International Civil Aviation Organization

Twenty Eighth Meeting of the Communications/ Navigation and Surveillance Sub-group (CNS SG/28) of APANPIRG

Bangkok, Thailand, 1 July – 5 July 2024

Agenda Item 7: Surveillance

7.1 Review Report of Ninth Meeting of the Surveillance Implementation Coordination Group (SURICG/9), including:

- Report of the Fourth Meeting of the Surveillance Study Group (SURSG/4)

REVIEW OF OUTCOMES OF THE NINTH MEETING OF THE SURVEILLANCE IMPLEMENTATION COORDINATION GROUP (SURICG/9)

(Presented by the Secretariat)

SUMMARY

This paper presents the relevant outcomes of the Ninth Meeting of the Surveillance Implementation Coordination Group (SURICG/9) for meeting review.

1. INTRODUCTION

1.1 The Ninth Meeting of the Surveillance Implementation Coordination Group (SURICG/9) was held at the ICAO APAC Regional Office, Bangkok, Thailand, from 7 – 10 May 2024. The Meeting was attended by 68 participants from 22 Member States/Administrations, 4 International Organizations, and 1 industry partner. The meeting report, working papers, information papers and other resources can be accessed at
https://www.icao.int/APAC/Meetings/Pages/2024-SURICG-9.aspx

1.2 This paper presents relevant information and updates from the Meeting.

2. DISCUSSION

2.1. The summary of discussions in the Meeting is given in the following paragraphs.

Review of Relevant Meetings - Sec (WP/02)

2.2. The paper summarized relevant information and updates, highlighting the reviewed outcomes of SURICG/8, ATMAS TF/4, and relevant discussions of other meetings of CNS SG/27 and APANPIRG/34. The Meeting was informed that the ICAO TV channel at https://www.icao.tv/ is a good resource for States/Administrations, and many recorded videos are available for open access. The co-chair also encouraged participants to consider further improvements to the regional surveillance strategy in future.

ICAO Recommendations and Guidance on GNSS Vulnerability – Sec (WP/04)

2.3. The paper presented an overview of ICAO's Recommendations and Guidance on Global Navigation Satellite System (GNSS) vulnerability. By introducing the CNS Challenges in 2024, it was noted the APANPIRG/34 meeting urged States/Administrations and airspace users (through IATA) to report GNSS occurrences to the ICAO APAC Office using the reporting templates which was proposed by SRWG/8 and circulated through the State Letter Ref.: T 8/5.10 – AP052/24(CNS) on 23 April 2024. The Meeting reiterated the importance of surveillance (independent of GNSS source) and air-ground communication for operations in case of GNSS outage.

2.4. The Meeting discussed new improvements in ADS-B avionics, which will transmit the GNSS interference status to a ground station. The Aireon space-based ADS-B payload can mitigate the situation through a satellite-based MLAT solution. The Meeting also emphasized the importance of educating operational staff, such as ATCOs and pilots. The Meeting was shared with the FAA Safety Alert for Operations (SAFO) 24002, which was posted on the meeting page.

Outcome of SURSG/3 and Updates on SURSG/4 – Sec (WP/05)

2.5. This paper summarized the main outcomes of the Report of the Third Meeting of the Surveillance Study Group (SURSG/3) held in Hong Kong, China, as a hybrid Meeting (In-Person and Virtual Participation) from 22 to 24 March 2023. The Meeting was informed that the fourth Meeting of the Surveillance Study Group (SURSG/4) was to be held in Hong Kong, China, as an In-Person meeting from 30 to 31 May 2024 after the Joint event of SWIM over CRV Demonstrations and Surveillance data sharing over SWIM trial planned from 28-29 May 2024 in Hong Kong China. The SURSG/4 Meeting's objective was to provide expert views and recommendations to achieve harmonized sharing of surveillance data in SWIM in the APAC Region along with the potential models of sharing of surveillance data in SWIM according to the Surveillance Strategy adopted by APANPIRG in support of ICAO's GANP and ASBU initiatives. The Meeting noted the State letter Ref: T 8/ 2.9, 2.10 & 2.11 – AP043/24 (CNS) dated 08 March 2024, sharing information about both meetings, agenda items, and other required information with APAC States/Administrations.

2.6. The SURICG/9 Meeting noted that as per the current plan, as most deliverables except one Guidance material for the sharing and access of surveillance data allocated to SURSG are completed and most objectives are achieved, the SURSG/4 Meeting will propose the dissolution of the SURSG if the joint event is successful and after the completion of the remaining deliverable and presentation at future SURICG meetings. If SURSG/4 concludes the dissolution of SURSG, the decision will seek the endorsement of SURICG and then CNS SG accordingly. The SURICG/9 Meeting noted that SURSG/4 outcomes will be presented to SURICG/10 next year.

Review Regional Surveillance Requirements – Sec (WP/06)

2.7. The paper reviewed regional surveillance requirements specified in Table CNS II-APAC-3 in APAC e-ANP Volume II, presented the updated Table CNS II-APAC-3 SURVEILLANCE of ANP Volume II by SURICG/8 as well as additional comments by States/Administrations.

Review/update ADS-B Implementation Status - Sec

2.8. The Meeting reviewed the consolidated ADS-B implementation information from States/Administrations in the Table of ADS-B Implementation Status in the APAC Region and further updated this table provided in **Appendix A** of this paper.

2.9. The Meeting reviewed the reports on the Sub-regional ADS-B implementation plan/projects presented by BOB and SEA Ad Hoc working groups led by Indonesia and Singapore, respectively. The reports updated by BOB and SEA Ad Hoc groups are provided in **Appendix B** and **C** of this paper, which could serve as a basis for further development of the sub-regional implementation plans and follow-up actions for coordination by States/Administrations.

2.10. The Meeting reviewed the updated table on ADS-B Data Sharing Implementation Status which States and Administrations provided their updates during the ad-hoc working group sessions. The updated table is provided in **Appendix D** of this paper.

Guidance on Management of 1030-1090MHz Utilization – SGP (IP/02)

2.11. The paper presented the work that is being undertaken by the Surveillance Panel to manage the 1030/1090 MHz utilization and highlighted the importance of States/Administrations adhering to guidance and SARPs to maintain healthy frequency utilization. It identified issues related to 1030/1090 MHz spectrum load and possible mitigations, with information on the affected ICAO documents and specific aspects such as relevant regulations and standards already available.

ADS-B Equipage and Quality Performance Observed in the US – USA (IP/13)

2.12. The paper summarized the observed NIC/ NACp performance computed by its ADS-B Performance Monitor (APM) for air carrier aircraft compared to the requirement of the US ADS-B mandate and provided ADS-B equipage trends in US tracked by APM for each unique ICAO aircraft address.

Challenges Finding the Cause of Non-Compliant ADS-B Data – New Zealand (IP/18)

2.13. New Zealand presented technical issues behind the non-compliant ADS-B data and methods to resolve the issues after coordinating with the regulator and the OEM. Two complex issues related to 2 different ADS-B transponder types were shared with corresponding resolutions.

Statistical Analysis of ADS-B Quality of Performance in Sendai Airport – Japan (IP/12)

2.14. This paper provided an overview of the initial findings regarding statistical values associated with the installation values and the characteristics of ADS-B performance on the airport's surface, where more positional data with lower NIC values were observed compared to the airborne positional data. Japan shared that a monitoring system for ADS-B performance is under development for further investigation into the decrease in performance.

Update the Action Plan for Surveillance in China - (IP/06)

2.11. China updated the current surveillance status with radar, ADS-B, SMR and MLAT. China further shared the progress of National ADS-B implementation optimization and adjustment, as well as the trial operation of WAM systems in terminal areas.

Trial Application of Remote Tower Optical System Technology in Civil Aviation Industry of China – (IP/07)

2.12. This paper presented the trial of the remote tower optical system conducted jointly by a regional air traffic control unit and a local airport. Contents such as system structure, system main functions, performance parameters and test scenario establishment were shared. The future application of the remote tower mode and the prospect of one center for multiple airport modes were also discussed.

Update on ATC Surveillance Activities in Australia - (IP/08)

2.13. This paper provided an update on air traffic control surveillance activities in Australia and upcoming plans. It highlighted the works Australia carried out and upcoming projects to make

greater use of ADS-B and Mode S. Australia will continue to assess the viability of the new surveillance technologies and innovation as they approach maturity.

II-SI Code Operation Deployment in Japan - (IP/09)

2.14. Japan shared the deployment of II-SI code operation with its difficulty in assigning II codes to all SSRs in Japan. Japan further revealed its plan to manufacture a new SSR for II-SI code starting in 2024. Japan was reminded to coordinate with the ICAO APAC Regional Office on assigning II / SI codes.

Status of Multi-Sensor Operation in Japan -(IP/10)

2.15. Japan shared the multi-sensor system consisting of several surveillance sensors such as SSR, WAM and ADS-B, and Hybrid Air-Route surveillance sensor Processing equipment (HARP), which provides a higher update rate and higher position accuracy to cope with the increase in traffic. The development and implementation of the system had been completed, and the ATC display in operation already showed multi-sensor target data from SSR/WAM. Integration of ADS-B data is now being planned.

Selective Interrogation System for Mode A/C Multilateration – Japan (IP/11)

2.16. This paper presented a selective interrogation system for Mode A/C multilateration (MLAT) employed for the roll-call interrogation of Mode A/C aircraft. Mode A/C MLAT development aims to improve aviation safety in Mode A/C aircraft operation - although Mode S signals are primarily used for MLAT, many aircraft equipped with only Mode A/C transponders still exist in Japan. The paper shared the issues to be addressed, the concept and principle of the selective interrogation system and the measurement result.

ADS-B in Retrofit Spacing (AIRS) Evaluation Project Update - USA (IP/14)

2.11. This paper provided a progress update on the ADS-B In Retrofit Spacing (AIRS) evaluation project, which is a large-scale operational evaluation of ADS-B In applications previously discussed in SURICG/6-IP/08. The project involved a collaborative effort between the Federal Aviation Administration (FAA), ACSS and American Airlines (AAL) in a public-private partnership to equip 288 AAL A321 aircraft with an ADS-B In retrofit solution that supports Cockpit Display of Traffic Information (CDTI)-Assisted Visual Separation (CAVS), CDTI Assisted Separation (CAS), and Interval Management (IM) capabilities.

2.12. The Meeting was informed that the FAA is continuing to evaluate the data from the trials to determine the gained efficiency and additional benefits for the airspace. The information will serve as input to assist in determining the appropriate next steps for the potential utilization of ADS-B In applications across US airspace.

ADS-B Implementation Activities in Pakistan and System's Capabilities – (IP/15)

2.13. Pakistan updated the implementation progress of the ADS-B system and its capability. There were 9 redundant ADS-B ground stations installed to enhance surveillance coverage in the area traditionally covered by radars. Analysis of real-time traffic reveals that, after the application of the quality filter in accordance with Circular 326 for 5NM separation, the ADS-B surveillance is comparable to MSSR. It was noted that the high ADS-B equipage rate of >99% for all commercial carriers would take additional time to reach the desired high equipage rate for general aviation aircraft.

Update on New Zealand Surveillance Status- (IP/17)

2.14. This paper provided an update on the surveillance activities in New Zealand in 2024, with a surveillance structure based on ADS-B as the primary surveillance source and six MSSRs, an MLAT system for cooperative surveillance back-up and 3PSRs for non-cooperative back-up. New Zealand shared that it would continue to collaborate with Australia on the introduction of a satellite-based augmentation system

Enhancing Surveillance Provisions for Safe and Reliable Services from Aerodrome Control Towers and Apron Control Centres in the Hong Kong International Airport – Hong Kong China (IP/19)

2.15. This paper highlighted the latest technology adopted by the Hong Kong International Airport (HKIA) for the implementation of Advanced Surface Movement Guidance and Control System (A-SMGCS), Digital Apron and Tower Management System (DATMS) and Automatic Foreign Object Debris Detection System (AFODDS), providing safe and reliable services from aerodrome control towers and apron control centres in the HKIA, as well as coping with the air traffic growth and operational needs. The Meeting is invited to consider the implementation of relevant technologies, based on the ICAO GANP/ASBU framework, if deemed necessary and operationally justified, to enhance surveillance provisions for safe and reliable services for aerodrome control towers and apron control centres for busy airports.

Surveillance Activities in Singapore - (IP/20)

2.16. This paper provided a summary of surveillance activities in Singapore, including radars, A-SMGCS, ADS-B, ADS-C/CPDLC and DAPS. This paper also shared equipage requirements for ADS-B out exclusive airspace and airport surface, and ADS-B equipage which was monitored over the past few years.

2.17. The Meeting appreciated Singapore's sharing, in particular on the statistics of ADS-B equipage of aircraft, which revealed the difference between States/Administrations as well as a trend of changes. The Meeting invited States/Administrations to incorporate individual statistics and trend analysis on equipage similar to IP/20 of SURICG/9 for future meetings to see any need for another initiative on new equipage mandate in future. **ACTION ITEM 9-3**

Update on Surveillance Activities in Nepal - (IP/21)

2.18. Nepal shared the current surveillance system service structure based on PSR, SSR, MSSR, ADS-B and WAM systems. As to the future plan of surveillance activities, Nepal also shared that a survey for MLAT implementation for SMC service Kathmandu (VNKT) has been scheduled.

Update on Surveillance Activities in Indonesia – (IP/22)

2.19. Indonesia updated the Air Traffic Management surveillance activities in Indonesia, including the development/implementation of radar, ADS-B, MLAT, SMR and Space-Based ADS-B.

Trial Operation Space Based ADS-B in Indonesia – (IP/23)

2.20. This paper shared the trial of Spaced-Based ADS-B conducted in Indonesia in 2021-2022, which provided better coverage in mountainous and oceanic areas. It also shared the vulnerability due to numerous disruptions in GNSS. Indonesia is exploring the possibility of operational implementation.

Post ADS-B Implementation Update and Surveillance Rollout for Fiji – (IP/24)

2.21. The document provides an update on Fiji's implementation of surveillance-based Area and Approach control services using ADS-B technology. It outlines the transition from procedural control to surveillance control services due to increased air traffic volumes and safety occurrences. Fiji mandated all aircraft domiciled in the country to have ADS-B transponders by December 2013, and by 2019, ten ADS-B ground stations were installed to improve surveillance coverage and enhance flight safety and efficiency in domestic controlled airspace. Surveillance services commenced on 6 October 2022.

Issues Implementation and Using ADS-B for Surveillance Separation – New Zealand & Sec. (WP/09)

2.22. Following the discussion in SURICG/8 on using ADS-B for ATC operations, Airways New Zealand has been asked by various ICAO APAC States for assistance with the introduction of ADS-B technology. The paper highlighted challenges faced by ANSPs and put forward a proposal to hold an ADS-B Implementation Workshop to assist States/Administrations with issues in the implementation of ADS-B including using ADS-B for surveillance separation.

