Republic of Korea  
Singapore

Date: 7 December 2012 at International Business Centre, Yangon, Myanmar

The participants met to update the harmonization plan for L642 and M771 as shown in the attached table below.

Hong Kong, China and Singapore agreed to share with one another occurrences of aircraft with abnormal observations to facilitate investigation. The criteria to determine such abnormal observation will be discussed and agreed upon separately.

Indonesia will consider the sharing of information of aircraft with abnormal observations with Hong Kong, China and Singapore.

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<b>Harmonization Plan for L642 and M771</b>			
<b>No.</b>	<b>What to harmonize</b>	<b>What was agreed</b>	<b>Issue / what needs to be further discussed</b>
1	Mandate Effective	SG, HK, CN: 12 Dec 2013 VN : to be confirmed	
2	ATC Operating Procedures	No need to harmonize	Refer to SEACG for consideration of the impact of expanding ADS-B surveillance on ATC Operating Procedures including Large Scale Weather procedures.
3	Mandate Publish Date	No need to harmonize	To publish equipment requirements as early as possible.
4	Date of Operational Approval	No need to harmonize	
5	Flight Level	SG, HK, CN: - At or Above FL290 (ADS-B airspace) - Below FL290 (Non-ADS-B airspace)  VN to be confirmed	
6	Avionics Standard (CASA/AMC2024)	SG - CASA or AMC2024 or FAA HK - CASA or AMC2024 or FAA VN - CASA or AMC2024 or FAA(TBC) CN - CASA or AMC2024 or FAA(TBC)	ADS-B Task Force agreed that DO260B will be accepted as well.  SG, HK, and CN agreed their ADS-B GS will accept DO260, DO260A and DO260B by 1 July 2014 (Note 1)
7	Aircraft Approval		
7a)	Procedures if Aircraft Not Approved or Aircraft without a Serviceable ADS-B Transmitting Equipment before Flight	SG, HK, CN : FL280 and Below VN to be confirmed	



7b)	Aircraft Approved but Transmitting Bad Data (Blacklisted Aircraft)	For known aircraft, treat as non ADS-B aircraft.	Share blacklisted aircraft among concerned States/Administration
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.

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

### **ADS-B DATA SHARING PLAN FOR BOB**

#### **Bay of Bengal Ad Hoc Group States Present:**

Bangladesh; India; and Myanmar

Date: 7 December 2012 at IBC, Yangon, Myanmar

1. India made it clear that they were willing to share ADS-B data.
  
2. Regarding Myanmar – India, the parties planned to proceed as follows:
  - Myanmar send draft ADS-B data sharing agreement to India by 31 Dec 2012 to which India will respond  
  
The objective is to sign agreement by 1H 2013.
  - India will send an updated “Harmonization Framework Document” to Myanmar by 31 December to which Myanmar will respond.
  
3. Bangladesh expressed their willingness to share ADS-B Data with other countries. Bangladesh will review their ADS-B Implementation Plan based on recommendation and suggestion made during the meeting. i.e. reduction of number of planned stations.

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