



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

**REPORT OF
THE NINTH MEETING OF THE SOUTH EAST ASIA
AND BAY OF BENGAL SUB-REGIONAL ADS-B IMPLEMENTATION
WORKING GROUP
(SEA/BOB ADS-B WG/9)**

Beijing, China
30 October - 1 November 2013

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

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

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1. INTRODUCTION

1.1 The Ninth Meeting of the South East Asia and Bay of Bengal Sub-regional ADS-B Implementation Working Group (SEA/BOB ADS-B WG/9) was held at ICAO Regional Sub-Office (RSO) in Beijing, China from 30 October to 01 November 2013.

2. ATTENDANCE

2.1 The meeting was attended by 39 participants from Australia, Bangladesh, China, Hong Kong China, India, Indonesia, Malaysia, Maldives, Singapore, Thailand, Viet Nam, IATA and CANSO. List of participants is at **Attachment 1**.

3. OPENING OF THE MEETING

3.1 Mr. Nopaddol Pringvanich, Chief of RSO, extended warm welcome to the participants and provided brief introduction of RSO. He also emphasized the importance of harmonized implementation of ADS-B in the Sub-regions. The Chairman of the APANPIRG ADS-B Study and Implementation Task Force, Mr. Greg Dunstone highlighted the objective of the meeting. Mr. Li Peng, Regional Officer CNS, on behalf of the Secretariat, thanked RSO and ATMB/TEDC for their support in conducting the meeting in Beijing China.

4. OFFICERS AND SECRETARIAT

4.1 The SEA ADS-B Working Group recalled that the Working Group had been moderated by the representative nominated by the host State as agreed at the first meeting of the group. However, considering the meeting was held in the ICAO Regional Sub-office, as proposed by the Secretariat, Mr. Greg Dunstone, Chairman of APANPIRG ADS-B SITF was elected as chairman for this meeting. Mr. Li Peng, Regional Officer CNS and Mr. Shane Sumner, Regional Officer ATM Asia and Pacific Office acted as the secretaries of the meeting. The meeting was also facilitated and assisted by the staff of RSO.

5. ORGANIZATION, WORKING ARRANGEMENTS AND LANGUAGE

5.1 The meeting met as single body through the meeting except for Friday, 2 Ad Hoc working groups were established to deal with the SEA and BOB Sub-regional activities.

5.2 The working language was English only inclusive of all documentation and this Report. A total of 14 working papers, 10 information papers were considered by the meeting. A list of papers is at **Attachment 2**.

Agenda Item 1: Adoption of Agenda

1.1 The agenda adopted by the meeting was as follows:

Agenda Item 1: Adoption of Agenda

Agenda Item 2: Review outcome of the AN Conf/12, ADS-B SITF/12 and APANPIRG/24

Agenda Item 3: Updating implementation and co-ordination activities

- 3.1 Readiness of implementation – Singapore
- 3.2 Readiness of implementation – Hong Kong, China
- 3.3 Readiness or status of implementation – China and Viet Nam
- 3.4 Readiness of implementation of UAP in Australia
- 3.5 Updates by other States

Agenda Item 4: Separation minima for ATS Routes L642 and M771

Agenda Item 5: Review of sub-regional implementation plans

- 5.1 Review outcome of Ad-hoc Working Group at previous meetings
- 5.2 Review status of data sharing agreement between India and Myanmar
- 5.3 Identification of potential projects in Eastern part of South China Sea Area
- 5.4 Harmonization of ADS-B regulations, rules and procedures
- 5.5 Discuss progress on data sharing among other States

Agenda Item 6: Need for monitoring and improvement in compliance

Agenda Item 7: Any other business

Agenda Item 2: Review outcome of the AN Conf/12, ADS-B SITF/12 and APANPIRG/24

2.1 Under this agenda, the meeting reviewed the outcome of the AN Conf/12 and APANPIRG on ADS-B presented by the Secretariat.

Recommendations of AN Conf/12 (WP/3)

2.2 AN Conf/12 developed 56 Recommendations. The scope of the follow-up action by planning and implementation regional groups (PIRGs) on the recommendations, in some cases, extends to States, International Organizations and other stakeholders. The meeting noted that a number of recommendations identified by the ADS-B SITF relevant to ADS-B include not limited to Recommendations 1/7, 1/9, 1/11, 2/2, 4/2, 4/3, 4/5, 6/5 and 6/6. The meeting noted the work being carried out by the ATM Seamless planning group on priorities of ASBU module for the ASIA/PAC Region including ADS-B based ground surveillance service. The meeting reviewed the required follow-up to the recommendations provided in Attachment to WP/3. Through Conclusion 24/4, States and International Organizations were also urged to take follow-up action as appropriate on the applicable recommendations of the AN Conf/12.

2.2.1 Australia, Hong Kong China and Singapore presented a joint Working Paper (WP/11) as requested by the ADS-B SITF/12 meeting. The meeting discussed the relevant recommendations and actions need to be taken. 16 of 56 Recommendations were identified relevant to ADS-B implementation i.e. Recommendations 1/2, 1/7, 1/9, 1/11, 1/12, 2/2, 4/1, 4/2, 4/3, 4/5, 4/6, 6/1, 6/2, 6/6, 6/10 & 6/12. The meeting reviewed the proposed statements and recommended follow-up actions by APANPIRG and its contributory bodies for each of 16 recommendations. As result of discussion, the meeting made several changes to proposed actions in paper. The updates will be consolidated and presented to the next meeting of ADS-B SITF meeting scheduled for April 2014. Member States of the Working Group were requested to provide further comments to Hong Kong China (through the ICAO secretariat) for consolidation before the next Task Force meeting to be held in April 2014. The proposed ADS-B SITF response and actions to 16 AN-Conf/12 recommendations are provided in **Appendix A** to this Report. Discussions on some of these recommendations are recorded briefly as follows:

Recommendation 1/7 - The meeting discussed whether enough had been done to harmonize ADS-B planning, including such considerations as mandates defined for ATS routes rather than airspace volumes and planning for service delivery outcomes and future decommissioning of expensive radars that may no longer be required.

Recommendation 1/9 - It was agreed that the highest cost benefit was likely to be achieved in the NAT region. The cost of space based ADS-B surveillance was not yet known, and the cost of supporting data and voice communications must also be considered. The challenge would be in ensuring the Asia/Pacific Region did not end up with multi-layered technologies implemented without benefit delivered. ADS-B SITF should maintain a watching for the development for the time being.

Recommendation 1/11 - ATM automation support for surveillance technologies such as MLAT and Mode S DAPS should be subject to operational need and cost benefits. There may be also some scope for enhancement to the ADS-B Implement Guidance Document to include human-machine interface (HMI) considerations.

Recommendation 4/2 - There was possibly a need to ensure alignment of any follow up work and the provisions of the Seamless ATM Plan. The Seamless Plan identified the highest priority ASBU modules for the Region as Critical Upgrade. Module B0-ASEP was a Recommended Upgrade, and B0-OPFL categorized as May Not be Universally Implemented. The meeting also proposed to following draft Conclusion for consideration by the ADS-SITF on the regional ADS-B OUT forward fit mandate commencing from December 2017.

Draft Conclusion 3/1 – ADS-B OUT Forward Fit

That, States/Administrations in APAC Region mandate that aircraft with an individual certificate of airworthiness first issued on or after 8 January 2017 (two years after the European forward fitment mandate is effective) be equipped with ADS-B avionics compliant with Version 2 ES (equivalent to RTCA DO260B).

Recommendation 4/3 - While noting APANPIRG Conclusion 24/43 urging States to not display geometric altitude to ATC, it was also noted that there may be a use for it in some safety-related applications such as detecting Mode C SSR errors and processing. It was also recommended to develop regional policy on mandating ADS-B OUT for the remotely piloted aircraft as it would be difficult to retrofit at later stage of minimum safe altitude alerts.

Recommendation 4/6 - Any ADS-B SITF response or action on ADS-B equipage requirements for remotely piloted aircraft should be with full awareness of the work of other ICAO groups studying these aircraft. There was a need to clarify definitions and operation of such remotely piloted aircraft (RPA) formally called unmanned aerial systems (UAS).

ACTION ITEM - 1: Singapore will support for development Guidance Material on the subject.

Recommendation 6/2 - There may be a need to consider words other than “better equipped, better served” to describe the link between equipage and capacity and efficiency benefits.

2.2.2 The meeting also discussed the need for development of a high level regional strategy and timeline on the deployment of surveillance facilities. In this connection, the meeting was reminded of guidance provided in Edition 4 of Global Air Navigation Plan endorsed by the Assembly in September 2013. States may consider developing their national plan for their surveillance capabilities.

2.2.3 The meeting was informed that Hong Kong China was going to decommission one SSR after the end of its operational life in consultation with airspace users.

2.2.4 The meeting noted that Mode S radars are being deployed by a number of States in the Region, however function of Mode S radar with DAPS for ATM automation system has not been fully utilized. Some examples were highlighted by Australia.

2.2.5 Regarding Recommendation 6/10, the meeting discussed the synergy between PBN and ADS-B implementation using GNSS. The meeting agreed that a brief guidance material may be developed for consideration by CNS SG for inclusion into the regional PBN implementation plan.

ACTION ITEM - 2: Australia agreed to prepare a draft for presentation to next ADS-B SITF meeting in April 2014.

Outcome of APANPIRG/24 on ADS-B (WP/2)

2.3 The meeting reviewed the outcome of APANPIRG/24 on the report of ADS-B SITF Task Force including the work accomplished by the Eighth meeting of the SEA/BOB ADS-B Working Group. It was noted that the APANPIRG/24 meeting held in June 2013 reviewed the outcome of the Twelfth meeting of the ADS-B Study and Implementation Task Force. The outcome of APANPIRG/24 on matters relating to ADS-B was provided in WP2. The Reports of Twelfth meeting of ADS-B Task Force and Eighth meeting of the SEA and BOB WG were also reviewed by the CNS SG/17 in May 2013 in Bangkok, Thailand.

2.3.1 APANPIRG/24 appreciated the efforts and progress made by the ADS-B SITF and the SEA ADS-B WG and expressed its appreciation and gratitude to DCA, Myanmar and the Airports Authority of India for hosting the Eighth meeting of the South East Asia and Bay of Bengal Sub-Regional ADS-B Implementation Working Group and the Twelfth meeting of the ADS-B Study and Implementation Task Force.

2.3.2 APANPIRG/24 meeting noted the ADS-B implementation status by States and some issues observed during the implementation. The meeting noted the report of APANPIRG/24 meeting on ADS-B as provided in the Attachment to the Working Paper.

Agenda Item 3: Updating implementation and co-ordination activities

3.1 Under this agenda, the meeting reviewed readiness status for implementation of surveillance based service.

Australia (IP/3)

3.2 The meeting noted the following updates presented by Australia:

- En-route Radar Replacement (ERRP) - 14 SSR Mode S installations including new transportable SSR radars over the next few years;
- WAM in Tasmanian (TASWAM) operational since early 2010 and WAM in Sydney (SYDWAM) supporting a 3NM separation standard and for Parallel Runway Monitor (PRM) application were receiving a software upgrade in October and November 2013 that will include support for DO-260B ADS-B target processing;
- Two additional ADS-B sites have been commissioned - Point Lookout and Mt Hardgrave.
- Planning to install additional 15 ADS-B ground stations from 2014 to 2016 in addition to updates on current 31 ADS-B stations.
- Significant date - from 12 December 2013 ADS-B OUT mandating applies in Australian airspace (domestic and foreign aircraft). Applications for exemption to this requirement being considered by CASA.
- The Airservices Australia and the Department of Defence released a Request for Tender (RFT) for a new joint civilian/military Australia ATM system called “OneSKY” which was estimated for full operational around 2020.

Readiness for ADS-B Mandate (IP/5)

3.3 The meeting noted Australia’s readiness for implementation of the Upper Airspace Program (UAP) ADS-B mandate from 12 December 2013:

- ATC system readiness (operational use since 2004);
- ATC staff readiness (in use for many years, with a training package for post-mandate operations in place);
- Technical staff readiness (training and certification);
- Blacklist management (ATC and Technical Staff procedures);
- Data recording, tools and procedures for detection and analysis of anomalies;
- Mandate and technical standards (in place since 2009, effective Dec 2013);
- Avionics Fitment (high overall equipage, with some limited exemptions available);
- Airline flight planning;

- Entry of Flight ID by pilots;
- Avionics installer and maintenance coordination, support;
- Manual of ATC being updated to support the mandate;
- Exemption management for military, state aircraft and ferry flights;
- Management of avionics failures (provisions for return to maintenance base);
- AIP update;
- Industry coordination and publicity (industry meetings, 1 on 1 meetings, bulletins, advertisements); and
- Government coordination (military, government departments, regulator and ANSP)

China (IP/8)

3.4 China provided updates on the status of their ADS-B implementation. Eight ADS-B ground stations had been installed by the end of 2012. The national ADS-B ground station deployment roadmap was going to be issued shortly. According to the draft plan, more than 200 ADS-B ground stations will be constructed nationwide as the first phase.