2.23. With the approval of the ICAO ANB SIP fund, the secretariat and Airways New Zealand have worked out a provisional agenda for this Workshop scheduled for 14-16 August 2024. The invitation will be circulated through a State Letter immediately after SURICG/9. The Workshop will be mainly supported by an operations specialist and a communications and surveillance engineer from Airways New Zealand. Hong Kong China and Singapore will also contribute experts for presentation. The Meeting invited States/Administrations to nominate experts to support and participate in the Workshop in person to maximize the benefit of the Workshop. **ACTION ITEM 9-4**

Presentation 1: Presentation on Surveillance - EUROCAE

2.25. The presentation provided information about the Surveillance-focused Working Groups, particularly WG-51, which covers ground and aircraft elements for ADS-B, including standards for VDL Mode 4, ADS-B, and MLAT Ground systems. It also outlined the five sub-groups within WG-51. Additionally, the document highlighted the membership statistics, with over 470 member organizations and a growth rate of 10% per annum since 2020. It emphasized the benefits of membership, such as achieving influence within the industry, reputation building, and better preparedness to respond to customer and regulator expectations. Furthermore, it mentioned the presence of over 5000 registered experts who contribute to or monitor the Working Group activities and the distinction between full and limited membership privileges.

2.26. The Meeting was informed about the difference between MASPS and MOPS in the context of EUROCAE Documents categories and definitions. The Minimum Aviation System Performance Standard (MASPS) describes and specifies the operational and/or functional requirements of a complete end-to-end system, which may include airborne, on-ground and space segments. It should provide a high-level architecture describing the individual components and should allocate between those components the performance, safety and interoperability requirements. The Minimum Operational Performance Standard (MOPS) specifies the performance of a component (a piece of equipment, protocols, exchange formats…), which is the minimum necessary performance to satisfy a regulatory requirement. In particular, it specifies the tests to be made to ensure that the specified performance is achieved. Intended to be referenced by an ETSO.

2.27. EUROCAE’s work on UTM is mainly undertaken by SG3 of WG105, and some publications are relevant, including ED318, ED270, ED282, ED269, and ER301. The Meeting appreciated the presentations and encouraged States/Administrations to subscribe to EUROCAE as an organization to make use of the valuable technical materials for aviation.

Presentation 2: ASTERIX Status – EUROCONTROL

2.28. The presentation briefed the ASTERIX governance library, discussed the publication of ASTERIX Specifications in a machine-readable format, and highlighted the availability of JSON and PDF versions on the EUROCONTROL ASTERIX website. The presentation also outlined the development of ASTERIX categories, including the implementation of ADS-B Version 3 and the joint activity with EUROCAE WG-51/SG-4 for Category 053. It further mentions the development of new data items proposed by DFS for Categories 062/063, with a target date not before the middle of 2024.

2.29. The Meeting was informed about the difference between MASPS and MOPS in EUROCAE Documents categories and definitions. The Minimum Aviation System Performance Standard (MASPS) describes and specifies a complete end-to-end system's operational and/or functional requirements, which may include airborne, on-ground and space segments. It should provide a high-level architecture describing the individual components and allocate the performance, safety and interoperability requirements between those components. The Minimum Operational Performance Standard (MOPS) specifies the performance of a component (a piece of equipment, protocols, exchange formats…), which is the minimum necessary performance to satisfy a regulatory requirement. In particular, it specifies the tests to be made to ensure that the specified performance is achieved. Intended to be referenced by an ETSO.

2.30. EUROCAE's work on UTM is mainly undertaken by SG3 of WG105. Some relevant publications include ED318, ED270, ED282, ED269 and ER301.

ICAO Surveillance Panel Activities - ICAO SP ASWG Rapporteur (IP/16)

2.32. This paper provided an overview of the recent and upcoming activities of the ICAO Surveillance Panel (SP) and its Working Groups, the Aeronautical Surveillance Working Group (ASWG) and the Airborne Surveillance Working Group (AIRBWG). It highlighted the establishment of the Performance-Based Surveillance Sub-Group (PBSSG) to develop measurable technical performance specifications for surveillance systems. The PBSSG has been working on a draft RSUR Manual, with plans to finalize it and submit it for approval at the Sixth Meeting of the SP in the third quarter of 2025. Additionally, it mentioned that since the last SURICG meeting, each of the Surveillance Panel's Working Groups had held two meetings, indicating ongoing and active engagement in surveillance-related matters. Furthermore, the paper outlined the upcoming year's meeting schedule, including the Working Group meeting dates and locations for 2025, 2026, and 2027.

Proposal for Amendment (PfA) to Annex 10, Volume IV, Endorsed by the Surveillance Panel – Co-chair (IP/03)

2.33. This paper provided a summary of the amendments to Annex 10 Volume IV that are significant to the SURICG, with highlights to interrogator code (IC) for ADS-B and MLAT and II/SI code operation.

Change Proposal to Manual on Testing of Radio Navigation Aids (Doc 8071) Volume III – Testing of Surveillance Radar Systems – Co-chair (IP/04)

2.34. This paper highlighted the changes to Doc 8071 Vol III that are of interest to the SURICG. Modification to Appendix B of Doc 8071 Vol III was proposed to align with the required frequency of flight inspections in Appendix A of Doc 8071 Vol III and was endorsed by the fifth Meeting of the Surveillance Panel.

Change Proposal to Aeronautical Surveillance Manual(Doc 9924) – Co-chair (IP/05)

2.35. This paper outlined the proposed changes to Doc 9924 that are of interest to SURICG and endorsed by the fifth Meeting of the Surveillance Panel. The changes in modifying the use of interrogator codes and further clarifying II/SI code allocation in Doc 9924 Appendix H and J were highlighted.

2.36. The Meeting highly appreciated the valuable sharing by SP members and encouraged States/Administrations to nominate experts to participate in SP meetings and share with SURICG in future.

Reservation of Identifier Codes for Test Radars and Military Radars – Australia, Singapore & Sec. (WP/10)

2.37. The paper outlined the general strategy for the assignment of and migration to Mode S SI codes in the APAC region. It emphasized the importance of ensuring continued support for Mode S II-only transponders and the need for radars to support II/SI code operations before assigning an SI code. There is a focus on avoiding overlap between radars using matching II codes and radars using SI codes, with specific guidelines for assigning SI codes in such cases.

2.38. The paper discussed the reservation of II codes 14 and 15 (and their matching SI codes) for special use in the European region, with different considerations for the APAC region, and proposed a way forward on the reservation of II codes and matching SI codes for test and military radars.

2.39. Singapore supplemented the discussion through Flimsy/01. After further deliberation on the three methods proposed by WP/10 and the revised proposal in the Flimsy/01, the Meeting agreed to formulate the following Draft Conclusion for consideration by CNS SG:

<table>
<tr><td colspan="3">DRAFT Conclusion SURICG/9/1 Update of the General Strategy on Assignment of and Migration to SI Code in the APAC Region</td></tr>
<tr><td colspan="2">That:
1. The ICAO APAC regional office will manage the assignment of II codes 14 and 15 and their matching SI codes like the rest of the II and SI codes.
2. Revised General Strategy on Assignment of and Migration to SI Code provided in Appendix E to this paper be adopted.</td><td>Expected impact:
☐ Political / Global
☐ Inter-regional
☐ Economic
☐ Environmental
☐ Ops/Technical</td></tr>
<tr><td>Why: Study by SURICG concluded that reservation of II codes 14 and 15 and their matching SI codes for research/test radars and military radars on a region-wide basis is not practicable in APAC.</td><td colspan="2">Follow-up: ☐Required from States</td></tr>
<tr><td>When: 5-Jul-24</td><td colspan="2">Status: Draft to be adopted by PIRG</td></tr>
<tr><td colspan="3">Who: ☐Sub groups ☐APAC States ☐ICAO APAC RO ☐ICAO HQ
☐Other: XXXX</td></tr>
</table>

The Mode S DAPs Implementation and Operations Guidance Document - China, Singapore (WP/11)

2.40. The paper introduced the revised draft of the Mode S DAPs Implementation and Operations Guidance Document. The main amendments to this draft include the addition of some achievements from Mode S and DAPs WG/6, such as the general strategy on the assignment of and migration to SI code, and some information about the management of the 1030/1090 MHz utilization. The Edition 6.0 (Draft) consists of 9 Sections and 6 appendixes, addressing topics such as implementation principles, system integrity, regulations and procedures, training needs, and specific

examples of Mode S DAPs application. It provides detailed descriptions of Mode S DAPs data, including the Mode S downlink format, exchange protocol between surveillance and ATM Automation system, and guidance on the progress of implementing DAPs in the ICAO APAC region.

2.41. The Meeting noted that the newly added material on the management of the 1030/1090 MHz utilization has been updated by SP, and the general strategy on the assignment of and migration to SI code is being updated by this Meeting upon further approval by CNS SG/28. The Meeting requested China and Singapore to update the concerned sections along with the discussion of the Meeting and postpone the adoption of Edition 6.0 to SURICG/10 in 2025

Establish Point of Contact List for Mode S and DAPs Matters

2.42. The need for coordination on Mode S and DAPs-related matters between the ICAO APAC Regional Office and APAC States/Administrations was identified in SURICG/7. The Secretariat thus proposed the establishment of a point of contact (POC) list to ensure the efficiency and effectiveness of the coordination process for SSR Mode S IC. States/Administrations were invited to provide information on POCs to effectively address such coordination processes. The updated POC List by SURICG/9 is provided in **Appendix F** of this paper. The Mode S Implementation status is provided in **Appendix G** of this paper.

Update on the Surveillance Module in Frequency Finder – Sec (WP/08)

2.43. Frequency Finder is a program developed by ICAO to assist in managing and coordinating aeronautical frequency assignments, including SSR Mode S II/SI codes. The program also provides for the calculation of interference areas and a geographical interface for plotting frequency assignments and combines database management functions for updating ICAO COM lists and the SSR list for SSR Mode S II/SI codes. The program has been enhanced to address the issue of overlapping coverage of Mode S radars in adjacent ICAO regions, with a new function to hide radar coordinates and allow the owner (the State) to unhide, modify, or add new coordinates. The modified version of Frequency Finder is expected to be distributed to Regional Offices by the end of the second quarter of 2024.

Revised ADS-B Implementation and Operations Guidance Document (AIGD) – Hong Kong China (WP/12)

2.44. This paper presented the proposed incorporation of outcomes of the Workshop on ICAO Aircraft Address (AD) and Target Identification (ID) in Surveillance Data and Flight Plan, which was held in conjunction with SURICG/8, into ADS-B Implementation and Operations Guidance Document (AIGD), with the purpose to raise the awareness of AD/ID discrepancy issues within the aviation community and provide stakeholders with recommendations to mitigate the discrepancies.

2.45. An ad-hoc group led by Hong Kong, China, and supported by China, New Zealand, Singapore, USA and IATA developed a guideline which consolidated the outcomes of the Workshop. It was recommended that the guideline be incorporated into AIGD Edition 16.0.

2.46. The Meeting reviewed the revised AIGD, appreciated the contribution of the ad-hoc group, and reiterated that the AD/ID discrepancy is not only an issue with the ADS-B application, it's also relevant to Mode S radar and transponder. Recognizing the guideline could be published on the ICAO APAC website for a more comprehensive user group, including CAA, ANSP and airlines, the Meeting suggested the ad-hoc group fine-tune the wording for this regard and publish the guideline as a standalone document by endorsing the following draft Conclusion:

<table>
<tr><td colspan="3">Draft Conclusion SURICG/9/2 - Guideline on addressing inconsistencies of Aircraft Address (AD) and Target Identification (ID) between Surveillance Data and Flight Plan</td></tr>
<tr><td colspan="2">What: APAC guideline on addressing inconsistencies of ICAO Aircraft Address (AD) and Target Identification (ID) between Surveillance Data and Flight Plan provided in Appendix H to this paper is adopted.</td><td>Expected impact:
☐ Political / Global
☐ Inter-regional
☐ Economic
☐ Environmental
☒ Ops/Technical</td></tr>
<tr><td>Why: The guideline consolidated the outcomes of the Workshop on ICAO Aircraft Address and Target Identification between Surveillance Data and Flight Plan held in June 2023.</td><td colspan="2">Follow-up: ☐Required from States</td></tr>
<tr><td>When: 05-July-24</td><td colspan="2">Status: Draft to be adopted by Subgroup</td></tr>
<tr><td colspan="3">Who: ☒Sub groups ☐APAC States ☒ICAO APAC RO ☐ICAO HQ ☐Other: XXXX</td></tr>
</table>

Date and Venue for the Next Meeting

2.47. The Meeting considered that the next SURICG meeting would be held for four days, tentatively planned for April 2025. Subject to further coordination and consideration, the USA tentatively offered to host the next Meeting in the week commencing on 21 April 2025.

3. ACTION BY THE MEETING

3.1 The Meeting is invited to:

a) note the information contained in this paper;

b) adopt the draft conclusion specified in sections 2.39 and 2.46; and

c) discuss any relevant matter as appropriate.

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ADS-B IMPLEMENTATION STATUS IN THE APAC REGION

State/ Administration	ADS-B Ground Infrastructure and ATC System readiness or Implementation plan	Date of issue/ effectiveness date of equipage mandate	Mandated Airspace and/or ATS-routes	Intended separation criteria to be applied	Remarks
AFGHANISTAN	ADS-B & Multilateration system installed.				subject to safety assessment
AUSTRALIA	A total of 51 ADS-B sites (99 ground stations) and 28 WAM stations (30 remote units) are operational (Total 79 sites) ATC readiness since 2004 ADS-B data sharing with Indonesia operational since 2/2011. ASMGCS using multilateration and ADS-B is operational in Brisbane, Sydney, Melbourne and Perth November 2016 – ADS-B converted to "radar like" Cat 48 for use in Melbourne Terminal Area and Perth Terminal Area in early 2017. Additional "pseudo" radar (converted ADS-B data) feeds for Approach Class D services. **June 2024 –** development of	2009/effective date of mandating in upper airspace 12/12/2013. An ADS-B mandate for all IFR aircraft applies from 2/2017. Some limited exemptions for foreign registered aircraft and some private operations.	All airspace for IFR aircraft from 2/2017 ~~All airspace for IFR aircraft from 2/2017~~	2.5NM, 3NM and 5 NM surveillance separations. 3/2016 - Manual of ATC updated to include 3 nautical mile separation using ADS-B in terminal control unit. 3/2017 – 2.5NM separation authorized using ADS-B when also used with radar. Vectoring allowed using ADS-B Precision Runway Monitoring for Sydney WAM 2025+ 3NM separation service with ADS-B only. ~~2.5NM, 3NM and 5 NM surveillance separations.~~	WAM is operating in Tasmania since 2010 with 5 NM separation service. WAM is also operating in Sydney for 3 NM separation service in TMA and for precision runway monitoring function. CASA has approved the use of reduced specification ADS-B avionics to support ADS-B IN and ATC situational awareness for VFR aircraft Additional safety assurance works for 3NM separation service with ADS-B only. ~~WAM is operating in~~

State/ Administration	ADS-B Ground Infrastructure and ATC System readiness or Implementation plan	Date of issue/ effectiveness date of equipage mandate	Mandated Airspace and/or ATS-routes	Intended separation criteria to be applied	Remarks
	Centralised ADS-B to Radar Converter (ARC) system for application of "pseudo" radar in Terminal Area and Approach Class D services. CMATS replacing the current ATM system is under the testing and validation phase. ~~A total of 50 ADS-B ground stations and 28 WAM stations are operational (Total 78)~~ ~~ATC readiness since 2004 ADS-B data sharing with Indonesia operational since 2/2011.~~ ~~ASMGCS using multilateration and ADS-B is operational in Brisbane, Sydney, Melbourne and Perth~~ ~~November 2016 – ADS-B converted to "radar like" Cat 48 for use in Melbourne Terminal Area and Perth Terminal Area in early 2017.~~ ~~CMATS replacing the current ATM system is expected to be fully operational in 2026 period.~~	~~2009/effective date of mandating in upper airspace 12/12/2013.~~ ~~An ADS-B mandate for all IFR aircraft applies from 2/2017.~~ ~~Some limited exemptions for foreign registered aircraft and some private operations.~~		~~3/2016 – Manual of ATC updated to include 3 nautical mile separation using ADS-B in terminal control unit.~~ ~~3/2017 – 2.5NM separation authorized using ADS-B when also used with radar.~~ ~~Vectoring allowed using ADS-B~~ ~~Precision Runway Monitoring for Sydney WAM~~	~~Tasmania since 2010 with 5 NM separation service.~~ ~~WAM is also operating in Sydney for 3 NM separation service in TMA and for precision runway monitoring function.~~ ~~CASA has approved the use of reduced specification ADS-B avionics to support ADS-B IN and ATC situational awareness for VFR aircraft~~

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BANGLADESH	Bangladesh has taken the "Modernization of CNS-ATM System of CAAB" project which is going on G2G agreement with France and likely to be implemented by 2024. This project included a plan of five ADS-B ground stations to be installed at Dhaka, Cox's Bazar, Sylhet, Saidpur and Barisal. ADS-B data will be integrated with new ATM system at Dhaka. Bangladesh has also a plan to install MLAT stations to provide surface movement control at HSIA, Dhaka as well as TMA coverage as a backup and complimentary RADAR coverage to the Dhaka MSSR.				Bangladesh is willing to share ADS-B data with neighbouring States to enhance the safety and surveillance capability in the sub-region.
BHUTAN	ADS-B ground infrastructure feasibility study will be completed in the middle of 2020.	Equipage mandate will be issued once after the completion of feasibility study.			
BRUNEI DARUSSALAM	5 ADS-B ground stations with WAM functionality installed in 2015 and full operation in October 2016. ADS-B/WAM data are fused with radar data in				

State/ Administration	ADS-B Ground Infrastructure and ATC System readiness or Implementation plan	Date of issue/ effectiveness date of equipage mandate	Mandated Airspace and/or ATS-routes	Intended separation criteria to be applied	Remarks
	the TopSky ATC Automation system (Thales) to enhance full radar surveillance coverage for Brunei Darussalam. Memorandum of Understanding (MOU) on ADS-B data sharing with Singapore and Brunei Darussalam is expected to sign in April 2019.				
CAMBODIA	3 ADS-B ground stations installed at Phnom Penh, Siem Reap and Stung Treng City since 2011 and able to provide full surveillance coverage for Phnom Penh FIR. Cambodia is willing to share data with others.				
CHINA	5 UAT ADS-B stations are used for flight training of CAFUC. The upgrade to 1090ES ADS-B stations project has already finished. In the training airspace, a hybrid operation mode of UAT and 1090ES is currently used. 308 ADS-B ground stations nationwide have already in operation by 2019.	The operation of national ADS-B Service is implementing in step - by-step way. Phase I: from October 10, 2019 ➢ ADS-B control services will be provided in APP where radar control services are not available; ➢ ADS-B control services will be implemented in control area above 8400m (inclusive) where Radar	The ADS-B mandate published in October 2020, in a separated AIC Nr.09/19 named "Implementation of ADS-B Control Services"		

State/ Administration	ADS-B Ground Infrastructure and ATC System readiness or Implementation plan	Date of issue/ effectiveness date of equipage mandate	Mandated Airspace and/or ATS-routes	Intended separation criteria to be applied	Remarks
	4 ADS-B stations operational in Sanya FIR since 2008. Chengdu-Jiuzhai and Chendu - Lhasa route with 8 ADS-B stations. 9 ADS-B stations deployed on the routes H15 and Z1 by the end of 2015. 19 ADS-B stations at the small airport.	control services are not available; ➢ Radar control services will be provided, using integrated surveillance data of ADS-B and radar, in control areas above 8400m (inclusive) where radar control services are available. Phase II: from December 31, 2020 ➢ ADS-B control services will be provided in APP and ACC where radar control services are not available; ➢ Radar control services will be provided, using integrated surveillance data of ADS-B and radar, in APP and ACC where radar control services are available; and ➢ ADS-B equipment will be used at the tower of transport airports to display flight movements.			

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HONG KONG CHINA	ADS-B out operations over PBN routes L642 and M771 at or above FL 290 within HK FIR was effective in December 2013 and within HK FIR at or above FL 290 has been effective since December 2016. ADS-B ground station infrastructure completed in 2013. ADS-B signal provided by Mainland China to cover southern part of Hong Kong FIR commenced in 2010 and has been put into operational use after commissioning of the new ATMS since November 2016. Trial on Space-based ADS-B data was conducted in 2021 and completed in 2022. The data are used to support long-range air traffic surveillance for ATFM purpose.	AIP supplement issued on 29 Aug 2014 with 8 Dec 2016 as effective date. Mandate ADS-B out equipage for locally registered GA/helicopters since 31 January 2023.	HKFIR at or above FL290	5NM surveillance separation	Fully implemented ADS-B in HKFIR by phased approach to ensure safe and smooth integration of ADS-B into the Air Traffic Management System to provide aircraft separation service since November 2018.
MACAO, CHINA	Mode S MSSR coverage available for monitoring purposes.				Airspace – ATZ only

State/ Administration	ADS-B Ground Infrastructure and ATC System readiness or Implementation plan	Date of issue/ effectiveness date of equipage mandate	Mandated Airspace and/or ATS-routes	Intended separation criteria to be applied	Remarks
DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA	ADS-B has been used as back-up surveillance of SSR since 2008.				
FIJI ISLANDS	ADS-B /multilateration ground stations installed. Situational awareness service provided in 2013. New ATM System commissioned on **1 April 2021** to support surveillance in the Domestic Airspace. ADS-B Ground stations replacement and installations of new sites were completed and commissioned on the **25th of March 2022**. Fiji now has a total of 10 ADSB ground stations that were installed at strategic locations within the Fiji Islands.	The Civil Aviation Authority of Fiji (CAAF) mandated all aircraft domiciled in Fiji to have ADS-B transponders by 31st **December 2013**. Mode S (Extended Squitter 260-B preferred). Some limited exemptions for State aircraft which includes those used in military, customs, and police services.	The Civil Aviation Authority of Fiji mandated the Fiji Domestic airspace to be Automatic Dependent Surveillance Broadcast (ADS-B) Out Exclusive Airspace from **13 July 2023.**	5nm separation service has commenced within the surveillance coverage area, which is much greater than the Fiji Domestic Airspace from 6th of October 2022. Fiji Domestic airspace. a) CTR SFC to 2500ft b) TMA 2500ft to F250 (Class D) ~~b)~~c) CTA 6500ft to F600 (Class D). ~~c) TMA 2500ft to F250 (Class D)TA 6500ft to F600 (Class D).~~ Approximately 150nm North, West and South of Nadi. And about 260nm East of Nadi.	Surveillance services was commenced on the **6th of October 2022**, Thursday to Monday from 0000UTC - 0800UTC.On the **8th of December 2022**, the hours of watch were revised to 1800UTC – 0800UTC, Thursday to Monday. From the **28th of December 2023** till today, the surveillance control has been provided daily from 1800UTC - 0800UTC. The goal is 24 hours operation by the last quarter of 2026. ~~Simulator training in progress with transition commencing from mid-September to mid-December 2022.~~

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FRANCE ***(French Polynesia)***	ATM system is ready for ADS-B sensors/Installation of 5 first GS expected at beginning of 2017. 2nd stage with implementation of 7 GS and associated VHF coverage.			5 NM for airspace under coverage.	
INDIA	ASMGCS (SMR + Multilat) is operational at Delhi, Mumbai, Chennai, Kolkata, Bangalore, Hyderabad, Jaipur, Amritsar, Lucknow, Ahmedabad and Guwahati Airports. ASMGCS (SMR+MLAT) proposed at Cochin and Bhubaneswar (VOCI&VEBS) Expected to be completed by Sept 2022. ADS-B Ground Stations are installed at 36 locations to cover continental and Oceanic airspace. Out of these 36 ADS-B ground receivers, 30 receivers have been operationalized and remaining 6 ADS-B ground receivers will also be operationalized soon.	AIP supplement issued on 25th October, 2018 with effective date of implementation from 01st January 2019 which was subsequently revised through NOTAM G1995/18 to be effective from 01st January 2020.	On all ATS Routes within continental airspace at and above F290.	a) 5 NM within 60 NM of ADS-B ground station i.e. in the terminal airspace served by the ADS-B receiver. b) 10 NM beyond 60NM of ground station i.e. in the en route airspace.	Standalone ADS-B based APP Surveillance service provided at VOCL, VOCB, VEPT, VEAT,VIJP, VOTR and VEBS. MSSR/ADS-B integrated mode APP Surveillance service provided at VILK, VOML, VEBN,VANP and VIAR.

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	India has entered into a contract with M/s Aireon in July 2019 to receive ADS-B data for Oceanic regions of Indian FIR to ensure seamless Surveillance coverage across its oceanic airspace, Space Base ADS-B system has been successfully integrated with Data fusion systems of Mumbai, Chennai and Kolkata in January 2021 and presently being used for situational awareness only ATM automation systems at 22 ATC Centres are capable of processing ADS-B data.				
INDONESIA ~~**INDONESIA**~~	There are 49 operational ADS-B Ground Stations across Indonesia, including 11 new locations spread across Sumatra (Indian Oceanic area), Papua, and the northern part of Ujung Pandang FIR (Melonguane Island), installed to enhance surveillance coverage. 48 of them have the capability to receive and process up to DO-260B transponders The ADS-B ground stations has been integrated to 10 ATC		Starting on 23rd April 2020, Indonesia has implemented mandatory ADS-B equipment for all transport aircraft category flying at all level (SFC up to FL600) in 2 ACCs, 9 TMAs and 10 Airports.~~,~~ ~~Starting on 23rd April 2020, Indonesia has implemented mandatory ADS-B equipment for all transport aircraft category flying at all~~	Using 5 NM separation standard. ~~Using 5 NM separation standard.~~	ADS-B data sharing had been conducted by Indonesia with Australia and Singapore. LOA of collaboration in ADS-B data sharing has been achieved with India. LOA of collaboration in ADS-B data sharing

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	systems and 2 others will follow after being upgraded ~~All 30 ADS-B ground station have been met with DO260B in November 2019;~~ ~~The 18 new ADS-B ground stations, with DO260B capability, will be established to cover the traffic in terminal and area. The 7 ADS-B ground station has been installed in Papua. 11 ground stations has been completed.~~ ~~The ADS-B ground stations has been integrated to 9 ATC systems and 3 others will follow after being upgraded.~~		~~level (SFC up to FL600) in 2 ACCs, 9 TMAs and 10 Airports.~~		are under reviewing by Malaysia, Philippines and PNG. ~~ADS-B data sharing had been conducted by Indonesia with Australia and Singapore.~~ ~~LOA of collaboration in ADS-B data sharing has been achieved with India.~~ ~~LOA of collaboration in ADS-B data sharing are under reviewing by Malaysia, Philippines and PNG.~~

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JAPAN	Multilateration Systems for surface monitoring have been implemented at eight airports PRM (WAM) has been implemented at Narita Airport and Haneda Airport. En-route WAM system have been implemented at four areas Plan to use ADS-B information under RAD conditions starting in 2024.				
KIRIBATI					
LAO PDR.	2 ADS-B ground stations(DO-260A compliant) were installed in Vientiane and Louangphabang Int'l Airport in 2015 and the ADS-B data is fused with MSSR data target in the ATM Automation system. 3 ADS-B ground stations (DO-260B compliant) completed the installation at existing MSSR sites (Xiengkhouang, Savannakhet and Champasack)				Still use for Monitoring as signals from Ground Stations are integrated to ATM System

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	in 2017 to enhance the full ADS-B coverage of Lao FIR.				
MALAYSIA ~~**MALAYSIA**~~	Ground Infrastructure: Kuala Lumpur FIR: 1. Three (3) ADS-B GS have been installed in Terengganu, Langkawi and Genting. ADS-B data from these stations are now fully integrated into the KL ATCC ATM system. Kota Kinabalu FIR: Four (4) ADS-B GS have been installed in Kuching, Bintulu, Kota Kinabalu and Sandakan. ADS-B data from these stations are now fully integrated into Kota Kinabalu and Kuching ATCC ATM System. ~~Ground Infrastructure:~~ ~~Kuala Lumpur FIR:~~ ~~1. Three (3) ADS-B GS i.e. Terengganu, Langkawi and Genting have been installed in Kuala Lumpur FIR and the ADS-B data from those stations are now fully integrated into the~~	Phase 1: 15 September 2022 Phase 2: Targeted by Q1 2027 Phase 3: Targeted by Q4 2028 ~~AIC Issued on September 2017.~~ ~~AIP Supp on 16 Jan 2020.~~	Phase 1: On ATS routes N571, P628, L510, P627, L645 and P574 at FL 290 to FL 410 within Kuala Lumpur FIR Phase 2: ADS-B as secondary means of surveillance within the Kuala Lumpur FIR and Kota Kinabalu FIR for en-route airspace. Operational flight level is TBD. Phase 3: ADS-B used as the primary means of surveillance for en-route airspace. ~~Phase 1: On ATS routes N571, P628, L510, P627, L645 and P574 at FL 290 to FL 410 within Kuala Lumpur FIR~~ ~~Phase 2: En-route airspace in Kuala Lumpur and Kota Kinabalu FIR~~	ICAO approved surveillance separation. ~~ICAO approved surveillance separation.~~	Malaysia is working on upgrading ADSB Ground facilities infrastructure for Kuala Lumpur FIR, reviewing options for space-based ADSB and data sharing collaboration with India, Indonesia and Thailand.