3.5 One ADS-B ground station had been put into trial operation in the area of Sanya FIR since 2008. Additional three ADS-B ground stations were being constructed in the area. In July 2009, Sanya ATC Centre integrated ADS-B signal into their ATM automation system which is able to display ADS-B data alone or show the integrated data derived from both radar and ADS-B. In order to support implementation of ADS-B based surveillance service for the major ATS routes L642 and M771, China had issued a NOTAM on ADS-B trial operation.

3.5.1 Currently in Sanya FIR an ADS-B signal alone won't be used for ATC separation services. It was further informed that current radar coverage was large enough to cover Sanya FIR.

Singapore (WP/13)

3.6 Singapore updated the meeting that most of the preparation for ADS-B for L642 and M771 had been completed. The outstanding item would be the safety case which is expected to be completed by the end November 2013.

3.7 Singapore affirmed that an AIP supplement would be issued to remind the airspace users of the requirements.

Hong Kong China (Presentation)

3.8 Hong Kong China updated the meeting that their ground station infrastructure is ready and they observed about 80% ADS-B equipage along L642/M771 according to the survey conducted in September 2013. Hong Kong China has issued an AIP supplement on 29 October 2013 about the ADS-B mandate.

3.8 While reviewing the updates on the readiness from Hong Kong China, the issue of the implementation of a mandate for ADS-B equipage and ATC operational use of ADS-B data was discussed. Hong Kong, China advised that since early 2013, they had been monitoring the avionics performance of ADS-B equipped aircraft flying within HKFIR allowing all stakeholders to get better

prepared for the coming mandate. Three major categories of problems in ADS-B equipped aircraft (see WP/10) were identified, some of which have safety implications to ATC and require rectification by airline operators. Hong Kong China will continue to collect and analyse ADS-B data, as well as disseminate the monitoring results to concerned CAA/airline operators to steer the programme forward. ADS-B signals will continue to be fed to ATC controllers under an operational trials programme. Hong Kong, China indicated they will continue to assess progress in rectification of the problems and the aircraft performance in support of safety assessment before using the ADS-B signals for operations. In view of the foregoing, Hong Kong China will review the ADS-B mandate for HKFIR at suitable time.

3.9 There was further discussion of other examples of operationalizing ADS-B services before introducing mandates, and IATA advised that airlines have a strong preference for States to complete the required analysis, trials and implement an operational ADS-B service prior to mandating equipage, as mandates required considerable cost, time and resources on the part of operators.

Viet Nam (IP/4)

3.10 Viet Nam informed the meeting about the status of their two phased ADS-B Implementation plan and ADS-B mandate for eight oceanic ATS routes including M771, L642, L625, N892, M765, M768, N500 and L628 at and above FL290.

3.11 The phase one for redundant coverage for oceanic airspace of Ho Chi Minh FIR had been completed by March 2013. The phase two for whole lower and upper airspace of Ha Noi and Ho Chi Minh FIR will be completed by 2016. The mandate for ADS-B equipage was published through an AIC dated 20 June 2013. According to the AIC, aircraft must carry a serviceable and compliant ADS-B OUT transmitting equipment from 12 December 2013 and aircraft operator were also requested to have relevant ADS-B operational approval issued from the State of aircraft registry.

Malaysia (IP/2)

3.12 The meeting noted the ADS-B implementation plan presented by Malaysia. The plan include installation of two ADS-B ground stations in KL FIR; surveillance data sharing with neighboring country and the requirement for fitment of on-board equipment. The location of ADS-B stations will be at Pulau Langkawi and Genting Highland. The milestone of the ADS-B Implementation Plan is shown as follows:

No	Program	2014	2015	2016	2017	2018
1	Installation of ADS-B systems at two stations	➔				
2	Data Sharing with neighboring country		➔			
3	Requirement for fitment of On-Board Equipment			➔		
4	Full implementation of ADS-B Service at specific routes/Exclusive Airspace					✓

Maldives (IP/7)

3.13 The meeting was informed that Maldives Airports Company Limited (MACL) had completed installation and commissioning of 4 ADS-B ground stations in November 2012. Two stations were installed at Male' Ibrahim Nasir International Airport (INIA), One station is at the North in Kulhudhuffushi Island and another one is at South in Fuah Mulah Island. The work to integrate ADS-B sensor data to the ATM automation system was planned for early November 2013 with Site Acceptance scheduled in mid-November 2013. With the installation of these ADS-B ground stations, it now covers

approximately 95% airspace of the FIR at and above FL290. Maldives plans to deploy an ADS-B expert through ICAO Technical Cooperation Bureau to assist in the development of ADS-B concept of operations, policy to use of technology, regulations and phased operational implementation. Monitoring and collection of ADS-B data was carried out. Maldives has plans to share ADS-B data with its adjacent FIRs.

3.14 The meeting was also informed that the seaplane in Maldives had equipped with ADS-B for their operational control purpose. The seaplane also has ADS-B IN functions well.

India (IP/6)

3.15 India updated the meeting on their ADS-B implementation plan which aims at providing redundancy for Radar and filling the surveillance gaps. The ATS Automations systems at major ATC Centers, viz., the 12 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). The Indian ANSP is monitoring the airframes (ADS-B tracks) on stand-alone monitors as well as Situation Data Displays and studying the integrity of the ADS-B information and evaluating the use of ADS-B in both Non-Radar and Radar environment for Air Traffic Control purposes.

3.16 India expressed their willingness to share ADS-B data with Myanmar, Maldives, Sri Lanka, Malaysia and Indonesia. The AAI had commenced the process of acquiring approval from the Government and Regulatory agencies for ADS-B data sharing with neighbors. In the recently concluded ATS coordination meeting of the Bay of Bengal Arabian Sea Indian Ocean Region India and Myanmar reviewed the status of implementation of ADS-B in the respective States.

3.17 Airports Authority of India, the Indian ANSP conducted a one day ADS-B workshop with the support of IATA through their member airlines on 25th October, 2013 for the benefit of aviation professional including the Regulator, flight crew, Aircraft maintenance engineers, flight dispatchers, CNS engineers and air traffic controllers which was also attended by delegates from Bangladesh, as a part of the stakeholder engagement leading to awareness ahead of ADS-B implementation in India.

Agenda Item 4: Separation minima for ATS Routes L642 and M771**Separation Minima and Airspace Capacity in the South China Sea (WP/4)**

4.1 The Secretariat presented information on separation standards applicable in airspace served by ATS surveillance, and their contribution to improvements in airspace capacity and efficiency. The information included references to Standards and Recommended Practices defined in ICAO Doc 4444 (PANS/ATM), and the Asia/Pacific Region's expectations of the application of appropriate separation minima as agreed by APANPIRG/24 in its adoption of the Asia/Pacific Seamless ATM Plan.

4.2 The expansion of ATS surveillance coverage in the South China Sea as a result of ADS-B implementation would provide the opportunity for significant improvements in airspace capacity while simultaneously reducing ATC workload and task complexity. ADS-B coverage would supplement the existing radar coverage, which already included major part for ATS routes L642 and M771, and provide backup coverage in the event of failures or other outages of SSR facilities.

4.3 PANS/ATM and the regional Seamless ATM Plan define categories of airspace in which surveillance based separation standards should be applied. Extension of ATS surveillance coverage would bring a number of significant capacity, efficiency and safety benefits. Airspace capacity and efficiency improvements would be achieved through the implementation or extension of ATS surveillance services, *where accompanied by implementation of surveillance based separation standards*. In the case of en-route airspace, a horizontal separation minimum of 5 nautical miles (NM) would replace the horizontal separations of 30 NM or 50 NM, or longitudinal minima of 10 and 15 minutes (approx. 80 to 120 NM) commonly applicable in oceanic airspace.

4.4 It was noted that surveillance based separation minima of 5 NM and 3 NM had been in wide use globally for several decades, including in a number of Asia/Pacific States, in many cases using early generations of primary and/or secondary radar systems and ATC displays which had long since been retired.

4.5 In considering issues of surveillance based separation in South-East Asia, outcomes of the Combined 3rd Meeting of the South Asia/Indian Ocean ATM Coordination Group (SAIOCG/3) and 20th Meeting of the South-East Asia ATS Coordination Group (SEACG/20) held in Bangkok, Thailand, from 18 to 22 February 2013 demonstrated that overly-conservative separation minima of 30, 40 and 50 NM were both applied and planned within surveillance coverage in the South China Sea area, including ATS routes L642 and M771, thus failing to fully utilize current and planned surveillance and ATM system.

4.6 M771 and L642 were to be monitored, with a view to working through the logistical issues and planning for implementation of ATS surveillance based 20NM separation (SEACG Task List).

4.7 The Seamless ATM Plan had also specified Preferred ATM Service Levels (PASL), to be applied in 2 phases. PASL Phase I, with expected implementation by 12 November 2015 included:

ATM Systems

7.1 *The delivery of CNS/ATM services should be based primarily on the CNS/ATM capability. All ATC units should authorise the use of the horizontal separation minima stated in ICAO Doc 4444 (PANS ATM), or as close to the separation minima as practicable, taking into account such factors as:*

- a) *the automation of the ATM system;*
- b) *the capability of the ATC communications system;*

- c) *the performance of the ATS surveillance system, including data-sharing or overlapping coverage at TOC points; and*
- d) *ensuring the competency of air traffic controllers to apply the full tactical capability of ATS surveillance systems.*

4.8 The Seamless ATM Plan had accorded the highest priority for rectification of the lacking ATS surveillance and communication coverage to the South China Sea airspace between Viet Nam, Brunei Darussalam and the Philippines (**Figure 1**).

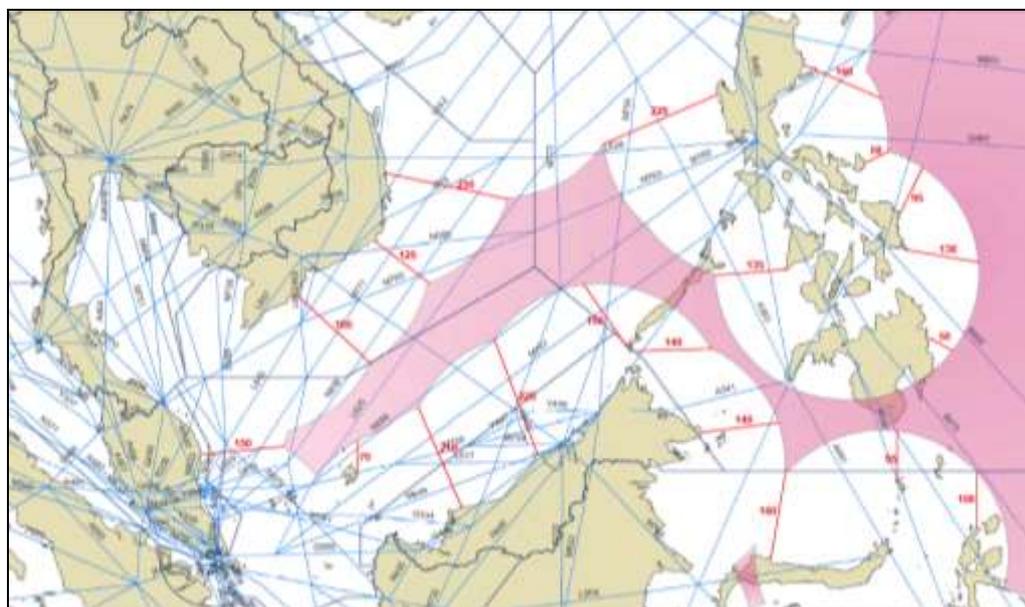


Figure 1: South China Sea ATS surveillance gaps (as at June 2013)

4.9 The meeting noted that the surveillance coverage depicted in Figure 1 was radar coverage only which, as radar data was not shared across boundaries, resulted in coverage gaps which were filled by ADS-B. Vietnam confirmed that Ho Chi Min FIR is also covered by radar and ADS-B.

4.10 SAIOCG/3 – SEACG/20 had further noted that the lack of coordinated ATFM processes in the Region often resulted in procedural separation standards being applied as pseudo ATFM measures. The Secretariat informed the meeting that this one-size-fits-all practice resulted not only in poor quality ATFM outcomes, but also artificially restricted ATC capacity and added significant workload and complexity to the ATC sectors involved, both at the point where the spacing was demanded and at upstream sectors, terminal units and aerodrome control towers that may themselves use appropriate PANS/ATM surveillance based separation

4.11 It was suggested that the meeting may not have sufficient ATC expertise to address the separation and ATFM issues raised, there were a number of items among the working paper's proposed actions by the meeting that may fall outside the meeting's terms of reference, and SEACG was the more appropriate forum for this discussion.