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	~~new ATM system in Kuala Lumpur ATCC.~~ ~~Kota Kinabalu FIR:~~ ~~Four (4) ADS-B GS have been installed in Kuching, Bintulu, Kota Kinabalu and Sandakan and the ADS-B data from these stations are now fully integrated into the new ATM system in Kota Kinabalu ATCC.~~ ~~Implementation Plan:~~ ~~Phase 1: ADS-B services on specific ATS routes and Flight Levels within Kuala Lumpur FIR,~~ ~~Operational trial since March 2020.~~ ~~Phase 2: ADS-B as secondary means of surveillance within the Kuala Lumpur FIR and Kota Kinabalu FIR for en-route airspace. Target date: Mar 2023.~~ ~~Phase 3: ADS-B used as the primary means of surveillance for en-route airspace. Target date: Mar 2025~~		~~Target date: Mar 2023~~		

State/ Administration	ADS-B Ground Infrastructure and ATC System readiness or Implementation plan	Date of issue/ effectiveness date of equipage mandate	Mandated Airspace and/or ATS-routes	Intended separation criteria to be applied	Remarks
MALDIVES ~~**MALDIVES**~~	4 ADS-B stations installed in Nov. 2012 (2 at Male' Ibrahim Nasir Intl Airport, 1 at Kulhudhuffushi Island in the North and 1 at Fuah Mulah Island in the South to cover 95% of the FIR at/above FL290. ~~Maldives'~~ ADS-B is integrated with the ATM system (in November 2013)~~, and under observation prior to commencing trials.~~ Additional FIVE ADS-B Sensors will be installed in predefined locations in Q3, 2024. Maldives has planned to share ADS-B data with its adjacent FIRs. ~~Updated by email~~ ~~4 ADS-B stations installed in Nov. 2012 (2 at Male' Ibrahim Nasir Intl Airport, 1 at Kulhudhuffushi Island in the North and 1 at Fuah Mulah Island in the South to cover~~				Seaplane in Maldives equipped with ADS-B for AOC purposes. These seaplanes have ADS-B IN functions as well. ~~Seaplane in Maldives equipped with ADS-B for AOC purpose. These seaplanes have ADS-B IN functions as well.~~

State/ Administration	ADS-B Ground Infrastructure and ATC System readiness or Implementation plan	Date of issue/ effectiveness date of equipage mandate	Mandated Airspace and/or ATS-routes	Intended separation criteria to be applied	Remarks
	~~95% of the FIR at/above FL290.~~ ~~Maldives' ADS-B is integrated with the ATM system (in November 2013), and under observation prior to commencing trials.~~ ~~Maldives has planned to share ADS-B data with its adjacent FIRs. Updated by email~~				
MARSHALL ISLANDS					
MICRONESIA (FEDERATED STATES OF)					
MONGOLIA	Ten ADS-B ground stations for combination SSR and filled the surveillance gaps implemented in 2015 and integrated with ATM system and trial operation in early 2016.				

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MYANMAR	**a) The ADS-B Implementation Update** - The five ADS-B ground stations have been installed in Myanmar. Among them, SITTWE and CoCo Island ground stations are installed in 2014, and are DO260 compliant. The other 3 stations, YANGON, MANDALAY and MYEIK airport ground stations are DO260B compliant and installations were finished in 2016. - All ADS-B data are fused with MSSR data in the TopSky ATC Automation system (Thales) in 2016 and using as MSSR backup in Yangon ACC. **b) The ADS-B data sharing update between neighbouring States** - Myanmar and India signed the MOU agreement for ADS-B data sharing on 6th May 2015. ADS-B data sharing test between Agartala (India) - Sittwe (Myanmar), and Port Blair (India)	Doing ADS-B data analysis and statistic for ADS-B equipped Aircraft in Yangon FIR.			Supplement radar and fill the gaps to improve safety and efficiency ADS-C/CPDLC integrated in Yangon ACC since 2010.

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	- CoCo Island (Myanmar) have been accomplished between technical teams since June 2018. At present, the shared ADS-B data from Myanmar side is now using as backup automation system at Kolkata for test purpose. But, Myanmar side is needed to discuss with ATM manufacturer for operational use of the India's Data at Yangon ACC. - Myanmar have planned to install new ADS-B Station in the 2nd quarter of 2019 at LASHIO Airport located in north-eastern part of Myanmar closed to the China-Myanmar border near the LINSO transfer point on A599 ATS route. After the installation finished, the ADS-B data sharing process can be proceeded between Myanmar and China.				
NAURU					

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NEPAL	Four ADS-B ground stations have been installed in 2019 at Kathmandu (Phulchowki), Bhairahawa, Nepalgunj and Dhangadi. Four (4) ADS-B Ground stations have been operated in test provision at Kathmandu (Mt. Phulchowki), Dhangadhi (VNDH), GBIA, Bhairahawa (VNBH) and Nepalgunj (VNNG).				Safety assessment will be done soon. In Tier 2 Category,
NEW CALEDONIA	Three ADS-B ground stations commissioned in 2010 to cover international traffic at La tontouta airport serving Tontouta ACC & APP. It is used for Situation awareness and SAR.				
NEW ZEALAND	MLAT and ADS-B data from WAM system centered in and around Queenstown. Provides surveillance coverage for Queenstown TOWER and Approach as well as Surveillance services using 3/5NM separation over the southern half of the South Island of New Zealand	Current: ADSB mandate for all controlled airspace from DEC 31, 2022, promulgated by NZCAA **Current:** Since July 2018, any current NZ registered aircraft upgrading transponder(s) is required to install DO260B	Current: All controlled airspace within the NZZC FIR	5NM surveillance separation in enroute controlled airspace, and 3NM surveillance separation in Terminal approach controlled (Class C) airspace.	Currently situational awareness surveillance targets are displayed for ADS-B targets from which the data supplied does not meet the requirements for surveillance separation.

State/ Administration	ADS-B Ground Infrastructure and ATC System readiness or Implementation plan	Date of issue/ effectiveness date of equipage mandate	Mandated Airspace and/or ATS-routes	Intended separation criteria to be applied	Remarks
	MLAT and ADSB data from the NZAA MLAT system to support surface movements control at NZAA ADSB data at 6 domestic aerodromes to provide ADSB APT surface movements control 27 ADSB-B Sites for Enroute, Terminal and ADSB APT services	transponder(s) which meet the NZCAA rule set. The rule specifies the minimum Technical Standing Orders (TSO) or transponder GNSS receiver models for position input into ADS-B			
PAKISTAN ~~**PAKISTAN**~~	Four (04) ADS-B sites at Pasni, Lakpass, Rojhan and Islamabad have been operational since 2019 . Additional Five (05) ADS-B sites of Dalbandin, Zhob, Laram Top, Karachi & Lahore to further strengthen the surveillance capability over Pakistan airspace were operationalized in 2024. All ADS-B ground receivers have been successfully integrated with ATMAS of Karachi, Lahore and Islamabad ACCs. Additionally, MLAT,SMR and ADS-B data is integrated with ASMGCS to support surface	Deliberations with relevant stakeholders are currently underway, and further studies and data analyses are being conducted in this matter.	TBD	15NM surveillance separation in enroute controlled airspace, and 5NM surveillance separation in Terminal airspace (upto maximum of 60NM) at or below FL255.	ADS-B ground stations will help to enhance surveillance coverage in areas traditionally underserved by radar, known as grey areas and cones of silence. ADS-B data will be used for vectoring and application of separation standards commensurate with the Radars only for ADS-B equipped aircraft. ~~The data of ADS-B will provide redundancy to the existing surveillance~~

State/ Administration	ADS-B Ground Infrastructure and ATC System readiness or Implementation plan	Date of issue/ effectiveness date of equipage mandate	Mandated Airspace and/or ATS-routes	Intended separation criteria to be applied	Remarks
	movements control at Lahore Aerodrome (OPLA). . ~~The Installation of ADS-B system at Pasni, Lakpass, Rojhan and Islamabad has been already completed and its data is integrated with ATM system and operational since 2019.~~ ~~The installation of additional QTY 5 ADS-B system has been completed at Dalbandin, Zhob, Laram Top, Karachi & Lahore to further strengthen the surveillance capability over Pakistan airspace. The sensors will be integrated with ATM systems after successful completion of Site Acceptance Tests and safety assessment.~~				~~Radar system and will also serve as gap filler in the identified grey areas within Pakistan Airspace.~~
PAPUA NEW GUINEA	Initially 7 ADS-B sites to be deployed across PNG to provide seamless coverage above FL285. Three (3) sites installed as of December 2017. Two (2) of these are operational. First site to be installed May/June 2017, with remainder to be completed in 2018.	An ADS-B mandate is on CASA PNG roadmap, however legislation yet to be developed. The Australian mandates will largely drive equipage for overflights (e.g. East-Asia to Australia/South Pacific). Expectation is that PNGASL (the ANSP) will lead development of ADS-B mandate framework.	None	**Air Traffic Control** Approach/ Arrivals 2018 – 5NM 2019 – 3NM (approach) Upper Airspace (>FL245) 2017/18 – Situational awareness.	

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	Additional 7 sites to be rolled-out in the 2018/19 timeframe. Site location will be dependent on infrastructure, security and an analysis of Phase 1 site performance. PNGASL (ANSP) will commence a transition to new ATM automation system in May 2018. The system will support fusion of ADS-B and RADAR data. 5 mile separation to be provided using ADS-B and fused ADS-B/Radar from May 2018. From 2018 onwards, PNGASL will be looking to share ADS-B data with Indonesia and Australia.	Initial steps may include mandate above F245 – but will depend on performance of Phase 1 ADS-B deployment. Country-wide mandate not envisaged before 2021/22.		2018/19 – 5NM Note: Implementation dictated by training requirements and new ATM system transition priorities. **Flight Service** Directed Traffic (FIS) 2019 – Situational awareness	
PHILIPPINES	One ADS-B GS installed at the Manila ATM Center for situational awareness. One ADS-B Ground Station installed at Bataraza, Palawan for data sharing with Singapore.				

State/ Administration	ADS-B Ground Infrastructure and ATC System readiness or Implementation plan	Date of issue/ effectiveness date of equipage mandate	Mandated Airspace and/or ATS-routes	Intended separation criteria to be applied	Remarks
	Additional ground stations are planned to be installed in Laoag Airport, Tagaytay, Jomalig Island, Puerto Princesa Airport, Mt. Majic Mactan, and General Santos "Tambler" Airport.				
REPUBLIC OF KOREA	Installed 10 ADS-B receivers and in operation since May 2020. 2 more receivers will be installed by 2024.	To be confirmed.	To be confirmed.	To be confirmed.	
SINGAPORE	The airport MLAT system was installed in 2007 and "far-range" ADS-B sensor was installed in 2009. ATC system has been processing ADS-B data since 2013.	AIC was issued on 28 December 2010/effective from 12 Dec.2013. ADS-B OUT equipment requirement for all aircraft operating on selected ATS routes within the WSSS FIR from 27 January 2022. ADS-B OUT equipment requirement for all aircraft operating within the WSSS FIR from 26 January 2023.	At and above FL290, affecting the following ATS routes L642, L644, M753, M771, N891 & N892 At and above FL290, affecting the following ATS routes L517, L625, L649, M758, M767, M768, M772 & N884.	40nm implemented on ATS routes L644 and N891. 20nm implemented on ATS routes L642, M771, M753 and N892.	Safety case was completed end of November. 2013.

State/ Administration	ADS-B Ground Infrastructure and ATC System readiness or Implementation plan	Date of issue/ effectiveness date of equipage mandate	Mandated Airspace and/or ATS-routes	Intended separation criteria to be applied	Remarks
		AIP updated in May 2018 to reflect the ADS-B equipment certified as meeting: a. EASA - (AMC 20-24), or b. EASA CS-ACNS (Subpart D - Surveillance - SUR), or c. FAA - Advisory Circular No: 20-165A (or later versions), or d. The equipment configuration standards in Appendix XI of Civil Aviation Order 20.18 of CASA.			
SRI LANKA	Total of 5 ADS-B Ground Receiving Stations and 01 Central Processing Station have been installed in March 2017. ADS-B Data is fused with Multi-sensor Data, including MSSR and ADS-C in the ATM system at Colombo ACC Ratmalana was launched for operational used on 15 Nov. 2017. New ATM system planned for operational at APP Centre in 2018 will also be capable of fusing Multi-sensor Data, including MSSR and ADS-B	Revised Date of Equipage mandate would be 31st Dec 2020. Ref: AIC A02/16 (Initially AIC A02/14 was issued in November 2014)	All ATS Routes within Colombo TMA	Initially 5 NM within Approach Radar Coverage, 8 Nm within Area Radar Coverage & Procedural Separation minima outside Radar Coverage.	On completion of a safety assessment, use of ADS-B alone for ATC separation purposes.

State/ Administration	ADS-B Ground Infrastructure and ATC System readiness or Implementation plan	Date of issue/ effectiveness date of equipage mandate	Mandated Airspace and/or ATS-routes	Intended separation criteria to be applied	Remarks
THAILAND ~~**THAILAND**~~	4 ADS-B ground stations (DO260B and lower compliant) have been installed. Moreover, 3 SSRs have been upgraded with ADS-B capability. In total, 7 ADS-B stations are expected for air traffic services by the end of 2024. ~~Five ADS-B ground stations (DO-260B and lower compliant) have been primarily installed for research and development purpose and are being undergone the approval process to be used for air traffic services with a target date by the end of 2021.~~ ~~The new ATM automation system was successfully implemented in Q1 2020. It can~~ ~~The ATS surveillance data sharing with the adjacent FIRs was approved in principle in October 2018.~~	TBD ~~The airspace re-structure and aircraft equipage mandate are planned to be studied in 2021 and are expected to be started implementation in 2022.~~	TBD ~~TBD~~	5 NM within ATS Surveillance Control Services in Bangkok FIR. ~~TBD~~	
TONGA	Trial planned for 2017				

State/ Administration	ADS-B Ground Infrastructure and ATC System readiness or Implementation plan	Date of issue/ effectiveness date of equipage mandate	Mandated Airspace and/or ATS-routes	Intended separation criteria to be applied	Remarks
UNITED STATES	The US identified required ADS-B Service Volumes in 2007. Using data from over 600 terrestrial radio sites, the US domestic ADS-B system became operational in 2014. As of 1 January 2020, ADS-B aircraft equipage was mandated in most controlled airspace within the US. Over 172,000 US- registered aircraft are now equipped. ADS-B is used by all U.S. air traffic control facilities for ATC separation.	The U.S. ADS-B Out rule (14 CFR 91.225 and 14 CFR 91.227) was issued in May 2010 and specified that the ADS-B Out mandate was effective on 1 January 2020.	Class A, B, and C airspace, plus Class E airspace above 10,000 ft MSL and some additional airspace. See 14 CFR 91.225 for complete details. The U.S. is using ADS-B for TMA separation including the following criteria: - 3nm separation - 2.5nm between aircraft established on final approach course within 10nm of landing runway (when other conditions are met) - independent parallel approach operations down to 3600 ft centreline separation - dependent parallel approach operations down to 2500 ft centreline separation (currently 1.0 nm diagonal distance).	The U.S. is using ADS-B for en route 3nm separation at or below FL230, and 5nm separation at higher altitudes. The U.S. is using ADS-B for TMA separation including the following criteria: - 3nm separation - 2.5nm between aircraft established on final approach course within 10nm of landing runway (when other conditions are met) - independent parallel approach operations down to 3600 ft centreline separation - dependent parallel approach operations down to 2500 ft centreline separation (currently 1.0 nm diagonal distance).	The U.S. has implemented integrated WAM/ADS-B to support 5nm separation in the following areas: • Airspace around Juneau, Alaska • Airspace surrounding various airports in the mountains of western Colorado The U.S. has implemented integrated WAM/ADS-B to support terminal separation in the following areas: • KCLT terminal area • KLAX terminal area Implementation of integrated WAM/ADS-B is underway in the New York terminal area and

State/ Administration	ADS-B Ground Infrastructure and ATC System readiness or Implementation plan	Date of issue/ effectiveness date of equipage mandate	Mandated Airspace and/or ATS-routes	Intended separation criteria to be applied	Remarks
					is being considered for additional U.S. terminal areas.
VANUATU					
VIET NAM	Two phases ADS-B implementation plan adopted. Phase 1 implemented in March 2013. Phase 2 commenced in 2015 for whole lower and upper Hanoi FIR and 2018 for Ho Chi Minh FIR	1) AIC issued on 20 June 2013/ADS-B mandating effective from 12 December 2013 in Ho Chi Minh FIR. 2) AIC A08/16 issued on 15 December 2016/ the policy on Automatic Dependent Surveillance – Broadcast (ADS-B) equipage and operation for civil aircraft within Ho Chi Minh and Ha Noi FIRs/ + Mandating effective from 01 July 2017.	1) M771, L642, L625, N892, M765, M768, N500 and L628 At/above FL290. + Mandating effective from 01 July 2017, all civil aircraft operating within Sectors of Ha Noi ACC from FL290 up to FL460 must be operated ADS-B OUT. Civil aircraft without ADS-B OUT will be operated below FL290 or at other flight levels assigned by Ha Noi ACC. + Mandating effective from 01 July 2018: aircraft having maximum take-off weight of 15 000 kg or heavier and operating within Ha Noi and Ho Chi Minh FIRs		Operators required to have operational approval from State of aircraft registry.

State/ Administration	ADS-B Ground Infrastructure and ATC System readiness or Implementation plan	Date of issue/ effectiveness date of equipage mandate	Mandated Airspace and/or ATS-routes	Intended separation criteria to be applied	Remarks
		+ Mandating effective from 01 July 2018 + Mandating effective from 01 January 2020, aircraft having maximum take-off weight of 5 700 kg or heavier and operating within Ha Noi and Ho Chi Minh FIRs must be ADS-B OUT equipped and operated.	must be ADS-B OUT equipped and operated. + Mandating effective from 01 January 2020: aircraft having maximum take-off weight of 5 700 kg or heavier and operating within Ha Noi and Ho Chi Minh FIRs must be ADS-B OUT equipped and operated.		

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REPORT FROM BAY OF BENGAL AD HOC WORKING GROUP
~~6 – 9 June 2023~~ 7 – 10 May 2024

States Presented:
China
Indonesia
Malaysia
Thailand
India
Maldives
Nepal
Sri Lanka

Observer:
IATA
Japan

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

Implementation Updates

1. Bangladesh (no update provided in 2024)
Not Present

We are trying to modernize our systems through the implementation of ATM project. At first it was in PPP & now it is on G2G with France. This was under the process of government approval. Government approval is granted, and 5 ADS-B receivers will have been installed at detailed below,

Cox's Bazar, Barisal, Saidpur, Dhaka and Sylhet, there is another one for Extended Economic Zone at new area in the Bay of Bengal which is 200NM at south of the country.

2. Bhutan (no update provided in 2024)
Not Present

Bhutan cannot join previous SEA/BOB ADS-B meeting as we do have plan to implement ADS-B, but now we are targeting to complete ADS-B feasibility study by mid of 2019 and now it is extended up to mid of 2020.We found out that feasibility study (Coverage and ground station location) is necessary as Bhutan is surrounded by mountain terrain.

As per the result of feasibility study we are going to implement installation of ground station.

Bhutan do not have any national policy or regulation about data sharing, so we will be sharing data with any neighbouring countries/states as per the regional norms and conditions.

3. China
China has been continuously promoting to push forward the application of ADS-B technology. China provided update on the installation and related activities regarding ADS-B surveillance system as follows:

- 5 UAT ADS-B stations are used for flight training of CAFUC. The upgrade to 1090ES ADS-B stations project has already started in 2017, and the project is finished by 2022;

- 4 ADS-B station in operational in Sanya FIR since 2008;
- Chengdu - Lhasa route with 7 ADS-B stations;
- 9 ADS-B stations deployed on the routes H15 and Z1 by the end of 2015;
- 19 ADS-B station at the small airport; and
- 308 ADS-B stations nationwide have already finished in operation ~~stallation and~~ ~~SAT by~~ at the end of 2018. And there are 2 level-1 data processing centres working in main-standby mode for redundancy, 8 level-2 data processing centres to concentrate data from data stations within its area of responsibility, as well as 36 data stations to collect received data from GSs. All the installation and SAT of GSs, level-2 data processing centres and level-1 data processing centres have already complete. The trial operation has started from October 10, 2019 and the ADS-B mandate had also been published on October 1, 2019, which is effective from October 10.2019.

4. Indonesia

Indonesia earlier informed that ADS-B ground station at Aceh is already operational and updated to comply with DO-260B (ver 2) and expressed willingness to share data with India (It was earlier decided to have Port Blair-Aceh data sharing, but for better coverage and usability it was suggested in the meeting to have data sharing of upcoming Campbell Bay ADS-B - Aceh when India is ready).

Indonesia now will share the data with Campbell Bay ADS-B – Aceh only.
Campbell Bay ADS-B is installed.

Letter of Agreement between Indonesia and India regarding ADS-B data sharing is on progress
Letter of agreement is agreed by Indonesia and India, yet to be signed.

5. Malaysia

Malaysia has completed the installation of the two new ADS-B ground station in Langkawi and Genting and were now fully integrated into the new ATM system. Both stations are compliant with DO-260B with output data handling function as plot and tracks (ASTERIX CAT21 ver. 0.23, ver. 0.26 and ver. 2.1.)

Malaysia is venturing to share ADS-B data with Indonesia, India and Thailand. Data sharing from India (Port Blair or Campbell Bay ADS-B GS), or from Indonesia (Aceh ADS-B GS)or from Thailand will close the surveillance gap within the KL FIR.

The ADS-B data (from Genting and Langkawi) processed through ADS-B central processing system is now integrated into new ATC Systems and is now ready for data sharing. Malaysia is reviewing the sample agreement proposed by India and Indonesia and will revert as soon as possible.

~~At present, ADS-B Data Sharing with Indonesia is currently on hold due to decision by Indonesia in BOBTFRG/3 meeting to refrain conducting surveillance data sharing in Bay of Bengal due to certain reasons until further notice.~~

6. Maldives
Maldives started using ADS-B to enhance ATS surveillance capability in Male FIR on 7th February 2016.

With 4 ground stations (2 autonomous stations at Male; 2 unduplicated ground stations: 1 at an island in the North and the other in the South), the ADS-B provides coverage up to 90% of Male FIR above FL290.

ADS-B serves as the backup for Male radar and is in use for vectoring and 5NM separation commensurate with Radars

As part of the effort towards full implementation of ADS-B, from March 2017 aircraft imported for commercial air transport in the Maldives are required to be equipped with ADS-B Out, as published in AIP ENR 1.6-3.

The full implementation, which ~~would~~ require carriage of ADS-B Out, ~~is~~ was ~~targeted~~ implemented for the year ~~2020~~ 2021

Maldives is making efforts to complete the airworthiness approval for all locally registered aircraft, already equipped with ADS-B.

~~Out of the 73 aircraft registered for commercial air transport in the Maldives, 62 aircraft have given approval for ADS-B by Maldives Civil Aviation Authority (MCAA).~~

~~This include 55 seaplanes (Twin Otter aircraft with floats) conducting commercial air transport between Velana International and resort islands. These aircraft, although operate on VFR, are fitted with ADS-B out functionality combined with GPS to give highly accurate positional information.~~

Maldives is in the process of installing ~~two~~ five additional ADS-B Ground Station in ~~2023~~ 2024, to improve the coverage at low flight levels.

7. Myanmar (no update provided in 2024)
Not Present

The 5 ADS-B ground stations have been installed in Myanmar. Among them, Sittwe and Co Co Island ground stations are installed in 2014 and they are DO260 compliant, and Yangon, Mandalay and Myeik airports ground stations are DO260B compliant and installation was finished in 2016.

All ADS-B data are fused with MSSR data target in the Top Sky ATC Automation system (Thales) in 2016, and using as MSSR backup and surveillance monitoring in Yangon ACC.

In addition, Myanmar have planned to install new ADS-B Station in the First quarter of 2020 at Lashio Airport located in north-eastern part of Myanmar closed to the China-Myanmar border near the LINSO transfer point on A599 ATS route. After the installation finished, the ADS-B data sharing process can be proceeded between Myanmar and China *after March, 2020.*

For the communication links between Yangon and Beijing, it can use the existing 2M E1 IPLC link which is now using for AFTN messaging and (AIDC Testing) Voice, and also can be used the existing Yangon-Beijing VSAT link as backup.

Myanmar also willing to participate the special coordination meetings to promote relevant works in terms of the surveillance data sharing among the countries to enhance the safety and surveillance capability in the sub-region.

Lashio installation will be completed by First quarter of 2020.
Redundant Communication link via Land line / CRV / V-SAT is proposed under discussion.

8. Thailand

Thailand provided update on the installation and related activities regarding ADS-B and other related surveillance system as follows:

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

- ~~MLAT has been in operation at Suvarnabhumi Airport (VTBS) since 2006. Another MLAT installation was carried out at Don Mueang Airport (VTBD) in 2017 and operational since mid 2019 at the same time when the new ATM automation system, which is the system that receives and processes data, was implemented.~~

- 4 ADS-B ground stations (DO260B and lower compliant) have been installed at Doi Inthanon (Chiangmai), Hatyai Airport (VTSS), Samui Airport (VTSM) and Ubon Ratchathani Airport (VTUU). Moreover, 3 SSRs at Surat Thani Airport (VTSB), Ubon Ratchatani Airport (VTUU), and Phuket Airport (VTSP) have been upgraded with ADS-B capability. In total, 7 ADS-B stations are under approval process and is expected for air traffic services by the end of 2024.

Data sharing

- ATS surveillance data sharing with adjacent FIRs was approved in principle in October 2018.

- User requirements, particularly ATS routes to be served, and communication link test plan are discussed in 2018.

9. India (no update provided in 2024)

ADS-B Usage and Mandate in India:

India has installed 36 ADS-B ground receivers to enhance redundancy in existing Radar airspace and also to extend Surveillance coverage in low density airports and in certain oceanic airspace. It will also facilitate extension of Surveillance coverage for low altitude (below existing Radar coverage) leading to more efficient use of airspace. ADS-B data is being used for Terminal as well as Enroute Surveillance operations.

Out of 36 ADS-B ground receivers presently 30 receivers have already been operationalized and efforts are on to operationalize remaining 6 ADS-B ground receivers soon. Further, India has entered into a contract with M/s Aireon in July 2019 to receive ADS-B data for Oceanic regions of Indian FIR to ensure seamless Surveillance coverage across its oceanic airspace, Space Base ADS-B system has been successfully integrated with Data fusion systems of Mumbai, Chennai and Kolkata in January 2021 and presently being used for situational awareness only.

In order to promote ADS-B usage in India, the Director General of Civil Aviation (DGCA) India has issued ADS-B avionics mandate w.e.f. 01st January 2020, all aircrafts flying over Indian continental airspace at or above FL290, are to be equipped with on-board ADS-B equipment.

10. Sri Lanka

Sri Lanka has installed 5, ADS-B stations and data received by the stations have been integrated and available for sharing. The ADS-B coverage is approximately 350NM from Piduruthalagala, the highest mountain situated in central Sri Lanka. Sri Lanka is willing to share this data with India and Maldives. India is requested to provide a soft copy of draft agreement for sharing of ADS-B data with Sri Lanka so as to enable Sri Lanka to look into the terms and conditions of draft agreement.

11. Nepal

Nepal has also completed installation of 4 ADS-B GS at Mt. Phulchowki (Kathmandu), Nepalgunj, Bhairahawa and Dhangadhi Airports and have been integrated with MSDPS.

~~Efforts are on to operationalize soon~~ They are in test operation.

ADS-B Data Sharing

Project 1 - ADS-B Data Sharing between China, Laos and Myanmar

Phase 1 *China and Laos sharing ADS-B data from following:*
Kunming ADS-B data processing Centre (china), which can customize the output of ADS-B data in version, specific area and height range depend on Laos's requirement.

Route to be affected B465.

China and Myanmar sharing ADS-B data from the following sites:
Lashio (Myanmar) Not yet installed – Target to be installed by March 2020.Route to be affected A599

China and Myanmar sharing ADS-B data from the following:
Kunming ADS-B Data Processing Centre (China), which can customize the output of ADS-B data in version、specific area and height range depend on Myanmar's requirement.

Operational Status
N/A

Expected benefits
- Enhanced air navigation safety at FIRs boundary.
- Promoting air traffic control work efficiency.

Project 2 - ADS-B Data Sharing between India and Indonesia

Phase 1
Aceh – Indonesia
Camp Bell Bay – India

Route to be affected B466, P574 and N563

Operational Status
ADS-B data from Campbell Bay (India) is proposed to be integrated with Jakarta (Indonesia) ATC centre. Similarly, data from Banda-Aceh (Indonesia) ADS-B is proposed to be integrated with Chennai (India) ATC centre. Draft Letter of Agreement (LOA) has been shared with Indonesia and necessary Government approval is awaited for implementation of data sharing.