4.12 The Secretariat responded that the paper had been written to address Agenda Item 4 of this meeting; *Separation Minima for ATS Routes L642 and M771*. It was also in the meeting's interests to be fully aware of all aspects of how any implemented ADS-B capability would be used, including related ATM system factors, ATC separation issues and the benefits to airspace capacity they would provide. The overall intent was to highlight the opportunity to align ADS-B capability and the implementation of appropriate ADS-B based separation with the separation expectations of Seamless ATM Plan Phase 1 PASL and the expected Regional Framework for Collaborative ATFM. The ADS-B

WG had a role in providing assistance and developing guidance for ADS-B issues such as ADS-B and related ATM system capability, procedure development, and ATC and pilot training, etc.

4.13 It was also suggested that minimum surveillance separation standards are not always used within surveillance airspace across FIR boundaries due to a range of issues including the incidence of pilot non-compliance with clearances in or approaching boundary areas, ATC coordination deficiencies, traffic demand and ATC system and display limitations requiring reconfiguration of airspace, ATC sectors and ATM systems.

4.14 IATA observed that there was a significant difference between minimum separation derived by ATM capability, and that required to manage traffic for various reasons. Setting separation at conservative distances in all circumstances, regardless of traffic demand, penalized aircraft when there was no need. The Chair pointed out the current traffic demand and scale of traffic growth in the Asia/Pacific Region, and the need for the meeting to support States and their economies by improving capacity to meet the demand.

4.15 The meeting discussed the purpose of ADS-B being to provide surveillance not only for safety enhancement and data sharing, but also service delivery outcomes. The meeting further discussed the difficulty in getting a coherent regional picture of implementation and service delivery plans and outcomes. The information was available, but was distributed across a number of different groups. It would be beneficial to get a collected view of plans including, for example, the plans for implementation of separation standards on L642 and M771.

ACTION ITEM - 3: Secretariat was requested to take the lead to prepare such a Document with strong support by IATA & CANSO

4.16 The meeting concluded that information provided in the paper and outcome of discussions by the meeting need to be provided to SEACG for further consideration regarding separation standard to be applied (already listed as SEACG's Task) and to ADS-B SITF for other aspects.

Agenda Item 5: Review of sub-regional implementation plans

5.1 Under this Agenda Item, the meeting reviewed and discussed several papers. Summary of the discussions was as follows:

User Perspective on ADS-B Mandates in the South China Sea (WP/5)

5.2 On 12 Dec 2013 ADS-B OUT Mandates will become effective on certain routes in the South China Sea. Current information from States concerned shows the following Routes will be affected:

Singapore: L642, M771, N891, M753, L644 & N892
Vietnam: L625, M771, N892, L642, M765, M768, N500 and L628
Hong Kong China: L642 & M771

5.3 Few questions raised in the paper include harmonization of mandates, service delivery outcomes and aircraft handling processes, co-ordination of routes affected which were also discussed by the meeting under Agenda Item 4.

5.4 The meeting discussed about handling of aircraft with ADS-B “inop” failure in flight and considered it should have no difference for transponder failure. The meeting considered that the procedure for handling such failure should be similar to SSR transponder. In case of failure when not departed yet, it should follow maintenance and MEL procedure.

5.5 During a flight, a cockpit warning may be generated because of abnormal function of GPS sensor/receiver.

5.6 DO260 and DO260A equipment do NOT normally generate any warning to the air crew on ADS-B failure. In such cases failure is only detected by ATC either on-ground (ASMGCS system) or in the air.

5.7 Therefore, the crew may be aware of some kinds of failure and won't be aware of other failures of ADS-B transmitting equipment or ADS-B transmitting incorrect data or failure. Air traffic controllers may be aware some abnormal situation and instruct Pilot to change to standby transponder similar to the procedure for SSR transponder failure. It is collaborative responsibility between pilots and controllers.

5.8 It was advised that States should define plans for handling aircraft with inoperative ADS-B equipment in the circumstances of failure in flight, or for relocation to a maintenance base for rectification.

ADS-B Collaboration Initiatives (WP/6)

5.9 CANSO highlighted the importance of close collaboration in ADS-B implementation and the need to maintain the momentum of on-going ADS-B initiatives over the South China Sea and Bay of Bengal.

5.10 Many States in the Asia/Pacific Region had implemented or planned to implement ADS-B, but there was a need for greater collaboration among neighbors to harmonize implementation plans. While ADS-B could bridge surveillance gaps and support future ATM concepts, close cooperation was the key to unlocking its full potential. The initial phase of ADS-B implementation over the South China Sea involving Indonesia, Singapore and Viet Nam was a great example of what can be achieved.

5.11 The possibility of ADS-B collaboration between India, Maldives and Sri Lanka had also been proposed, but no meeting between the parties had taken place. CANSO encouraged States concerned in the Bay of Bengal and eastern part of South China Sea to progress ADS-B data sharing in order to achieve more fruitful result of ADS-B Implementation.

5.12 The meeting discussed the reasons for implementation of ADS-B, noting that there were some examples where there were 3 layers of surveillance. IATA reminded the meeting that ADS-B should be installed with a clear operational requirement in mind.

5.13 In response to a query, India advised that they were assessing the need and timing for their ADS-B mandate. In response to CANSO's query regarding ADS-B progress in Brunei and Philippines, the Secretariat advised that the CNS/ATM upgrade project in the Philippines had recently been resumed which includes ADS-B processing capability. Brunei had been earlier approached to host this WG meeting in order to better engage them in ADS-B implementation.

Agenda Item 6: Need for monitoring and improvement in compliance

GPS Avionics Failure (WP7)

6.1 Australia provided information discussing the ADS-B impact of GPS avionics failure in Boeing aircraft. The ADS-B architecture of Boeing aircraft included 2 GPS receivers. One receiver provided data to the LEFT side transponder, and the other to the RIGHT (**Figure 2**).

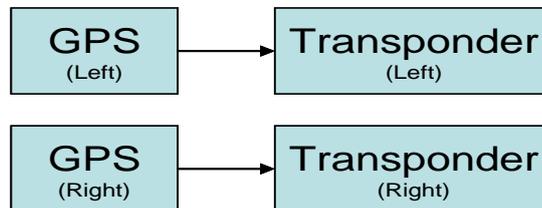


Figure 2: Boeing Aircraft ADS-B Architecture

6.2 Prior to deployment of RTCA-DO260B avionics there was no annunciation to the flight crew of ADS-B failure, and no indication if the transponder failed to receive GPS positional data.

6.3 In the event of failure of one GPS unit in Airbus aircraft the other GPS provided information to both transponders. In future Airbus was expected to adopt architecture similar to Boeing to reduce latency.

6.4 In the Boeing aircraft configuration the failure of one GPS would result in no ADS-B data being received by ATC if the corresponding transponder was selected as the operational transponder.

6.5 In mitigation it would be desirable that Boeing procedures required selection of the transponder on the alternate side if failure of a GPS unit was known by the crew. It was recommended that the Secretariat contact Boeing regarding this proposed mitigation.

6.6 As a further mitigation, ATC procedures could be developed, requiring ATC to request that the flight crew selected the alternate transponder when an ADS-B anomaly was detected. Australia had been using this procedure for some years, as detailed in the National ATS Procedures Manual (NAPM):

9-50-3

ADS-B position symbol not displayed

When ADS-B transmissions from a known ADS-B equipped aircraft are not being received within ADS-B coverage:

- a) inform aircraft that ADS-B transmissions are not being received;
- b) request pilot change to second transponder if possible; and
- c) submit an Event Report.

Australia AIP defined the phraseology **SELECT SECONDARY TRANSPONDER**

6.7 The procedure provided a recovery in cases of failed GPS, and had been successful in recovery from various other ADS-B anomalies.

6.8 Hong Kong China advised that Boeing did not include the effect of GPS failure on ADS-B output in its MEL, and that this information should be included. Hong Kong China and IATA would work through the Operators to write to Boeing to advance this issue.

ACTION ITEM - 4 Hong Kong China and IATA to contact Boeing through operators regarding GPS failure on ADS-B output in the MEL.

The Need for State of Registry Operational Approval (WP/8)

6.9 The experience of Australia had been that a requirement for prior “operational approvals” by the aircraft’s State of Registry restricted the safety and efficiency benefits of ADS-B. Air traffic separation by ATC was better served by accepting all aircraft having compliant ADS-B transmissions.

6.10 In its initial provision of ADS-B services almost 10 years ago Australia had required an Ops Specification of Letter of Approval to be provided by the aircraft operator before using the aircraft’s ADS-B data for ATS surveillance. This was based on assuring the aircraft’s compliance with the technical and operational standards published by the Australian regulator in 2007, and that the air crew were competent to operate in ADS-B surveillance airspace.

6.11 Many aircraft operators had difficulty or could not obtain the authorizing documents from their regulators as their States did not have an ADS-B approval system in place or did not understand what an approval entailed. Many aircraft transmitting high performance surveillance data were consequently not receiving the advantages of an ADS-B ATS surveillance service.

6.12 The requirement for operational approval had stemmed from APANPIRG Conclusion 21/39 (2010), which included a template for the guidance of States intending to introduce an ADS-B service. The template included the requirement that the aircraft operator should have the relevant operational approval from the State of Registry

6.13 Australia had examined the performance of ADS-B transmitted by aircraft not approved by their State of Registry, and found that in nearly all cases the data was as good as approved data. Aircraft transmitting non-compliant data were clearly detected by the ANSP, mainly due to low or zero integrity (NUCp) or large track-jumps. Australia had decided that the requirement for State of Registry approval was a hindrance to both safety and efficiency. The close similarity of transponder operation and air/ground communications between SSR and ADS-B based airspace was noted, and no separate approval process had been required for air crew or transponders operating in SSR airspace.

6.14 Since September 2012 Australia had changed from a so-called “white-list” of approved aircraft to a “black-list” of detected non-compliant aircraft. Aircraft with non-compliant ADS-B transmissions detected had been quickly moved to the black list, resulting in their removal from ATS displays for further flights. Operators and State regulators for these aircraft were contacted and requested to take corrective action. The aircraft remained on the black list until the operator advised that the problem had been fixed. This process removed the need for an ADS-B equipment process based on aircraft State of Registry approval.

6.15 The previous white list approval process was believed by Australia to be onerous, too restrictive, and achieved little if anything for safety assurance that could not otherwise be satisfied. The non-existence of a State of Registry approval should not override the safety advantages of the use of compliant ADS-B transmissions. More than 1 year of operation without a white list process confirmed that safety was enhanced by removal of the approval process. Many more aircraft were receiving an ADS-B service where they would otherwise have been excluded, and from 12 December 2013 they would not have been cleared to operate at or above F290.

6.16 The TPR901 transponder installed in many hundreds of Boeing and Airbus aircraft, including the track-jump problem, had demonstrated that State of Registry approval did not assure that the installed equipment did not transmit misleading information.

6.17 NAVCANADA had, after 4 years of operational use of an operational specification and certification requirement, had revised their safety case analysis and proposed to Transport Canada that the requirement be removed. The regulatory change was expected to be in place by December 2013. There was no certainty.

6.18 It was noted that a number of Asia/Pacific States required State of Registry operational approvals for their intended introduction of ADS-B mandates in December 2013, possibly to conform with APANPIRG Conclusion 21/39 and its template. However, those States may not maintain a white list of approved aircraft. Australia considered that a black list did obviate the need for a white list.

6.19 The meeting discussed the issues of OPS approvals and black lists, and how non-compliant aircraft would effectively be excluded from the ADS-B service. Singapore advised that aircraft without ADS-B capability indicated in their FPL would be excluded from mandate airspace, in the same way that aircraft that failed to plan RVSM capability were currently excluded. Hong Kong China stated that they would check the FPL for ADS-B capability indicators, but the aircraft track would be display.

6.20 In subsequent discussion it was agreed that States in APAC Region did not require an "Operational specification (ops spec)" to specify certification of non equipment aspects such as crew training, maintenance etc. These issues are covered under the existing requirements (if any) for the GPS and transponder equipment. In case where certification is required, the States were after assurance that the ADS-B avionics should comply with AMC20-24 or the applicable FAA or CASA ADS-B requirements. The operational approval requirements for ADS-B were considered to bring too little change to warrant an "ops spec".

Systematic Performance Monitoring of ADS-B Equipped Aircraft (WP10)

6.21 Hong Kong China recapped to the meeting that during the ADS-B SITF/12, a working paper was presented regarding a systematic algorithm based on an independent surveillance source and flight plan information to monitor and analyse avionics performance of ADS-B equipped aircraft. Moreover, APANPIRG/24 requested the ICAO Secretariat to seek the possibility of establishing a centralized database for sharing the monitoring results at the ICAO Regional Sub-office.

6.22 The Information in the working paper highlighted the analysis ADS-B data collected within the Hong Kong FIR during the 9 months from December 2012 to August 2013.