Benefits
Enhanced safety by reduction in occurrences of LHDs and LLDs in BOB region.

Project 3 - ADS-B Data Sharing between India and Malaysia

Phase 1
Port Blair/Campbell Bay - Langkawi ~~(2023)~~

Route to be affected N571, P628, L510, P627, L645 and P574

Operational Status
ADS-B data from Campbell Bay (India) is proposed to be integrated with Kuala Lumpur (Malaysia) ATC centre. Similarly, data from Langkawi (Malaysia) ADS-B is proposed to be integrated with Chennai (India) ATC centre. Draft Letter of Agreement (LOA) has been shared with Malaysia and necessary Government approval is awaited for implementation of data sharing. India and Malaysia are exchanging comments on the Draft LOA.

Expected benefits
Enhanced safety by reduction in occurrences of LHDs and LLDs in BOB region.

Project 4 - ADS-B Data Sharing between India and Myanmar (no update provided in 2022)

Phase 1
The ADS-B data sharing between Kolkata and Yangon FIR was an initiative taken by India and Myanmar to enhance safety and reduce LHDs along Kolkata-Yangon FIR boundary.

In 6 May 2015, Myanmar and India have signed the MOU agreement for ADS-B data sharing between the two countries.

As per the data sharing agreement, ADS-B data sharing test between Agartala(India) and Sittwe (Myanmar) and Port Blair(India) and Coco Island(Myanmar) has been accomplished between technical teams since June 2018. Kolkata has integrated the ADS-B feed from Sittwe and Co Co Island in its Automation system. Presently the data is given in the back up automation system at Kolkata for test purpose and ADS B equipped aircrafts are tracked from as far as 250 nm west of Bangkok.

But for Myanmar side, India's data is just received to Yangon ACC technical management room and need to discuss with ATM Manufacturer (Thales) of Surveillance Display System to integrate India's ADS-B data to existing Surveillance Display System for operational use in Yangon ACC. Because the multicast address and port from India's ADS-B data are different with existing setup.

The communication link used for ADSB data transfer between Yangon and Kolkata is the existing E1 IPLC link which is used for DSC phone between the two ATS units.

Route to be affected A201, A599, B465, G463, L507, P646, P762, G472, L524, M770 and L759

Operational Status
Operationalized for situational awareness. India-Myanmar data sharing has been completed successfully through under sea cable between Mumbai (India) and Yangoon (Myanmar). Data from Sittwe (Myanmar) and Coco Island (Myanmar) has been successfully integrated with Kolkata Automation system, and there were no reported instability issue. Similarly, data from Agartala (India) and Port Blair (India) has been provided to Yangoon ATC centre.

Expected benefits
Enhanced safety by reduction in occurrences of LHDs and LLDs in BOB region.

Project 5 - ADS-B Data Sharing between Indonesia and Malaysia

Phase 1
Langkawi - Aceh (TBD)

Route to be affected B466, N571, P628, L510, P627, L645 and P574
ADS-B data from Aceh (Indonesia) is proposed to be integrated with Kuala Lumpur (Malaysia) ATC centre. Similarly, data from Langkawi (Malaysia) ADS-B is proposed to be integrated with Jakarta (Indonesia) ATC centre. Draft Letter of Agreement (LOA) has been shared with Indonesia and Malaysia and necessary Government approval is awaited for implementation of data sharing.
Malaysia and Indonesia is planning to use CRV for the data sharing link.
ASTERIX CAT21 Ver 0.26 format to be used for data sharing.

~~*Surveillance data sharing between Malaysia and Indonesia in Bay of Bengal is currently on hold until further notice.~~

Operational Status
New ATM Automation system Kuala Lumpur is now complete and ready for data sharing.
Expected benefits
Enhanced safety at FIR boundary

Project 6 - ADS-B Data Sharing between Malaysia and Thailand

Phase 1
Langkawi - Phuket

General discussion about possibility to share ADS-B data for route N571, P628, L510, P627, L645 and P574. Malaysia and Thailand to continue discussion to exchange views of the possible ADS-B data sharing.

Operational Status
~~N/A~~ Currently on hold until further discussion

Expected benefits
- Enhanced visibility of surveillance targets in Bay of Bengal.
- Enhanced situational awareness at FIR boundary.

Project 7 - ADS-B Data Sharing between India and Sri Lanka (no update provided in 2018 - 2022)

Phase 1
In view of integration of Space Based ADS-B data, India's requirement of ADS-B data from Sri Lanka is supplemented, by the data from Aireon. Hence there is no further follow up from India on the data sharing. However, in case Sri Lanka desires to have ADS-B data from India, project may be approached, afresh by Sri Lanka.

Operational Status
N/A

Expected benefits
Enhanced safety at FIR boundary

General remark for all the above projects: As agreed at previous ADS-B Task Force, WG and SURICG meetings, sharing of ADS-B data should include sharing of VHF radio facilities/services, where possible

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REPORT FROM SOUTHEAST ASIA SUB GROUP

Bangkok, Thailand, ~~6~~ *7 to* ~~9~~ *10* ~~*June*~~ *May 2024*~~*23*~~

States Present
Australia
Cambodia
China
Hong Kong, China
Indonesia
Malaysia
The Philippines
Singapore
Thailand
Viet Nam

Observer
Fiji
Japan
Macao, China

Previously Identified Projects

The South East Asia Group provide an update on the near term implementation of the following projects that were identified in previous meetings.

Project 1 – ADS-B Data Sharing Between Australia and Indonesia

Phase 1a
Indonesia and Australia sharing ADS-B data from the following sites:

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

Data Sharing Agreement signed in Nov 2010;
Communications links between Australia and Indonesia were upgraded from VSAT to terrestrial links in Mar 2016. The service quality was improved.

Benefits
Data used for air situational awareness and safety nets.
Enhanced Safety at FIR boundary.
Operational service commenced by Australia in 2010.
Indonesia has been using the data for Tier 2 services since Sep 2014

Phase 1b
Indonesia and Australia plan to share ADS-B data from the following additional sites:

- Timika (Indonesia) (Installed) - Commenced data sharing

- Kupang (Indonesia) (Installed) - Commenced data sharing
- Christmas Island (Australia) (Not yet installed)
- Browse Basin oil rig (Australia) (installed in 2018 and not yet operational)

Data Sharing Agreement signed on 18 Jun 2014.

Sharing agreement extended from 2023 to 2026.

Project 2 – ADS-B Data Sharing ~~I~~in Southeast Asia

Phase 1
Under the near term implementation plan, the parties have commenced ADS-B data sharing from the following sites:

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

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

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

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

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

DCPC services agreement between China and Hong Kong China signed in 2005.
ADS-B Data sharing agreement between China and Hong Kong China signed in 2013.

Operational Status
Singapore agreed on separation minima with Viet Nam and have commenced on ADS-B operations since Dec 2013. Singapore commenced with 40nm separation and subsequently reduced to 30nm separation between Singapore and Ho Chi Minh FIR. Further reduction to 20nm longitudinal separation was implemented on 10 Nov 2016.

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

Initial Benefits

The above sharing/collaboration arrangements will benefit L642, M771, N891, M753, N892 and L644. Enhanced safety and reduced separation have been achieved. Mandate was effective in Singapore FIR from Dec 2013. China published the mandate in Oct 2019. Mandate for domestic fleet was effective on 10 Oct 2019. Mandate for international fleet will effective on 31 Dec 2020. Hong Kong China's ADS-B mandate was effective from Dec 2016 for aircraft at FL290 and above.

Phase 2

The Philippines has installed ADS-B station at Manila ATM Centre and Bataraza. It is planning to ~~will~~ install ~~six~~ other ADS-B stations within Manila FIR~~s (Puerto Princesa Palawan, Laoag, Jomalig, Mt Majic, General Santos Airport and Iba Zambales).~~

Singapore and the Philippines signed an MOU in Oct 2015 to make available ADS-B data and VHF facilities at Bataraza, Palawan for Singapore. The project was completed in Aug 2017. The ADS-B of Bataraza is yet to be integrated into Manila ATM Centre and it will be done after the hardware is upgraded.

The Philippines indicated that there is a surveillance gap at Northwestern part of Manila FIR and is studying acquisition of space-based ADS-B data to cover the surveillance gap.

China's four ADS-B ground stations deployed in Sanya FIR may be able to cover parts of the surveillance gap. China is prepared to share its ADS-B data, via its ADS-B data processor, with neighbouring states.

Brunei signed an MOU with Singapore in April 2019 where Brunei shared ADS-B data with Singapore and provide the VHF facilities for Singapore ATC use. Data sharing commenced 1 September 2021.

Singapore and Viet Nam signed an agreement in Jul 2016 to make available ADS-B data and VHF facilities at Ca Mau for Singapore. The facilities were commissioned in Nov 2018.

Phase 3

Vietnam has ADS-B coverage at the Southern part of L625, N892, N884, M767 and M772 and Vietnam is willing to share the ADS-B data with the Philippines and Singapore. The discussion between Singapore and Vietnam is in progress.

The Philippines is studying the use of space-based ADS-B to cover its surveillance gaps.

In addition to sharing ADS-B data from its ADS-B station in Terengganu, Malaysia is also willing to share the ADS-B data from its ADS-B stations in Kuching, Bintulu, Kota Kinabalu and Sandakan~~.~~. The data from these four stations are also useful to Indonesia and will be shared under Project 3. Singapore will share data from its Singapore ADS-B station with Malaysia.

Malaysia and Singapore will initiate discussions on data sharing from the following sites:

- Terengganu (Malaysia) - Installed
- Bintulu (Malaysia) – Installed
- Kota Kinabalu (Malaysia) – Installed
- Kuching (Malaysia) – Installed
- Sandakan (Malaysia) - Installed
- Singapore (Singapore) - Installed

Initial benefits

Enhanced Safety at FIR boundary and coverage redundancy

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

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

- Pontianak (Indonesia) – Installed
- Tarakan (Indonesia) - Installed
- Bintulu (Malaysia) – Installed
- Kota Kinabalu (Malaysia) – Installed
- Kuching (Malaysia) – Installed
- Sandakan (Malaysia) - Installed

Malaysia and Indonesia are reviewing the collaboration agreement.

Initial benefits
Enhanced Safety at FIR boundary and coverage redundancy

Project 4 – ADS-B data sharing between Cambodia, Thailand and Viet Nam

Cambodia is willing to share the ADS-B data from the following sites:

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

Viet Nam completed installing 11 new ADS-B stations in the HCM FIR in 2023. Viet Nam is willing to share data with Cambodia and Thailand.

~~Thailand installed ADS-B ground stations and is in the process of issuance of air navigation service licence. Expected completion by end of 2024.~~Thailand has 4 ADS-B ground stations (DO260B and lower compliant) installed at Doi Inthanon (Chiangmai), Hatyai Airport (VTSS), Samui Airport (VTSM) and Ubon Ratchathani Airport (VTUU). Moreover, 3 SSRs at Surat Thani Airport (VTSB), Ubon Ratchathani Airport (VTUU), and Phuket Airport (VTSP) have been upgraded with ADS-B capability. In total, 7 ADS-B stations are under approval process and is expected for air traffic service by end of 2024.

Initial benefits
For redundancy

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

Indonesia and the Philippines initiated discussion in 2019 on data sharing:

- Melonguane (Indonesia) (installed)
- General Santos (The Philippines) (~~yet to install~~The plan to install to be reviewed)

Initial benefits
Situational awareness

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

Data Sharing between Australia and Papua New Guinea -

- Thursday Island (Australia) (installed)
- Gove (Australia) (installed)
- Kintore (Australia) Not yet installed – Target to be installed by 20275
- Burns Peak – Port Moresby (PNG) (installed)
- Mt Robinson (PNG) (to be installed by 2018) or Mt Nauwein (to be installed by 2018)

The above data sharing proposal will be re-evaluated due to implementation of space-based ADS-B in Papua New Guinea

Note that the above information from Papua New Guinea was based on previous updates as Papua New Guinea was not present at the meeting.

Data Sharing between Indonesia and Papua New Guinea

- Mt Nauwein (PNG) (to be installed by 2018) – Phase 1
- Merauke (Indonesia) (installed) – Phase 1
- Jayapura (Indonesia) (installed) – Phase 2

New ATM system installed in PNG.
The parties have yet to sign the agreement.

The above data sharing proposal will be re-evaluated due to implementation of space-based ADS-B in Papua New Guinea

General remark for all the above projects: As agreed at previous APAC ADS-B Task Force, WG and SURICG meetings, sharing of ADS-B data should include sharing of VHF radio facilities/services, where possible

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ADS-B Data Sharing Implementation Status in the Asia/Pacific Region

Related States/Administrations	ATS Route Served	Initiation Year	Agreement Date	Target Data Sharing Year	Implementation Status	Remarks/Challenges
Australia - Indonesia	Phase 1a L511, R592, G578, B349, M735, G326, A587, M768, A461, R340, B472, B473, G459	2010	2010	2010	Completed	SEA Report: Project 1
	Phase 1b M774, A458, J199, M766, G326, A587, L895, A585	2014	2014	TBD	Ongoing	Browse Basin oil rig (Australia) awaiting acceptance testing
	~~Phase 2~~ ~~L895, A585~~	~~2017~~	~~2019~~	~~TBD~~	~~Completed~~	~~SEA Report: Project 2~~
Australia - Papua New Guinea	TBN				Ongoing	SEA Report: Project 6 (to be re-evaluated due to the implementation of space-based ADS-B in Papua New Guinea)
Brunei - Singapore	M758, M768, M767	2015	2019	2021*	Completed	SEA Report: Project 2 *Data sharing start Sep 2021
China – Hong Kong, China	Project 1 M771, L642	2010	2013	2013	Completed	
	Project 2 M771, L642, A1	2017		2018	Completed	Supplementary data sharing of Route A1
China - Lao PDR	A581, B465	2019		TBD	Ongoing	BOB Report: Project 1
China - Myanmar	A599	2019		TBD	Ongoing	BOB Report: Project 1
India - Indonesia	B466, P574, N563	2018		~~2022~~2024	Ongoing	BOB Report: Project 2 Data Sharing LoA on progress by end of 2022
India - Malaysia	N571, P628, L510, P627, L645, P574	2017		~~2023~~2024	Ongoing	BOB Report: Project 3 Data Sharing LoA on progress by 2023