6.23 The analysis compared radar and flight plan information with ADS-B reported position, and examined the Navigation Uncertainty Category (NUC) and Flight Identification (FLTID) included in ADS-B reports, concluding that (a) ADS-B reported position deviation of greater than 1NM, (b) NUC of less than 4, and (c) FLTID mismatches against the ATS flight plan were examined if they were present in more than 5% of total reports by the aircraft. The system generated a list of aircraft meeting any of these criteria, including date/time of occurrence, ICAO Aircraft Address, a screen capture of radar and ADS-B tracks, graphical representation of NUC value changes and ADS-B/Radar track deviation. The monitoring and analysis of more than 350,000 ADS-B movements by more than 4,000 ADS-B equipped aircraft identified 3 major categories of problems:

- Category 1: ADS-B position report with good integrity (NUC 4 or greater), but position data bad when compared with radar;

- Category 2: FLTID not matching with Aircraft Identification in the flight plan; and
- Category 3: ADS-B position report with no integrity (NUC always 0)

6.24 The analysis results are attached at **Appendix B** to this Report.

6.25 Hong Kong China emphasized the safety implications to ATC for Category 1 problem, and recommended that monitoring results for Category 1 aircraft should be shared with other States capable of performing ADS-B monitoring and analysis to verify the findings, and that once verified a list should be promulgated on a central database for sharing with all parties. Concerned States and operators should then take remedial action, with ANSPs considering “blacklisting” affected aircraft from their ground systems before the problems were rectified.

6.26 Category 2 problems were observed for 15,598 (4.4%) ADS-B flights. Category 2 problem would trigger misleading conflict alert to ATC with cluttered screens - two target labels with different IDs (one for radar and another for ADS-B) being displayed to ATC, Hong Kong China recommended that these results should also be promulgated to concerned CAAs to follow up airworthiness issue with operators in question urging them for early rectification. Category 3 problems were observed for 16,612 (4.6%) ADS-B flights. It is recommended that concerned operators should initiate prompt action for rectification, otherwise they will be treated as non-equipped and requested to fly outside ADS-B airspace.

6.27 ICAO assistance in the establishment of a centralized database for storing and promulgating monitoring and analysis results for enhanced aviation safety of the region was requested. The Secretariat informed the meeting that the answer is affirmative. RSO agreed in principle to support the requirement and provided the service. However, detailed requirement and specification for the database needs to be developed, access and security procedure for input information and collected data sharing is also need to be further defined. Hong Kong China with support from Australia and Singapore agreed to develop the detailed requirement and procedure for consideration by the next meeting of the ADS-B SITF in April 2014. In the meantime, coordination with RSO should also be carried out. **(ACTION ITEM - 5)**

6.28 Considering wide extent of the problems, it was recommended that States intending to mandate ADS-B equipage should commence early monitoring, analysis and follow up work, say 9 months before mandate to allow sufficient time airline operators to rectify the problems, and for States to subsequently collect/analyse the data and conduct safety assessment, leading to deployment of ADS-B for operational use. Considering shortage of guidance on performance monitoring and analysis of ADS-B equipped aircraft, the meeting agreed to incorporate the proposed algorithm and scheme as guidance material into the AIGD. Hong Kong China will coordinate with States with ADS-B performance monitoring experience to update the AIGD and will prepare a working paper for discussion during the ADS-B SITF/13. **(ACTION ITEM - 6)**

South China Sea ADS-B Project Updates (WP/14)

6.29 Singapore, on behalf of Indonesia and Viet Nam updated the meeting on the progress of the South China Sea project since the last task force meeting. The updated time table of the harmonized action for implementation is provided in the attachment to the Working Paper.

6.30 The meeting appreciated active actions taken by three States for data sharing and other action and coordination role plays by Singapore.

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

6.31 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/9 meeting. The discussions were based on the outcome of previous meetings of the SEA/BOB WG/8. The outcome of discussions by Ad Hoc working groups is provided in **Appendix C** to this Report which could serve as a basis for further development of the sub-regional implementation plans at its next meeting. A readiness checklist updated by the meeting is provided in **Appendix D** to this Report.

Agenda Item 7: Any Other Business

7.1 Australia advised the meeting that the Australian regulator will soon issue an NPRM1305AS which will propose that foreign aircraft conducting IFR operations at any flight level in Australia will be required to carry ADS-B from Feb 2017. This will make the requirements for domestic and foreign aircraft the same from that date.

Date and Venue for the Next Meeting

7.2 The meeting discussed the need to hold another meeting to progress implementation of the sub-regional plan. The Secretariat will coordinate with member States of the Working Group for hosting the Tenth SEA/BOB ADS-B WG meeting in 2014. The exact dates and venue will be informed to the members States at due course.

7.3 A brief introduction on ADSB-2000A which is certified by CAAC was provided to the meeting by the Civil Aviation ATC Technology Equipment Development Co., LTD. (TEDC)

Note of appreciation

7.4 The meeting expressed its appreciation to the ICAO Regional Sub-office and TEDC of ATMB for their active support to the meeting.

PROPOSED FOLLOW-UP ACTION TO AN-CONF/12 RECOMMENDATIONS

Recommendations Adopted by AN-CONF/12	Proposed Response/Actions by ADS-B SITF
<p>Recommendation 1/2 – Implementation</p> <p>That ICAO:</p> <p>a) through its regional offices, provide guidance and practical assistance to States and regions and sub-regions when they decide to implement individual blocks or modules of the aviation system block upgrades;</p> <p>b) establish a group and improved mechanism for interregional cooperation to ensure harmonization of air traffic management; and</p> <p>c) assist States and regions in training and capacity-building towards implementation of the relevant modules of the aviation system block upgrades.</p>	<p>APANPIRG has already, and will continue, to provide guidance and practical assistance to States in our region regarding planning and implementation of ASBU modules related to ADS-B OUT and ADS-B IN.</p> <p>Since 2002, APANPIRG has established the "ADS-B Study & Implementation Task Force" (ADS-B SITF) which has been providing comprehensive guidance materials for ADS-B and numerous seminars and workshops on ADS-B before each meeting.</p> <p>APANPIRG has already proposed early implementation of ADS-B OUT technology and will continue to do so. This has been reflected in the Asia/Pacific Regional Surveillance Strategy document.</p> <p>B0-ASUR on "Initial Capability For Ground Surveillance" and B0-SNET on "Increased Effectiveness of Ground Based Safety Nets", which are dependent on ADS-B OUT technology, are amongst the highest priority ASBU implementation in the Asia Pacific region.</p>

Recommendations Adopted by AN-CONF/12	Proposed Response/Actions by ADS-B SITF
<p>Recommendation 1/7 – Automatic dependent surveillance — broadcast</p> <p>That States:</p> <p>a) recognize the effective use of automatic dependent surveillance — broadcast (ADS-B) and associated communication technologies in bridging surveillance gaps and its role in supporting future trajectory-based air traffic management operating concepts, noting that the full potential of ADS-B has yet to be fully realized; and</p> <p>b) recognize that cooperation between States is key towards improving flight efficiency and enhancing safety involving the use of automatic dependent surveillance — broadcast technology;</p> <p>That ICAO:</p> <p>c) urge States to share automatic dependent surveillance — broadcast (ADS-B) data to enhance safety, increase efficiency and achieve seamless surveillance and to work closely together to harmonize their ADS-B plans to optimize benefits.</p>	<p>APANPIRG has already proposed early implementation of ADS-B OUT technology, and will continue to do so.</p> <p>APANPIRG has encouraged ADS-B data sharing among States. Conclusions have been adopted under APANPIRG to urge States to share their ADS-B data and DCPC facilities. ADS-B data sharing is already operational in the region and further deployments are being planned. Besides, APANPIRG has also encouraged harmonized ADS-B implementation among States. Templates for harmonized ADS-B implementation, promulgation of harmonized ADS-B avionics equipage requirements, and guidelines for airworthiness and operational approval, have been developed and published. The dates of ADS-B mandates in many sub-regions were also aligned to take effect from 12 December 2013.</p> <p>APANPIRG has developed and published guidance materials on ADS-B data sharing and harmonized ADS-B implementation, and will continue to promote it at each APANPIRG and its contributory bodies' meetings.</p>

Recommendations Adopted by AN-CONF/12	Proposed Response/Actions by ADS-B SITF
<p>Recommendation 1/9 – Space-based automatic dependent surveillance — broadcast</p> <p>That ICAO:</p> <ul style="list-style-type: none"> a) support the inclusion in the Global Air Navigation Plan, development and adoption of space-based automatic dependent surveillance — broadcast surveillance as a surveillance enabler; b) develop Standards and Recommended Practices and guidance material to support space-based automatic dependent surveillance — broadcast as appropriate; and c) facilitate needed interactions among stakeholders, if necessary, to support this technology. 	<p>APANPIRG noted the development of space-based ADS-B.</p> <p>APANPIRG suggests that the highest cost benefit for this technology will be in the NAT region. We also note that the cost to ANSPs and the applicable lateral separations are not yet clear and that the technology is, as yet, unproven.</p> <p>However, APANPIRG sees enormous potential for space-based ADS-B across the oceans of the region. The strategy being adopted by the region is to keep an eye on its development until there is clarity about technical success and about the cost of the services before committing to this technology.</p> <p>The Asia/Pacific Seamless ATM Plan has identified space-based ADS-B as one of the key areas that should be researched for future development, in order to continue pursuance of seamless ATM beyond ASBU Block 0 implementations and global interoperability.</p>

Recommendations Adopted by AN-CONF/12	Proposed Response/Actions by ADS-B SITF
<p>Recommendation 1/11 – Automation roadmap</p> <p>That ICAO:</p> <ul style="list-style-type: none"> a) develop a global roadmap for the evolution of ground air traffic management automation systems in line with aviation system block upgrade implementation; and b) develop performance-based system requirements for air traffic management automation systems so that: <ul style="list-style-type: none"> 1) where necessary these systems are interoperable across States and regions; and 2) the function and operation of these systems will result in consistent and predictable air traffic management system performance across States and regions. 	<p>APANPIRG should encourage States to ensure that all newly deployed air traffic management automation systems should support all applicable ICAO adopted surveillance technologies such as ADS-B / MLAT and Mode S DAPS (Mode S Enhanced Surveillance), and that when appropriate, existing air traffic management automation systems will be upgraded to have such capabilities. Besides, capabilities to allow ADS-B data sharing should be included.</p> <p>Depending on whether there will be operational benefits to States and the region, APANPIRG could consider to promulgate a time line of expected ADS-B / MLAT / Mode S DAPS capabilities in their air traffic management automation systems by say November 2018 (in line with the "Preferred ATM Service Levels" PASL Phase II in Asia/Pacific Seamless ATM Plan).</p> <p>Guidance materials regarding appropriate ADS-B / MLAT / Mode S DAPS functionalities are available in the published guidance documents including guidance on sharing of ADS-B data. However, guidance materials for ADS-B implementation in complex radar airspaces are yet to be developed. ADS-B SITF to consider enhancing guidance materials for implementation of Mode S DAPS, as well as ADS-B implementation in radar airspace if needed.</p>

Recommendations Adopted by AN-CONF/12	Proposed Response/Actions by ADS-B SITF
<p>Recommendation 1/12 – Development of the aeronautical frequency spectrum resource</p> <p>That States and stakeholders:</p> <ul style="list-style-type: none"> a) recognize that a prerequisite for the deployment of systems and technologies is the availability of adequate and appropriate radio spectrum to support aeronautical safety services; b) work together to deliver efficient aeronautical frequency management and “best practices” to demonstrate the effectiveness and relevance of the industry in spectrum management; <p>2) demonstrate efficient use of the spectrum allocated through efficient frequency management and use of best practises;</p>	<p>With the deployment of ADS-B consideration should be given to the decommissioning of radars to reduce frequency spectrum utilization. The sharing of DCPC facilities to support ADS-B operations could also lead to decommissioning of certain HF stations and thus releasing the associated HF frequencies.</p> <p>High ADS-B fitment rates may lead to the removal of primary radars in some states.</p> <p>The Regional Surveillance Strategy has encouraged States to reduce dependence on primary radars for area surveillance.</p>
<p>Recommendation 2/2 – Development of ICAO provisions for remotely operated air traffic services</p> <p>That ICAO provide:</p> <ul style="list-style-type: none"> a) updates on additional guidelines for surveillance and air and ground communications systems; b) requirements for the use of sensors and display technologies to replace visual observation to air traffic in the provision of air traffic services; and 	<p>Due to the high Mode-S and ADS-B fitment and usage in the APAC region, trials of remotely operated ATS may be practical within the region earlier than other regions. APAC states should be encouraged to support these activities.</p>

Recommendations Adopted by AN-CONF/12	Proposed Response/Actions by ADS-B SITF
<p>Recommendation 4/1 – Efficient management of airspace and improved flow performance through collaborative decision-making</p> <p>That States:</p> <p>h) accelerate the implementation of collaborative decision-making processes in the provision of services at the regional level, being guided by the principles set forth in the <i>Manual on Collaborative Air Traffic Flow Management</i> (Doc 9971) and the <i>Manual on Flight and Flow – Information for a Collaborative Environment</i> (Doc 9965);</p> <p>i) according to their operational needs, implement the aviation system block upgrade modules relating to network operations included in Block 0.</p>	<p>CDM in some environments may be improved by separate organisations having a common view of the traffic.</p> <p>ADS-B data sharing between organisations may support better CDM.</p>
<p>Recommendation 4/2 – ICAO aviation system block upgrades relating to ground surveillance using automatic dependent surveillance – broadcast/multilateration, air traffic situational awareness, interval management and airborne separation.</p> <p>That the Conference:</p> <p>a) endorse the aviation system block upgrade modules relating to interval management included in Block 1 and recommend that ICAO use them as the basis of its work programme on the subject;</p>	<p>APANPIRG supports and prioritizes deployment of ASBU B0-ASUR (Initial Capability for Ground Surveillance) using ADS-B OUT technology. Initially, this serves the needs of ground surveillance but will place the region in a good position for ADS-B IN applications listed in Block 0 and Block 1.</p> <p>APANPIRG could consider to further enhance the region's preparedness by all States agreeing that all NEW aircraft registrations must have ADS-B OUT capability in our region by say 2017.</p>

Recommendations Adopted by AN-CONF/12	Proposed Response/Actions by ADS-B SITF
<p>b) agree in principle to the aviation system block upgrade modules relating to airborne separation included in Block 2 as the strategic direction for this subject;</p> <p>That States:</p> <p>h) according to their operational needs, to implement the aviation system block upgrade modules relating to ground surveillance, improved air traffic situational awareness and improved access to optimum flight levels included in Block 0.</p>	<p>APANPIRG could consider to enhance safety & efficiency in the region by supporting further deployment of ADS-B IN capabilities available in Block 0, including :</p> <ul style="list-style-type: none"> - B0-ASEP Air Traffic Situational Awareness (ATSA) - B0-OPFL Improved Access to Optimum Flight Levels Through Climb/Descent Procedures Using ADS-B (ITP)
<p>Recommendation 4/3 – ICAO aviation system block upgrades relating to airborne collision avoidance systems and ground-based safety nets</p> <p>That the Conference:</p> <p>a) endorse the aviation system block upgrade module relating to ground-based safety nets included in Block 1 and recommend that ICAO use it as the basis of its work programme on the subject;</p> <p>b) agree in principle to the aviation system block upgrade module relating to airborne collision avoidance systems included in Block 2, as the basis of the strategic direction for this subject;</p> <p>g) incorporate the new generation of airborne collision avoidance system (ACAS X) into its work programme;</p>	<p>Depending on whether there will be operational benefits for States and the region, APANPIRG could further improve safety in the region by encouraging States in the region to implement:</p> <p>B0-SNET Increased Effectiveness of Ground Based Safety Nets</p> <p>States in the region could agree, based on ALARP principles, to replace / upgrade their ATC systems to include :</p> <ul style="list-style-type: none"> - Short-term conflict alert (STCA) using data from available surveillance sensors such as Radar, WAM and ADS-B - Area proximity warning (APW) - Minimum safe altitude warning (MSAW) - Route adherence monitoring (RAM) - Cleared level adherence monitoring (CLAM)

Recommendations Adopted by AN-CONF/12	Proposed Response/Actions by ADS-B SITF
<p>That States:</p> <p>i) according to their operational needs, to implement the aviation system block upgrade modules relating to airborne collision avoidance systems and ground based safety nets included in Block 0.</p>	<p>- Selected level mismatch (using Mode C, Mode S and ADS-B data)</p> <p>The Asia/Pacific Seamless ATM Plan has set target date for implementation of the ground-based safety nets by PASL Phase II (expected implementation by November 2018).</p> <p>This could be done at the same time as upgrading the ATC system to support ADS-B.</p> <p>This recommendation supports ACAS-X which uses ADS-B to improve ACAS performance. An ADS-B fitment mandate across the APAC region would improve the effectiveness of these ACAS-X capabilities.</p>
<p>Recommendation 4/5 – Civil/military coordination/cooperation and sharing of airspace</p> <p>That States:</p> <p>a) planning and implementation regional groups, and ICAO to analyse the benefits that could be achieved through improved civil/military cooperation and sharing of the airspace serving international traffic flows and express the results of this analysis in terms of:</p> <p>1) capacity increases and reduction in routine delays as measured by traffic volumes on major traffic flows;</p>	<p>APAC could consider encouraging the sharing of ADS-B data between civilian and military authorities, including those from neighbouring States, to support a common view of the airspace.</p> <p>Engagement of the military in ADS-B could lead to improved co-ordination and increased airspace sharing. Use of ADS-B data provided by the civilian authority could fill surveillance gaps in the military system (at least as far as civilian traffic is concerned).</p> <p>Guidance materials on advice to military authorities regarding ADS-B data sharing has been developed and published.</p>

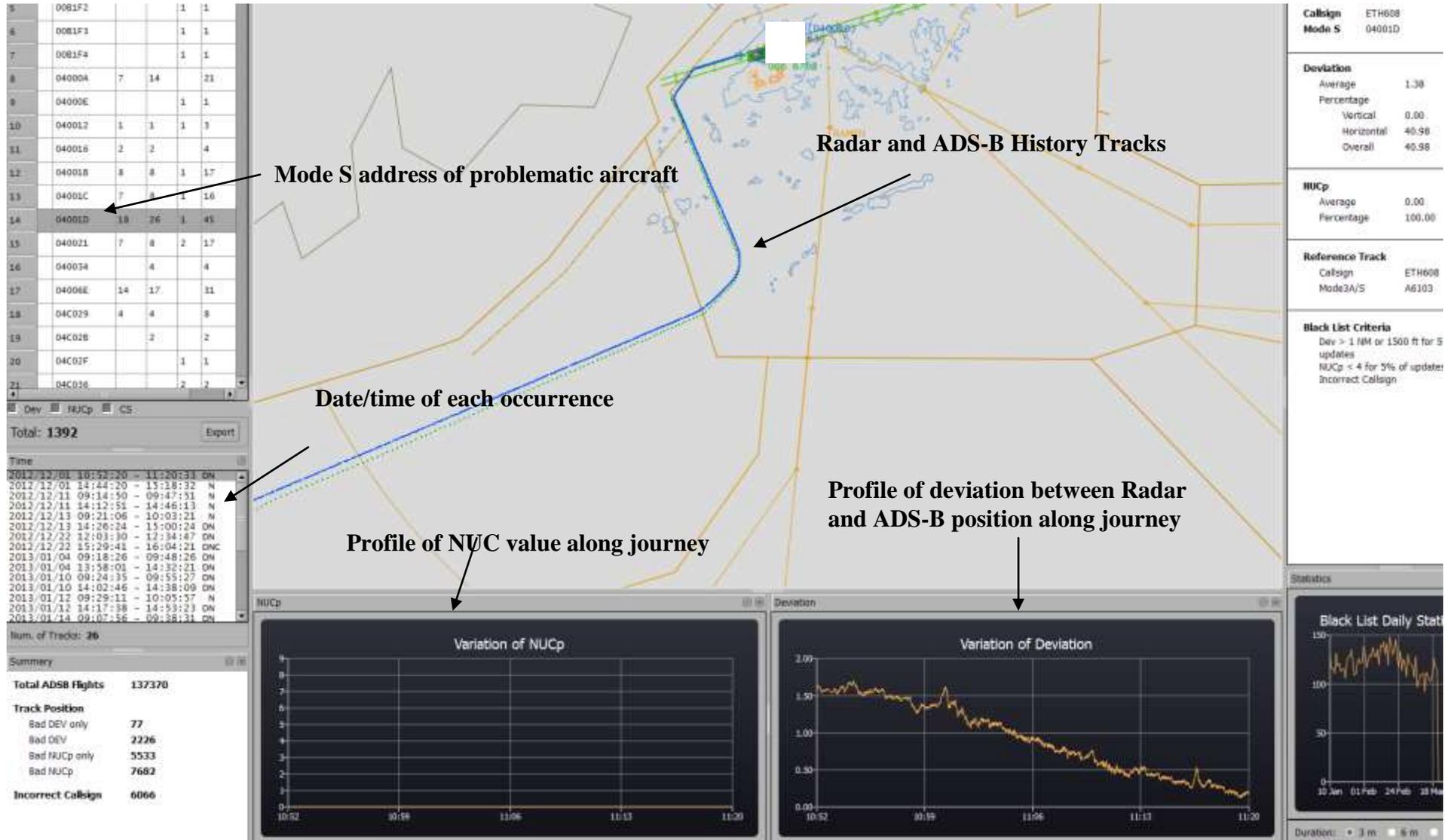
Recommendations Adopted by AN-CONF/12	Proposed Response/Actions by ADS-B SITF
<p>2) document fuel savings and emission reductions through the use of the fuel savings estimation tools; and</p> <p>3) other additional benefits;.</p>	
<p>Recommendation 4/6 – ICAO aviation system block upgrades relating to integration of remotely piloted aircraft into non-segregated airspace</p> <p>That the Conference:</p> <p>a) endorse the aviation system block upgrade module relating to remotely piloted aircraft included in Block 1 and recommend that ICAO use it as the basis of its work programme on the subject;</p> <p>b) agree in principle to the aviation system block upgrade modules relating to remotely piloted aircraft included in Blocks 2 and 3 as the strategic direction for this subject;</p>	<p>ADS-B SITF to seek clarification from ICAO on definition of "remotely piloted aircraft"</p> <p>A key to the support of remotely piloted aircraft in civilian airspace is surveillance. It could be appropriate to insist that all new registered remotely piloted aircraft operating in civilian airspace are required to have appropriate ADS-B OUT or Mode-S capability.</p> <p>The APANPIRG publication of such a rule could avoid the costs of an expensive retrofit in the future. The time is right for ADS-B SITF to deliberate such a strategic move.</p>
<p>Recommendation 6/1 – Regional performance framework – planning methodologies and tools</p> <p>That States and PIRGs:</p> <p>a) finalize the alignment of regional air navigation plans with the Fourth Edition of the <i>Global Air Navigation Plan</i> (Doc 9750, GANP) by May 2014;</p>	<p>APANPIRG should focus on implementing ASBU Block 0 Modules according to States' operational needs.</p> <p>ADS-B related ASBU Block 0 modules are ready for deployment including :</p>

Recommendations Adopted by AN-CONF/12	Proposed Response/Actions by ADS-B SITF
<p>b) focus on implementing aviation system block upgrade Block 0 Modules according to their operational needs, recognizing that these modules are ready for deployment;</p> <p>c) use the electronic regional air navigation plans as the primary tool to assist in the implementation of the agreed regional planning framework for air navigation services and facilities;</p> <p>d) involve regulatory and industry personnel during all stages of planning and implementation of aviation system block upgrade modules;</p> <p>e) develop action plans to address the identified impediments to air traffic management modernization as part of aviation system block upgrade planning and implementation activities;</p>	<p>- B0-ASUR (Initial capability for ground surveillance) using ADS-B/MLAT</p> <p>- B0-SNET Increased Effectiveness of Ground Based Safety Nets</p> <p>- B0-ASEP Air Traffic Situational Awareness (ATSA)</p> <p>- B0-OPFL Improved Access to Optimum Flight Levels Through Climb/Descent Procedures Using ADS-B (ITP)</p> <p>The Asia/Pacific Seamless ATM Plan has set the priorities and timeline in implementing the above modules.</p>
<p>Recommendation 6/2 – Guidelines on service priority</p> <p>That:</p> <p>a) ICAO develop an appropriate set of operational and economic incentive principles to allow early benefits of new technologies and procedures, as described in the aviation system block upgrade modules, to support operational improvements, while maximizing safety, capacity and overall system efficiency; and</p> <p>b) States and international organizations contribute to this work.</p>	<p>APANPIRG could obtain some quick wins by promulgating a view that aircraft equipped with ADS-B have service priority over those that don't (i.e. better equipped, better served). This will increase the business case for equipage.</p> <p>The above has already been reflected in the ADS-B mandate published by States (e.g. non-ADS-B equipped aircraft is required to fly outside the ADS-B airspace)</p>