Related States/Administrations	ATS Route Served	Initiation Year	Agreement Date	Target Data Sharing Year	Implementation Status	Remarks/Challenges
India - Myanmar	A201, A599, B465, G463, L507, P646, P762, G472, L524, M770, L759	2015	05/06/2015	2018	Completed	BOB Report: Project 4 Myanmar side: Discussion with ATM manufacturer for operational use at ACC is needed. Indian side completed.
Indonesia - Papua New Guinea	R204, A215, B462, B456	2018	~~2019~~	TBD	Ongoing	SEA Report: Project 6 (to be re-evaluated due to the implementation of space-based ADS-B in Papua New Guinea)~~SEA Report: Project 6~~
Indonesia - Malaysia	B466, N571, P628, L510, P627, L645 and P574	2017		TBD	Ongoing	BOB Report: Project 5
Indonesia-Malaysia	**Project 3** R455, M772, B648, R223, M522, M768 and A211	2023		TBD	Ongoing	SEA Report: Project 3
Indonesia - Philippines	A461, R590, B472	2018	~~2019~~	TBD	Ongoing	SEA Report: Project 5
Indonesia - Singapore	M646, M758, M761, N875	2010		2013	Completed	SEA Report: Project 2
Malaysia - Singapore	**Project 1** M758, M768, L649,	2017		TBD	Ongoing	SEA Report: Project 2
	Project 2 M904, M765, N875, N891	2018		TBD	Ongoing	SEA Report: Project 2
Malaysia - Thailand	N571, P628, L510, P627, L645, P574	2018		TBD	Ongoing	BOB Report: Project 6

Related States/Administrations	ATS Route Served	Initiation Year	Agreement Date	Target Data Sharing Year	Implementation Status	Remarks/Challenges
Myanmar - India	Project 1: Effect on Myanmar A201, A599, B465 Effect India: G463, L507, P646, N895	2018	2015	~~2020/2021~~TBD	Ongoing	Data communication between Myanmar and India is stable with two links. Different Multiaircraft Address from India ADS-B Data
	Project 2: L301, M770	2019	2016	2020/2021	On trial	
Philippines - Singapore	N884, M522, M754, M767, M772, L649	2018		2018	Completed	SEA Report: Project 2
Singapore - Vietnam	**Project 1** N892, N891, M771, M753, M758, L642, L644	2007		2013	Completed	SEA Report: Project 2
	Project 2 N892, N891, M771, M753, M758, M904, L642, L644	2014	2016	2018	Completed	SEA Report: Project 2

ADS-B Data Sharing Implementation Status in the Asia/Pacific Region

Related States/Administrations	ATS Route Served	Initiation Year	Agreement Date	Target Data Sharing Year	Implementation Status	Remarks/Challenges
Australia - Indonesia	Phase 1a L511, R592, G578, B349, M735, G326, A587, M768, A461, R340, B472, B473, G459	2010	2010	2010	Completed	SEA Report: Project 1
	Phase 1b M774, A458, J199, M766, G326, A587, L895, A585	2014	2014	TBD	Ongoing	Browse Basin oil rig (Australia) awaiting acceptance testing
	~~Phase 2~~ ~~L895, A585~~	~~2017~~	~~2019~~	~~TBD~~	~~Completed~~	~~SEA Report: Project 2~~
Australia - Papua New Guinea	TBN				Ongoing	SEA Report: Project 6 (to be re-evaluated due to the implementation of space-based ADS-B in Papua New Guinea)
Brunei - Singapore	M758, M768, M767	2015	2019	2021*	Completed	SEA Report: Project 2 *Data sharing start Sep 2021
China – Hong Kong, China	Project 1 M771, L642	2010	2013	2013	Completed	
	Project 2 M771, L642, A1	2017		2018	Completed	Supplementary data sharing of Route A1
China - Lao PDR	A581, B465	2019		TBD	Ongoing	BOB Report: Project 1
China - Myanmar	A599	2019		TBD	Ongoing	BOB Report: Project 1
India - Indonesia	B466, P574, N563	2018		~~2022~~2024	Ongoing	BOB Report: Project 2 Data Sharing LoA on progress by end of 2022
India - Malaysia	N571, P628, L510, P627, L645, P574	2017		~~2023~~2024	Ongoing	BOB Report: Project 3 Data Sharing LoA on progress by 2023

Related States/Administrations	ATS Route Served	Initiation Year	Agreement Date	Target Data Sharing Year	Implementation Status	Remarks/Challenges
India - Myanmar	A201, A599, B465, G463, L507, P646, P762, G472, L524, M770, L759	2015	05/06/2015	2018	Completed	BOB Report: Project 4 Myanmar side: Discussion with ATM manufacturer for operational use at ACC is needed. Indian side completed.
Indonesia - Papua New Guinea	R204, A215, B462, B456	2018	~~2019~~	TBD	Ongoing	SEA Report: Project 6 (to be re-evaluated due to the implementation of space-based ADS-B in Papua New Guinea)~~SEA Report: Project 6~~
Indonesia - Malaysia	B466, N571, P628, L510, P627, L645 and P574	2017		TBD	Ongoing	BOB Report: Project 5
Indonesia-Malaysia	**Project 3** R455, M772, B648, R223, M522, M768 and A211	2023		TBD	Ongoing	SEA Report: Project 3
Indonesia - Philippines	A461, R590, B472	2018	~~2019~~	TBD	Ongoing	SEA Report: Project 5
Indonesia - Singapore	M646, M758, M761, N875	2010		2013	Completed	SEA Report: Project 2
Malaysia - Singapore	**Project 1** M758, M768, L649,	2017		TBD	Ongoing	SEA Report: Project 2
	Project 2 M904, M765, N875, N891	2018		TBD	Ongoing	SEA Report: Project 2
Malaysia - Thailand	N571, P628, L510, P627, L645, P574	2018		TBD	Ongoing	BOB Report: Project 6

Related States/Administrations	ATS Route Served	Initiation Year	Agreement Date	Target Data Sharing Year	Implementation Status	Remarks/Challenges
Myanmar - India	Project 1: Effect on Myanmar A201, A599, B465 Effect India: G463, L507, P646, N895	2018	2015	~~2020/2021~~TBD	Ongoing	Data communication between Myanmar and India is stable with two links. Different Multiaircraft Address from India ADS-B Data
	Project 2: L301, M770	2019	2016	2020/2021	On trial	
Philippines - Singapore	N884, M522, M754, M767, M772, L649	2018		2018	Completed	SEA Report: Project 2
Singapore - Vietnam	**Project 1** N892, N891, M771, M753, M758, L642, L644	2007		2013	Completed	SEA Report: Project 2
	Project 2 N892, N891, M771, M753, M758, M904, L642, L644	2014	2016	2018	Completed	SEA Report: Project 2

GENERAL STRATEGY ON ASSIGNMENT OF AND MIGRATION TO SI CODE (revised)

Considering that, when formulating the general strategy:

a) It was previously shared that radars using SI code cannot detect II-only transponders unless a work-around known as the II/SI code operation is used;

b) Even if a radar using SI code supports the II/SI code operation, it will not be able to detect an II-only transponder if that transponder is already locked to a matching II code by a radar using that matching II code. A way to overcome this is for II radars to also use the II/SI code operations whereby it will only lock out SI-capable transponders and not II-only transponders. However, it is difficult to ensure that all radars (including old radars) can support the II/SI code operations in the near future;

c) Transponders that support only II codes are unlikely to disappear totally. Even with strict enforcement by ICAO, there will still be aircraft not subjected to ICAO's provision;

d) While it is possible to configure the lock-out coverage to be smaller than the designated operating coverage, such configuration may not be intuitive and may be subjected to error;

e) The European region is reserving II codes 14 and 15 (and their matching SI codes) for special use (i.e. research/test and military purposes). However, the situation in APAC region is different and do not have the same conditions that allow the reservation of II 14 and 15 (and their matching SI code);

f) The Surveillance Panel is deliberating on a proposal to include a **requirement** for use of II/SI code operations for radars using SI code and a **recommendation** for the use of II/SI code operations for radars using II code; and

g) The strategy is to be kept simple,

The following general strategy has been agreed ~~is thus proposed~~ for the assignment of SI codes:

a) The ICAO APAC regional office will assign SSR Mode S II or Mode S SI codes in accordance with the planning criteria in *Appendix A-1*, at the same time ensuring continued support for Mode S II-only transponders;

b) The ICAO APAC regional office will only assign an SI code if the radar can support II/SI code operations;

c) The ICAO APAC regional office will only assign an SI code to radars having overlapping coverage with another radar using "matching" II code when the radar using "matching" II code can support II/SI code operations;

d) The ICAO APAC Regional Office will assume that the designated operating coverage is the same as the lockout coverage. There will be a 5NM buffer between the coverages of two radars using the same II or SI code. States can, as necessary, select a lockout coverage that is smaller than the Designated Operational Coverage; and

e) ~~The ICAO APAC regional office will generally avoid assigning II 14 and 15 (and their matching SI codes) to new radars.~~ The ICAO APAC regional office will not reserve II codes 14 and 15 (and their matching SI codes) for special use like the case of Europe region. Instead, ICAO APAC regional office will have the full flexibility to assign II 14 and 15 (and their matching SI codes) like the rest of the II and SI codes.

The following general strategy for migration has been agreed ~~is proposed~~:

a) States with Mode S radars that can support II/SI code operation are encouraged to coordinate this functionality with the ICAO APAC regional Office to assign or re-assign SI codes to these radars.

b) The ICAO APAC Regional Office may also approach certain States to start migrating to SI codes.

Appendix A-1

The following planning criteria for assigning SSR Mode S II or SSR Mode S SI codes have been agreed by the Surveillance Panel and will be incorporated in the ICAO Aeronautical Surveillance Manual (DOC 9924)

(Editorial Note: Some of the texts below are edited from the original material in DOC. 9924)

Table 1: Considered interrogator (interrogator for which an Interrogator Code is demanded)
Mode S II-only interrogator
Operating on II code
Can operate with Mode S II-only and Mode S II/SI transponders

Case	Capability of the overlapping interrogator	Operating code	Condition	Transponder Type
A	A Mode S II only	Different II code	Overlap OK	II-only and II/SI
		Same II code	No overlap	
B	Mode S SI operating with II code (1)	Different II code	Overlap OK	II-only and II/SI
		Same II code	No overlap	
C	Mode S SI operating with SI code (1)	Any SI code, including a "matching" SI code	Overlap OK	II/SI
D	Mode S II/SI+ operating with II code (2)	Different II code	Overlap OK	II-only and II/SI
		Same II code	No overlap	
E	Mode S II/SI+ operating with SI code (2)	Non-matching SI code	Overlap OK	II-only and II/SI
		Matching SI code	No overlap	

Note 1: Mode S SI means Mode S II/SI capable interrogator which does not support the II/SI code operation
Note 2: Mode S II/SI+ means Mode S II/SI capable interrogator which does support the II/SI code operation

Table 2: Considered interrogator (interrogator for which an Interrogator Code is demanded)
Mode S II/SI interrogator that does not support the use of II/SI code operation.
Operating on II code
Can operate with Mode S II-only and Mode S II/SI transponders

Case	Capability of the overlapping interrogator	Operating code	Condition	Transponder Type
A	A Mode S II only	Different II code	Overlap OK	II-only and II/SI
		Same II code	No overlap	
B	Mode S SI operating with II code (1)	Different II code	Overlap OK	II-only and II/SI
		Same II code	No overlap	
C	Mode S SI operating with SI code (1)	Any SI code, including a "matching" SI code	Overlap OK	II/SI
D	Mode S II/SI+ operating with II code (2)	Different II code	Overlap OK	II-only and II/SI
		Same II code	No overlap	
E	Mode S II/SI+ operating with SI code (2)	Non-matching SI code	Overlap OK	II-only and II/SI
		Matching SI code	No overlap	

Note 1: Mode S SI means Mode S II/SI capable interrogator which does not support the II/SI code operation
Note 2: Mode S II/S+I means Mode S II/SI capable interrogator which does support the II/SI code operation

Table 3: Considered interrogator (interrogator for which an Interrogator Code is demanded) Mode S II/SI interrogator that does not support the use of II/SI code operation.
Operating on SI code
Can only operate with Mode S II/SI transponders

Case	Capability of the overlapping interrogator	Operating code	Condition	Transponder Type
A	A Mode S II only	Any II code including the matching II code	Overlap OK	II/SI
B	Mode S SI operating with II code (1)	Any II code including the matching II code	Overlap OK	II/SI
C	Mode S SI operating with SI code (1)	Different SI code	Overlap OK	II/SI
		Same SI code	No overlap	
D	Mode S II/SI+ operating with II code (2)	Any II code including the matching II Code	Overlap OK	II/SI
E	Mode S II/SI+ operating with SI code (2)	Different SI code	Overlap OK	II/SI
		Same SI code	No overlap	

Note 1: Mode S SI means Mode S II/SI capable interrogator which does not support the II/SI code operation
Note 2: Mode S II/SI+ means Mode S II/SI capable interrogator which does support the II/SI code operation

Table 4: Considered interrogator (interrogator for which an Interrogator Code is demanded) Mode S II/SI+ interrogator that supports the use of II/SI code operation.
Operating on II code
Can operate with Mode S II-only and Mode S II/SI transponders

Case	Capability of the overlapping interrogator	Operating code	Condition	Transponder Type
A	A Mode S II only	Different II code	Overlap OK	II-only and II/SI
		Same II code	No overlap	
B	Mode S SI operating with II code (1)	Different II code	Overlap OK	II-only and II/SI
		Same II code	No overlap	
C	Mode S SI operating with SI code (1)	Any SI code including a matching SI code	Overlap OK	II/SI
D	Mode S II/SI+ operating with II code (2)	Different II code	Overlap OK	II-only and II/SI
		Same II code	No overlap	
E	Mode S II/SI+ operating with SI code (2)	Any SI code including a matching SI code	Overlap OK	II-only and II/SI

Note 1: Mode S SI means Mode S II/SI capable interrogator which does not support the II/SI code operation
Note 2: Mode S II/SI+ means Mode S II/SI capable interrogator which does support the II/SI code operation

Table 5: Considered interrogator (interrogator for which an Interrogator Code is demanded) Mode S II/SI+ interrogator that supports the use of II/SI code operation.
Operating on SI code
Can operate with Mode S II-only and Mode S II/SI transponders

Case	Capability of the overlapping interrogator	Operating code	Condition	Transponder Type
A	A Mode S II only	Non-matching II code	Overlap OK	II-only and II/SI
		Matching II code	No overlap	
B	Mode S SI operating with II code (1)	Non-matching II code	Overlap OK	II-only and II/SI
		Matching II code	No overlap	
C	Mode S SI operating with SI code (1)	Different SI code	Overlap OK	II/SI
		Same SI code	No overlap	
D	Mode S II/SI+ operating with II code (2)	Any II code including a matching II code	Overlap OK	II-only and II/SI
E	Mode S II/SI+ operating with SI code (2)	Different SI code	Overlap OK	II-only and II/SI
		Same SI code	No overlap	