Recommendations Adopted by AN-CONF/12	Proposed Response/Actions by ADS-B SITF
<p>Recommendation 6/6 – Use of multiple constellations</p> <p>That States, when defining their air navigation strategic plans and introducing new operations:</p> <ul style="list-style-type: none"> a) take advantage of the improved robustness and availability made possible by the existence of multiple global navigation satellite system constellations and associated augmentation systems; b) publish information specifying the global navigation satellite system elements that are approved for use in their airspace; c) adopt a performance-based approach with regard to the use of global navigation satellite system (GNSS), and avoid prohibiting the use of GNSS elements that are compliant with applicable ICAO Standards and Recommended Practices; d) carefully consider and assess if mandates for equipage or use of any particular global navigation satellite system core constellation or augmentation system are necessary or appropriate; 	<p>ADS-B robustness would be improved if multiple constellations could be used.</p> <p>APANPIRG could consider to request states to ensure that <u>future</u> ADS-B and GNSS mandates do not rely on a single constellation.</p> <p>ADS-B SITF could consider to develop guidance materials for use of multiple constellations to support ADS-B in APAC region.</p>
<p>Recommendation 6/10 – Rationalization of terrestrial navigation aids</p> <p>That, in planning for the implementation of performance-based navigation, States should:</p> <ul style="list-style-type: none"> a) assess the opportunity for realizing economic benefits by reducing the number of navigation aids through the implementation of performance-based navigation; 	<p>APANPIRG could consider to:</p> <ul style="list-style-type: none"> a) promote the synergy between ADS-B and GNSS equipage. ADS-B requires a high performance GNSS system. The business case of ADS-B and GNSS

Recommendations Adopted by AN-CONF/12	Proposed Response/Actions by ADS-B SITF
<p>b) ensure that an adequate terrestrial navigation and air traffic management infrastructure remains available to mitigate the potential loss of global navigation satellite system service in their airspace; and</p> <p>c) align performance-based navigation implementation plans with navigation aid replacement cycles, where feasible, to maximize cost savings by avoiding unnecessary infrastructure investment.</p>	<p>combined is better than for either alone. ADS-B SITF could consider to develop guidance materials on this subject.</p>
<p>Recommendation 6/12 – Prioritization and categorization of block upgrade modules</p> <p>That States and PIRGs:</p> <p>a) continue to take a coordinated approach among air traffic management stakeholders to encourage effective investment into airborne equipment and ground facilities;</p>	<p>APAC States could agree to give higher service priority to ADS-B equipped aircraft than those that do not equip (i.e. better service, better served). States are encouraged to take a coordinated approach to implement ADS-B/WAM to bridge the existing surveillance gaps so as to apply end to end radar liked separation along major air routes.</p> <p>This can improve the business case for operators to equip.</p> <p>The above has already been reflected in the ADS-B mandate published by States (e.g. non-ADS-B equipped aircraft is required to fly outside the ADS-B airspace)</p>

The Analysis Compared Radar and Flight Plan

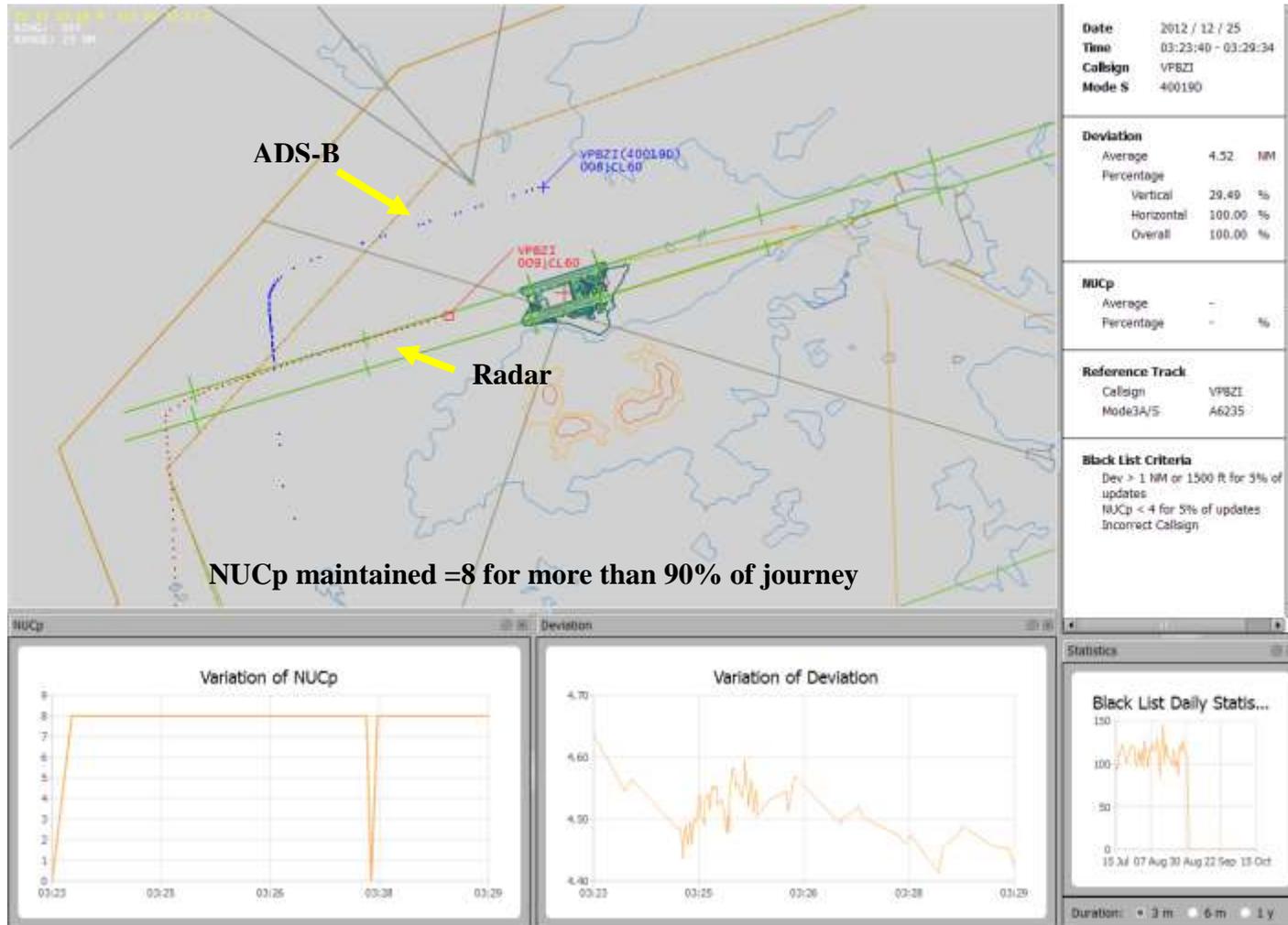


**Monitoring and Analysis Results of ADS-B Equipped Aircraft flying inside the HKFIR
from December 2012 – August 2013**

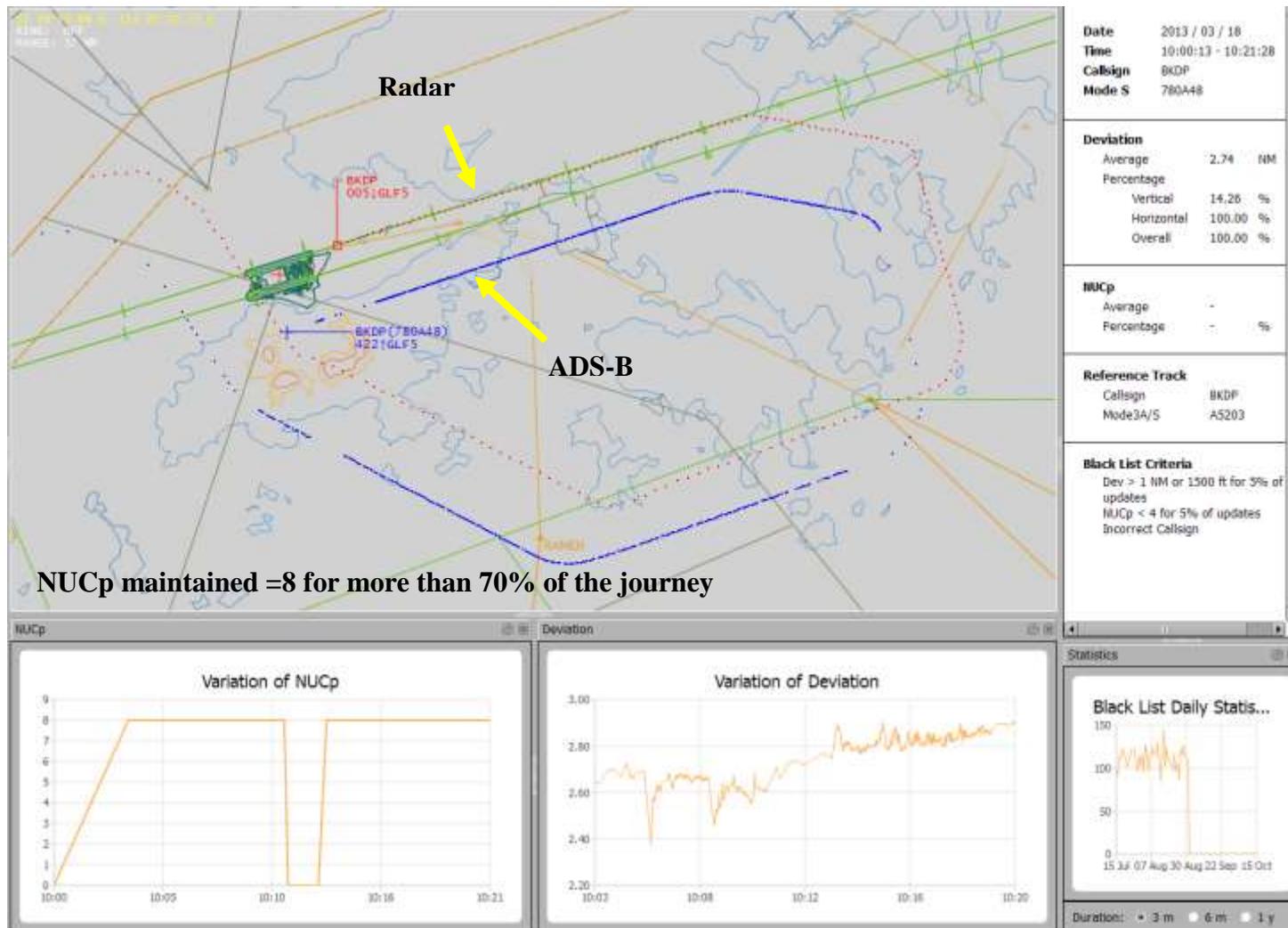
Category	Description	Safety implications to ATC (Yes/No)	Statistics	Recommendation
Cat. 1	ADS-B position report with good integrity (i.e. NUC \geq "4") but ADS-B position data are actually bad as compared with radar (meeting criterion 2.2(a)).	Yes. The ground system could not "automatically" discard ADS-B data with good integrity (i.e. NUC value \geq 4).	6 aircraft (1 local and 5 foreign registered) have been detected under this category. Typical examples are given in Attachment 1 – 3.	(i) The problem should be immediately reported to the concerned CAA/operators for rectification before the ADS-B data could be used by ATC. (ii) Consider to "blacklist" the aircraft before the problem is rectified.
Cat. 2	FLTID transmitted by ADS-B aircraft does not match with callsign in flight plan.	Yes. Could lead to screen clutter - two target labels with different IDs (one for radar and another for ADS-B) being displayed, causing potential confusion and safety implications to ATC.	15,598 (4.4%) ADS-B flights, or 1,827 aircraft (45.2%) are identified under this category. Typical examples are given in Attachment 4.	(i) Issue regulations / letters to concerned operators urging them to set FLTID exactly match with callsign in flight plan. (ii) Consider to "blacklist" the aircraft should no improvement be shown after notification.
Cat. 3	ADS-B position report with no integrity (i.e. NUC always "0").	No. The ADS-B data with NUC = 0 will be discarded by the ground system and the aircraft would be treated as if they were non-equipped.	16,612 (4.6%) ADS-B flights, or 555 ADS-B aircraft (13.7%) monitored are identified under this category. Typical examples are given in Attachment 5 - 8.	Concerned operators should initiate prompt action for rectification, otherwise they might be requested to fly outside ADS-B airspace.

Note : 358,386 ADS-B flight movements (or 4042 nos. ADS-B equipped aircraft) were monitored from December 2012 - August 2013

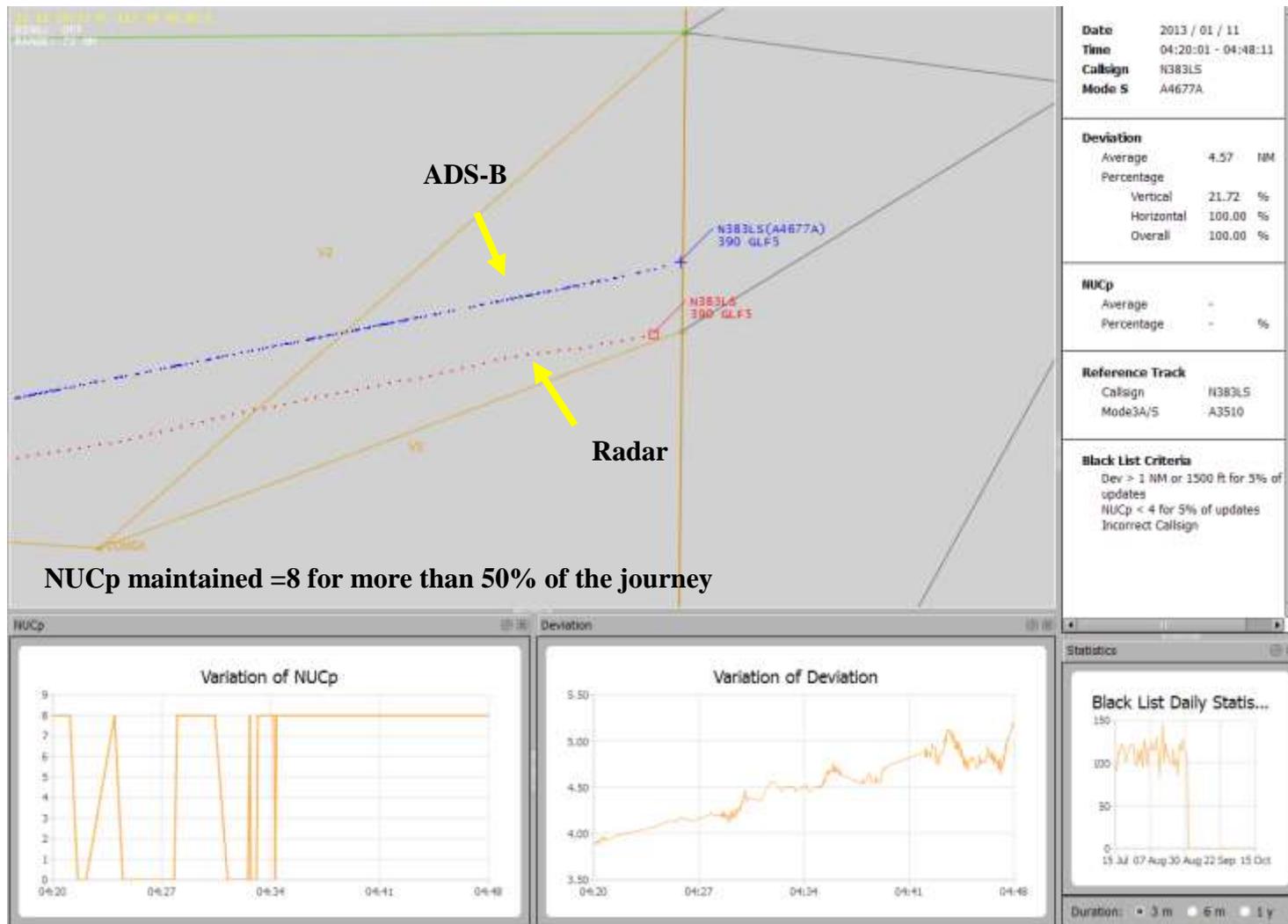
Average deviation from radar : 4.52NM

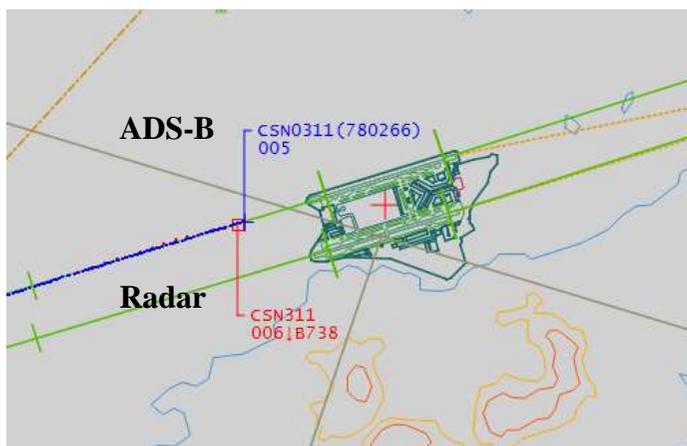


Average deviation from radar : 2.74NM

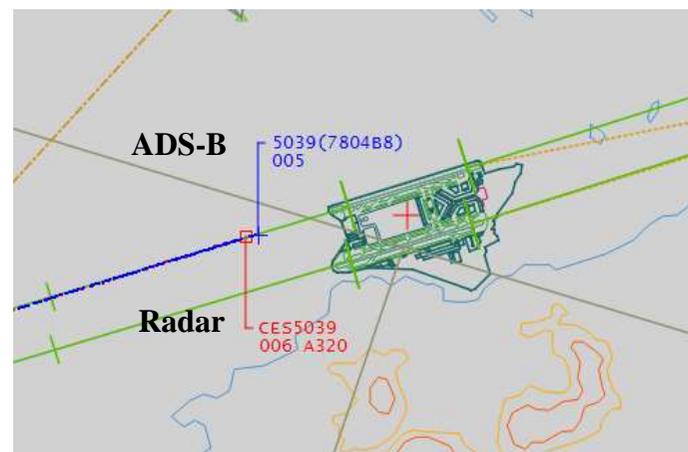


Average deviation from radar : 4.57NM

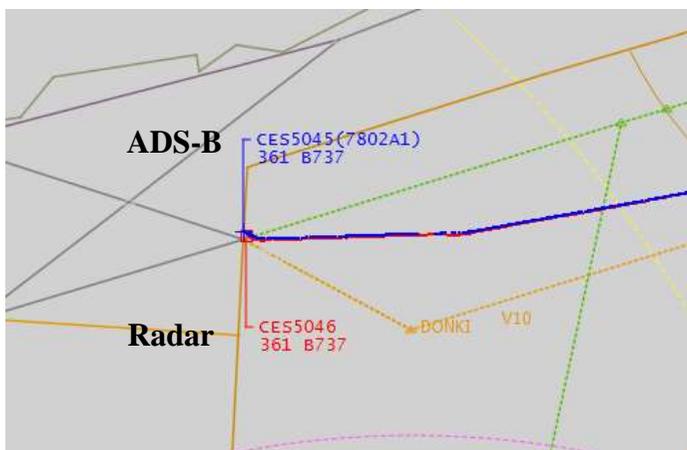




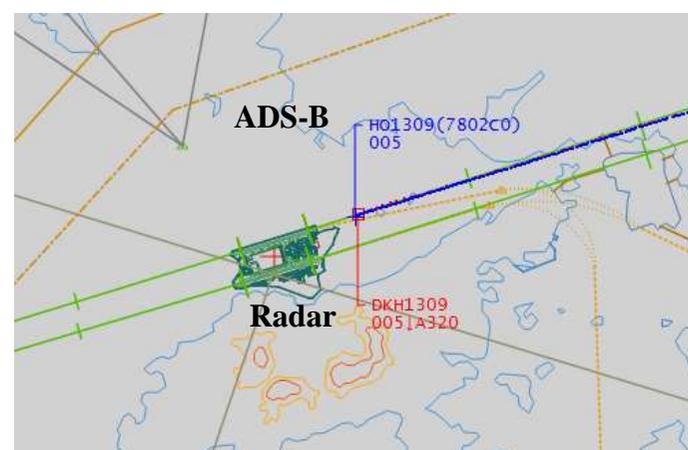
Additional zero inserted



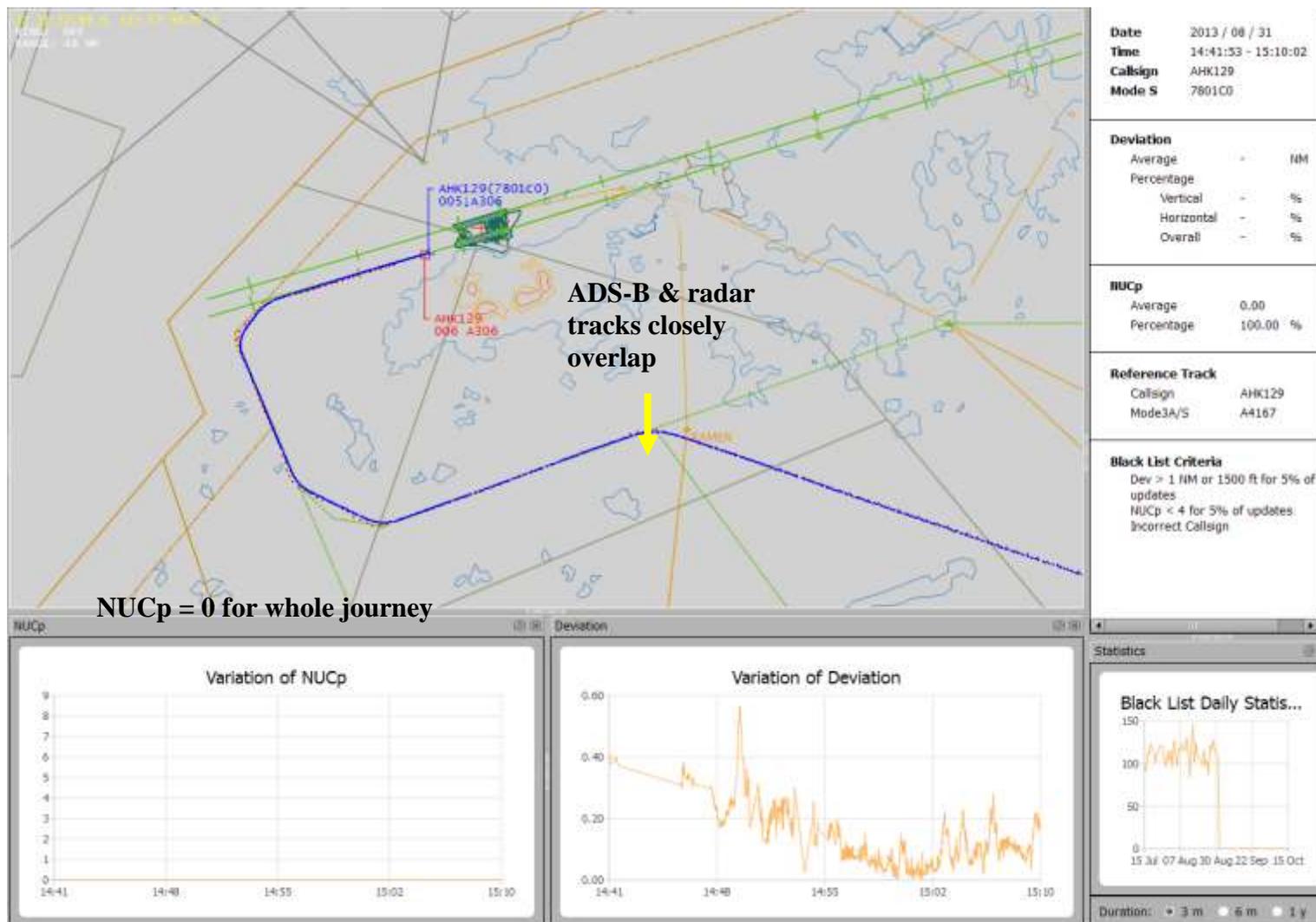
ICAO Airline Designator Code dropped

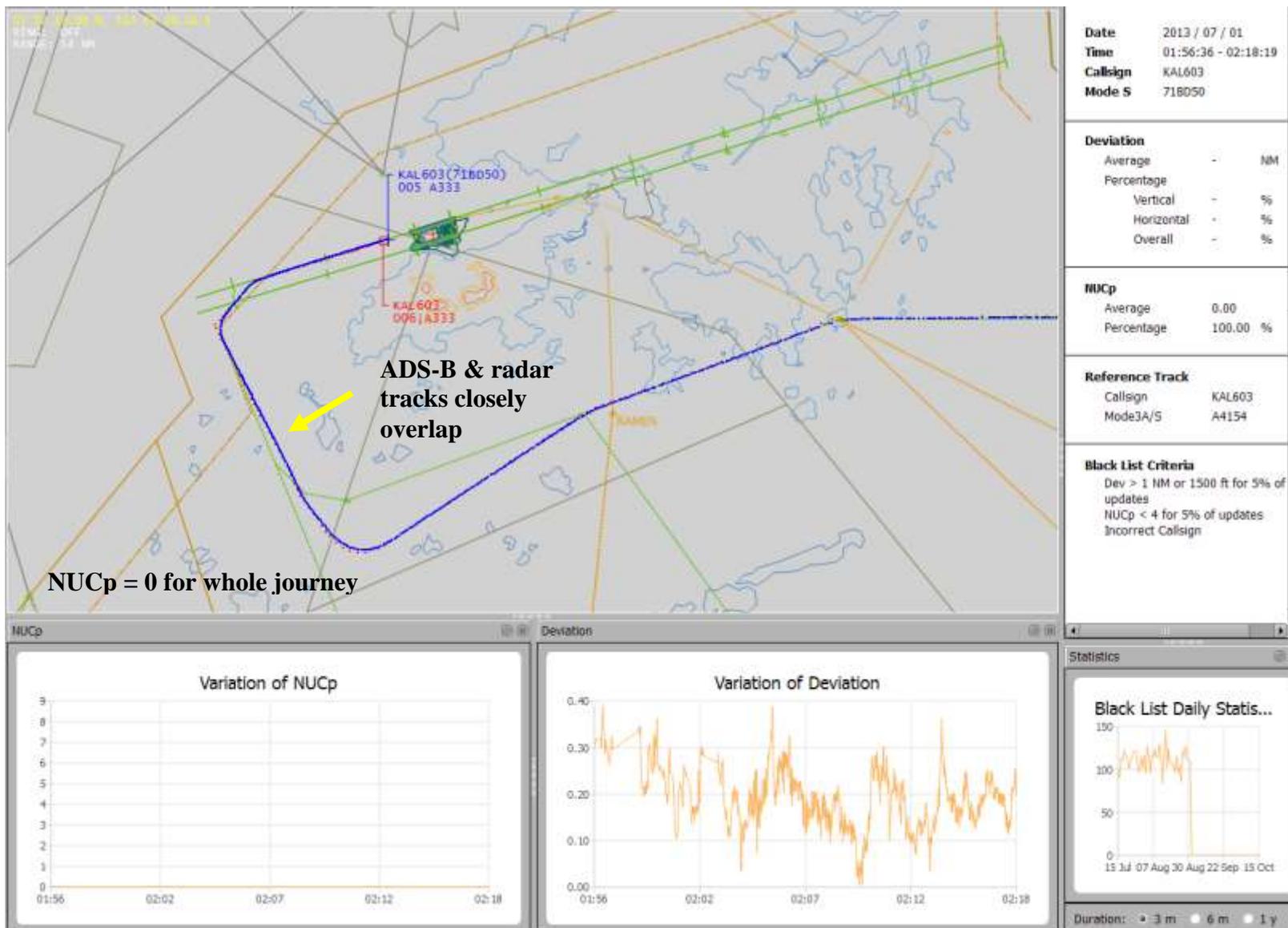


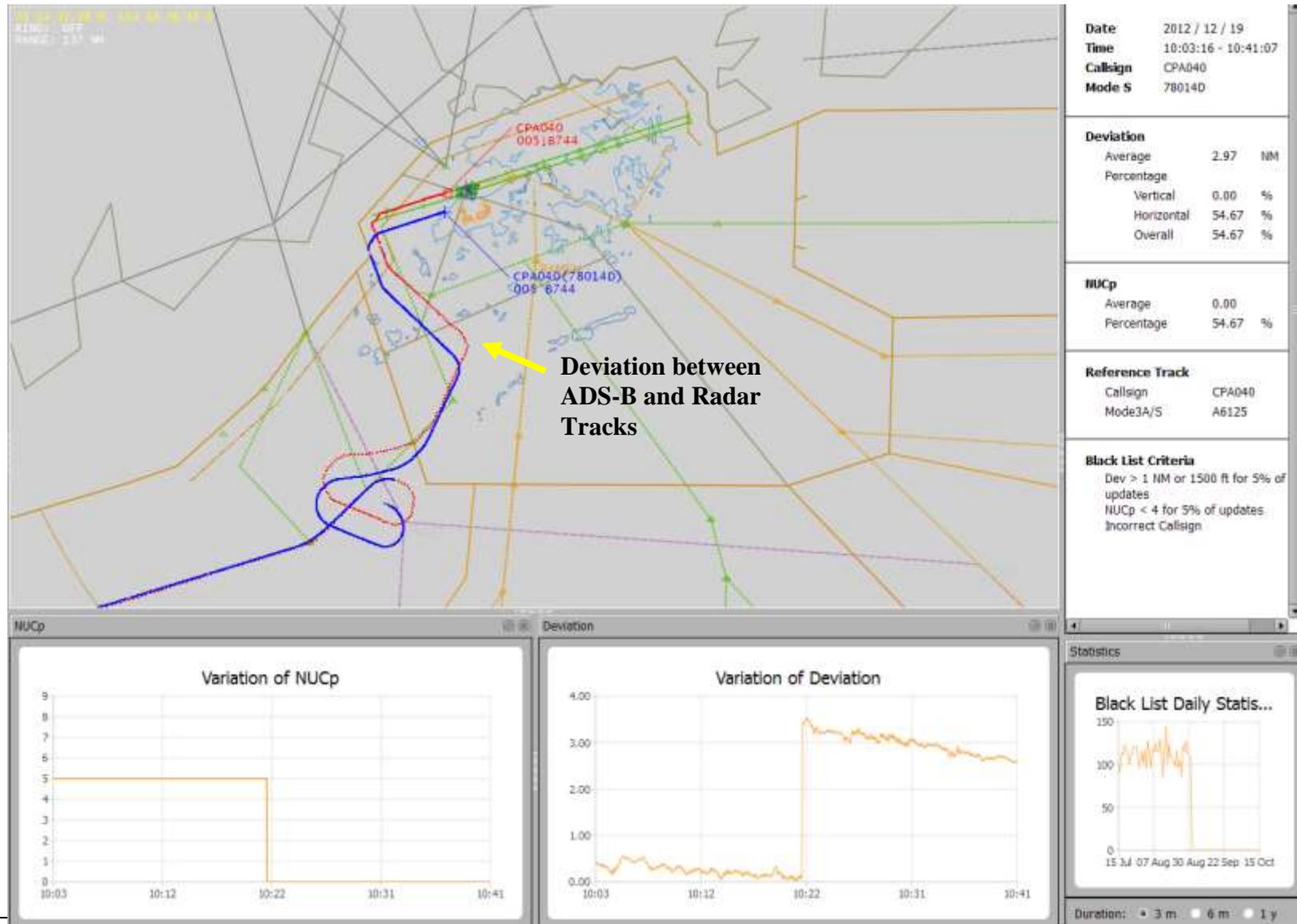
Wrong numerical codes entered



IATA Airline Designator Code used









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

States Present:

China
Hong Kong, China
Indonesia
Singapore
Vietnam
IATA (As observer)

Date: 1 November 2013 at ICAO APAC RSO, Beijing, China

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

Hong Kong - China, Indonesia, Vietnam and Singapore agreed to share with one another occurrences of aircraft with abnormal observations to facilitate investigation. China will advise whether China can share the occurrences of abnormal observation.

China will consider the sharing of information of aircraft with abnormal observations and update when the clearance is obtained.

The sharing will be limited to the Hong Kong – China, Indonesia, Vietnam and Singapore (China will be included upon their confirmation on the willing to share) in the initial phase.

As for the type of issues to be shared, the states will share all observations at the initial phase. The group will decide on the type of issues to be share when more experience is gathered.

Harmonization Plan for L642 and M771			
No.	What to harmonize	What was agreed	Issue / what needs to be further discussed
1	Mandate Effective	SG, HK, VN: 12 Dec 2013 CN (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	States to remind airlines that operational approval from State of registry is required.
5	Flight Level	SG, HK, VN, CN: - At or Above FL290 (ADS-B airspace) - Below FL290 (Non-ADS-B airspace) By 4 Nov 2013, SG, HK, VN would have issued AIP Sup.	By 4 Nov 2013, SG, HK, VN would have issued AIP Sup. CN (need to be confirmed)
6	Avionics Standard (CASA/AMC2024)	SG - CASA or AMC2024 or FAA (ES) HK - CASA or AMC2024 or FAA (ES) VN - CASA or AMC2024 or FAA (ES) CN (TBC) SG, HK and VN confirmed that their ADS-B GS can accept DO260, DO260A and DO260B.	ADS-B Task Force agreed that DO260B will be accepted as well. Status for CN to be confirmed. Indonesia will consider and have a willingness to upgrade their stations shared with other States.
7	Aircraft Approval		
7a)	Procedures if Aircraft Not Approved or Aircraft without a Serviceable ADS-B Transmitting	SG: FL280 and below. HK, CN, VN: Dependent on situation. ADS-B equipped aircraft will be	

	Equipment before Flight	given priority to operate above FL280.	
7b)	Aircraft Approved but Transmitting Bad Data (Blacklisted Aircraft)	For known aircraft, treat as non ADS-B aircraft. (China, Hong Kong - China and Singapore) Vietnam to be confirmed.	Share blacklisted aircraft 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.

Report on Implementation of ADS-B BOB Ad Hoc Working Group

Bay of Bengal Ad Hoc Group States Present:

Bangladesh;
India;
Indonesia
Maldives
Malaysia
Thailand
CANSO

Date: 1 November 2013 at Regional Sub Office, ICAO, Beijing, China

1. The participants met to update the status of implementation of ADS-B and possible data sharing between the neighboring States.

2. Maldives informed that their ADS-B ground stations at three locations viz. Male', Kulhudhufushi and Fuamulak have been commissioned and integration of data to the ATM systems will be completed by end of November, 2013. Maldives is willing to share ADS-B data with India and Sri Lanka (Probable date: 2H2014)
3. Bangladesh informed about the plan to install two ADS-B ground stations at Dhaka and Coxs Bazaar by 2H2014.
4. Indonesia informed that they are willing to share ADS-B data from ground station at ICEH with Portblair (Probable date: 2H2104)
5. India shared that the data sharing agreement between India and Myanmar was discussed during the ATS coordination meeting held in India last week and the data sharing agreement will be signed by 1H2014. The data sharing agreement template will be shared by India with other States.
6. CANSO informed about ADS-B plans of Sri Lanka and their willingness to share ADS-B data with neighboring states.

The following locations for data sharing were agreed upon during the sub-group meeting.

INDIA-BANGLADESH	
Agartala and Dhaka	(2H2015)
BANGLADESH-MYANMAR	
Coxs Bazaar and Sittwe	(2H2014)
INDIA – MYANMAR	
Agartala – Sittwe	(1H2014)
Portblair – Coco Island	(1H2014)
INDIA – INDONESIA	
Portblair – Aceh	(2H2014)
INDIA – MALDIVES	
Trivandrum – Kulhudhuffushi	(2H2014)
MALDIVES – SRI LANKA	
Male' – (TBD)	
INDIA – SRI LANKA	
Trivandrum - (TBD)	

READINESS CHECKLIST TABLE

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

**NINTH MEETING OF THE SOUTH EAST ASIA AND
BAY OF BENGAL SUB-REGIONAL ADS-B IMPLEMENTATION
WORKING GROUP
(SEA/BOB ADS-B WG/9)**

Beijing, China 30 October to 1 November 2013

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International Civil Aviation Organization

**THE NINTH MEETING OF THE SOUTHEAST ASIA AND BAY OF BENGAL
SUB-REGIONAL ADS-B IMPLEMENTATION WORKING GROUP
(SEA/BOB ADS-B WG/9)**

Beijing, China, 30 October - 1 November 2013

LIST OF WORKING AND INFORMATION PAPERS

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WORKING PAPERS			
1	-	Provisional Agenda	Secretariat
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3	2	Follow-up to Recommendations of the Twelfth Air Navigation Conference (AN-Conf/12) on ADS-B	Secretariat
4	2	Separation Minima and Airspace Capacity in the South China Sea Area	Secretariat
5	2 & 5	ADS-B Mandates in the South China Sea	IATA
6	5	ADS-B Collaboration Initiatives	CANSO
7	5.4	GPS Avionics Failure	Australia
8	5.4	The Need for "State of Registry" Operational Approval	Australia
9	6	Update on TPR901 Problem	Australia
10	6	Systematic Performance Monitoring of ADS-B Equipped Aircraft and Sharing of the Monitoring Results for the APAC Region	Hong Kong, China
11	2	Follow-up on Recommendations of AN-Conf/12	Australia, Hong Kong China & Singapore
12	6	Performance of ADS-B Stations and Avionics in Singapore FIR	Singapore
13	3	Readiness of Implementation – Singapore	Singapore
14	5	Update on the ADS-B Collaboration Project in the South China Sea	Indonesia, Singapore & Viet Nam

WP/IP No.	Agenda	Subject	Presented by
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INFORMATION PAPERS

1	-	Meeting Bulletin	Secretariat
2	3	ADS-B Implementation Plan in Malaysia	Malaysia
3	3	Surveillance Programme Update : Australia	Australia
4	3	Harmonization Framework for ADS-B Implementation in Viet Nam	Viet Nam
5	3	Readiness for ADS-B Mandate : December 2013	Australia
6	3	ADS-B Implementation in India – an Update	India
7	3	ADS-B Implementation Plan in Maldives	Maldives
8	3	ADS-B Implementation status updates from China	China
9	3	Status of ADS-B Implementation in Hong Kong, China	Hong Kong, China
10	3	A Briefing of TEDC's ADS-B Equipment	China