Note 1: Mode S SI means Mode S II/SI capable interrogator which does not support the II/SI code operation
Note 2: Mode S II/SI+ means Mode S II/SI capable interrogator which does support the II/SI code operation

ICAO APAC POINT OF CONTACT ON MODE S AND DAPS MATTERS

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2.	**BHUTAN**				
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	6.	Mr. YAO Yuan	Senior Engineer CNS division Organization Middle South regional Air Traffic Management Bureau of CAAC **CHINA (PEOPLE'S REPUBLIC OF)**	znyaoyuan@atmb.net.cn;	Tel: +8602086130892/ +8615920519742
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	STATE/NAME		TITLE/ORGANIZATION	E-MAIL	TEL/FAX
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6.	**FIJI**				
		(To be advised)			
7.	**INDIA**				
		(To be advised)			
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9.	**JAPAN**				

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10.		**LAO PDR**			
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11.		**MALAYSIA**			

		STATE/NAME	TITLE/ORGANIZATION	E-MAIL	TEL/FAX
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14.		**NEW ZEALAND**			
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16.		**PHILIPPINES**			

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	STATE/NAME		TITLE/ORGANIZATION	E-MAIL	TEL/FAX
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MODE S DAPs IMPLEMENTATION STATUS IN THE APAC REGION

No.	State/ Administration	Mode-S Surveillance Facilities and ATM System Readiness	Operational Status	Remark
1	**AUSTRALIA**	18 Mode-S capable radars in operation. Current ATM automation system (Eurocat) implemented limited Mode S DAPs capability. Future ATM automation system (CMATS) will implement additional Mode S DAPs capabilities.	Current ATM system (Eurocat) implemented FSSA DAP field to alert on selected altitude mismatches with ATC cleared level. Future ATM system CMATS: not in operation.	In CMATS, DAPS will be used in the following ways: • as an input into STCA processing • FSSA mismatch alert (similar to Eurocat) • Raise an alert to ATC if the TCAS generates an RA • Display of certain DAP fields (tbc) – display only, no alerting**.**
2	**CAMBODIA**	-3 Mode S capable radars -3 ADS-B stations -ATM system ready to process DAPs 1 MLAT (not yet officially operate)		
3	**CHINA**	90 Mode-S capable radars. Now ATM automation systems could process the DAPs including the position altitude and Mode 3/A Code. Almost all the ATM automation systems could process DAPs, just a few site systems not finished the software version upgrade.	Radars and DAPs application in ATM system for the second stage are operational.	
4	**INDIA**	30 Mode-S capable Radars have already been installed. All ATM systems except Chennai are capable to process DAPs.	Out of 30 Mode-S capable Radars, 28 radars are presently operational. All DAPs capable ATM systems are operational.	Commissioning of remaining 02 Mode-S capable radars is under process.

No.	State/ Administration	Mode-S Surveillance Facilities and ATM System Readiness	Operational Status	Remark
5	**INDONESIA**	28 Mode-S capable Radars 12 ATM systems	26 Radars are in operational. 6 ATM systems are capable for DAPs; and the rest are in evaluation process.	
6	**JAPAN**	13 En-route Radars are Mode-S capable, of which 4 Radars are in evaluation for DAPs. 4 Mode-S capable En-route WAMs. ATM system is in evaluation process for DAPs.	Radars/WAMs are operational and DAPs application in ATM is in evaluation.	
7	**LAO PDR**	- 4 Mode-S Capable MSSRs are operational (3 MSSR-Mode S Enhance Mode) - 5 ADS-B Ground Sations (2 GS with DO-260 A Compliant and 3 GS with DO-260 B Compliant) 2 ATM System with DAPs capable	4 Mode-S MSSR and ADS-B integrated into the ATM Systems.	Full Mode S are not yet put in operation (1 Mode-S MSSR station need to be replace due to aging) ADS-B operational as for Monitoring
8	**MALAYSIA**	10 Mode-S capable SSR are operational 7 ADS-B ground stations are operational	Radars and DAPs application in ATM system are operational	2 New Mode-S capable SSRs radar units are in the commissioning process targeted to be operational by Q4/2024 1 new Mode-S capable SSR radar unit is in installation process expected to be operational by Q4/2025. 1 New Mode S capable SSR radar unit is in the procurement process expected to be operational by Q1/2027 .

No.	State/ Administration	Mode-S Surveillance Facilities and ATM System Readiness	Operational Status	Remark
9	**NEW ZEALAND**	Current Operational Surveillance equipment: Primary: 27 ADSB sites (some dual, others single) Contingency: 5 MSSR, 1 combined MSSR/PSR and 2 PSR 1 MLAT for surface movements, 1 MLAT for WAM	All current surveillance systems are operational. The ATM is processing all DAPS data from ADSB, MLAT and MSSR – MODE A/C/S Code, Flight ID, SFL, IAS, and MACH data is provided to controllers, other data is used by the ATM – e.g., for calculating the wind speed/direction.	Planned Install 3 New MSSR/PSR. Remove Old MSSR/PSR - 5 MSSR, 1 combined MSSR/PSR and 2 PSR Review MLAT and WAM systems Note, New Zealand does not have a MODE S Mandate.
10	**PAKISTAN**	06 Mode-S EHS Capable MSSRs All 03 operational ATM Systems are capable to process DAPs. 1 MLAT system integrated with ASMGCS for surface movement control 09 ADS-B sites with redundant Ground Station receivers	Radars and DAPs application in ATM system are operational	
11	**PHILIPPINES**	12 Mode-S capable radars ATM system Capable of DAPs.	All radar systems are Operational ATM systems are likewise operational with DAPs capability disabled	Operational
12	**REPUBLIC OF KOREA**	13 Mode-S capable radars for ASRs 2 ATM system capable to process DAPs for en-route. 1 Mode-S capable radar for en-route. 11 ADS-B sites.	Out of 13 Mode-S capable Radars, 8 Radars are operational for ASRs. 2 ATM systems are processing all DAPs data from ADS-B and MSSR for en-route.	1 New MSSR/PSR is installing for en-route and will be operational end of 2023. Some MSSRs and ATM systems for ASR are currently being installed, are expected to be operational by the 2023.
13	**SINGAPORE**	3 Mode-S capable radars ATM system ready to process DAPs.	Radars and DAPs application in ATM system are operational	

No.	State/ Administration	Mode-S Surveillance Facilities and ATM System Readiness	Operational Status	Remark
14	**SRI LANKA**	two non-Mode-S radars that are working at BIA (Bandaranaiyake International Airport and mountain Pidurutalagala, Nuwara Eliya, Sri Lanka)		1. Mountain Pidurutalagala Mode - S Radar will be available by end of March 2024. 2. ATM system for the Approach control center at BIA with mode -S and DAP's processing is available by end of the second quarter of 2023. 3. WAM system with DAP's capability and or BIA Mode -S Radar update, planned to implement by end of 2024. 4. ATM system for area control center at Ratmalana (Colombo Airport) with Mode-S and DAP's processing is fully implemented by end of 2024 after implementing Pidurutalagala Mode-S Radar by March-2024.
15	**THAILAND**	12 Mode-S EHS RADARs. The new ATM system, Thailand Modernization CNS/ATM System (TMCS) project, is capable to process DAPs.	The TMCS project has been fully operating since last quarter of year 2020 and Mode-S DAPs implementation is expected for air traffic services by the end of 2024.	
16	**VIET NAM**	- 2 Mode-S capable radars - 2 ATM system ready to process DAPs. - 23 ADS-B stations - 1 MLAT	- Radars and ATM are capable of handling Mode S DAPs but not yet officially operation. - ADS-B is on operation	Vietnam is deploying following projects: - New 5 SSR Mode Station (EHS), - New Ho Chi Minh ATCC and new Da Nang ATCC (with new modern ATM system).

INTERNATIONAL CIVIL AVIATION ORGANIZATION
ASIA AND PACIFIC OFFICE

GUIDELINE ON

ADDRESSING INCONSISTENCIES OF ICAO AIRCRAFT ADDRESS AND TARGET IDENTIFICATION BETWEEN SURVEILLANCE DATA AND FLIGHT PLAN

Edition 1.0 – May 2024

Guideline on Addressing Inconsistencies of ICAO Aircraft Address and Target Identification between Surveillance Data and Flight Plan

1. INTRODUCTION

1.1 PURPOSE

1.1.1 ADS-B is an aircraft surveillance technology that relies on aircraft broadcasting their own position, velocity and other information to ground stations. It is a collaborative surveillance that requires coordination from stakeholders such as ANSPs, airline operators and ground handling agents. Proper ICAO Aircraft Address (AD) and Target Identification (ID) in surveillance data and flight plans are essential for the application of ADS-B and mode S surveillance. This guideline is developed to mitigate the discrepancies observed in AD and ID between surveillance data and flight plans to enhance the application of mode S or ADS-B surveillance in air traffic control, which plays a key role in safe and efficient ATM systems.

1.2 BACKGROUND

1.2.1 ADS-B and mode S radar are surveillance technologies that rely on onboard mode S transponders. The successful implementation of these technologies requires close coordination among aspects including ground equipment, flight operations, air traffic control, dispatch and aircraft maintenance.

1.2.2 The Flight ID is usually set in the aircraft by the flight crew via a cockpit interface. It enables air traffic controllers to identify an aircraft on the ATC disapply and to correlate a mode S or ADS-B track with the filed flight plan aircraft identification (ACID). Flight ID is critical to ATC planning and situational awareness, so it must be entered carefully and accurately.

1.2.3 Similarly, the flight dispatch should ensure the unique 24-bit aircraft address is correctly filed in Item 18 of the ICAO flight plan. The 24-bit aircraft address transmitted by the aircraft should exactly match with the one filed in the flight plan.

1.2.4 Correlating the flight plan with the mode S or ADS-B transmitted AD and ID allows for accurate association of the mode S or ADS-B data with the intended flight, ensuring that the position, velocity and other relevant information align with the planned flight trajectory.

1.2.5 In the event of any discrepancy in AD or ID between surveillance data and

flight plan, it is important to promptly identify and address the issue. The main solution to identify the discrepancy is to use software to create new alerts displaying in ATM system(s) to identify the issue to ATC, which has been deployed in ATM system(s) in some countries. Such alerts, while legitimate, may be considered as nuisance, which may induce distraction to and increase the workload of air traffic controllers thus not conducive to safe and efficient ATC operation.

1.2.6 With the extensive usage of mode S or ADS-B surveillance, the discrepancy issues could result in serious implications and pose challenges when the ATM system is solely reliant on mode S or ADS-B surveillance data for correlation/coupling.

1.3 REFERENCE

- ICAO Annex 10 - Aeronautical Telecommunications
- ICAO Annex 11- Air Traffic Services

2. KEY FINDINGS OF INCORRECT ID AND AD

2.1 GENERAL

2.1.1 It is important to assess each specific case and identify its contributing factors, in order to shed light on critical aspects that demand attention. The practice also aids to determine the most effective mitigation measures to address the root causes and minimize the potential for recurrence.

2.2 INCORRECT ID

2.2.1 In cases of discrepancies observed in ID between surveillance data and flight plan, the majority of attribution can be traced back to human error, while the remaining instances are associated with hardware and software defects.

2.2.2 The **human errors** involved can be summarized and categorized as follows:

(a) Typographical errors of cockpit crews, flight dispatch and/or ground handling agents, for example:

- Incorrectly set Flight ID (e.g., ABC123 instead of ABC321);
- Spaces in Flight ID (e.g., AB C12 3 instead of ABC123) which

produce a corrupted Flight ID;

- Additional leading zeros in Flight ID (e.g. ABC0123 instead of ABC123);
- Omission in ICAO airline designators (e.g. 123 instead of ABC123);
- Using aircraft registration instead of approved ACID (e.g., ZKABC instead of ABC123);
- No Flight ID set;

(b) Co-pilots and/or supervisory staff's failure to cross-check the flight data input;

(c) Failure to update the flight data in cases of delayed or cancelled flights;

(d) Failure to update the flight identification of the corresponding inbound flight after completing the outbound leg; and

(e) Misuse of IATA airline designator in ICAO flight plan.

2.2.3 **Database errors** and **aircraft defects** include:

(a) Programming or database defects in the flight planning systems of airline operators and/or ground handling agents; and

(b) Defects in mode S transponder system.

2.3 INCORRECT AD

2.3.1 In contrast to cases of incorrect aircraft identification which are predominantly attributed to human factor issues, the contributing factor to the broadcast of incorrect 24-bit aircraft address varies.

2.3.2 **Database defects** caused by the following activities contribute to more than 50% of mismatched 24-bit aircraft address cases:

(a) Failure to update the aircraft database upon registration of new aircraft or revised aircraft registration of the existing aircraft;

(b) Late notice airframe changes with the change message (CHG) not

being generated, or arriving after the flight becomes airborne;

(c) Data loss during upgrade to a new flight planning system; and

(d) Software-based defects in the flight planning system.

2.3.3 Other contributing reasons could be:

(a) **Human errors**, e.g. flight dispatch staff and/or ground handling agents' input of wrong 24-bit aircraft addresses in Item 18 of ICAO flight plans; and

(b) **Hardware defects** in mode S transponder system.

3. MITIGATION MEASURES

3.1 GENERAL

3.1.1 In light of the issues identified and summarized in Section 2, it is recommended to collaborate with the regulators and/or operators concerned to take the relevant mitigation measures as given in this Section to prevent recurrence of the discrepancy cases.

3.1.2 Mitigation measures should be implemented based on the nature and underlying causes of the issue. Air operators are recommended closely monitor the common issues and ensure equipment airworthiness, data quality and reliability. Regular maintenance and monitoring can help identify and address the problems promptly.

3.2 ID DISCREPANCY

3.2.1 When an alert is triggered due to an incorrect ID, it is essential for the flight crew to promptly address the issue by immediate correction of the ID. The controller acknowledges the alert, informs the pilot and requests a reset of the Flight ID - Phraseology **"RE ENTER IDENTIFICATION"**. Once the correction is made, the system can accurately associate the aircraft with its intended flight. The alert associated with the incorrect ID will thus be removed from the data black display.

3.2.2 A comprehensive overview of the measures to mitigate **human errors**, which contribute to most ID discrepancy cases, is provided below.

(a) Debriefing and Additional Training

Conducting debriefings with crew directly involved in ID discrepancy occurrence allows for an open discussion to identify the root causes and factors contributing to the error. The debriefing process helps in understanding the specific circumstances and provides an opportunity for additional training tailored to address the identified issues.

(b) Internal Safety Bulletins and Notices

Issuance of internal safety bulletins, circulars or notices to all staff members is an effective method to disseminate educational materials and enhance safety awareness throughout the organization. The communications provide guidance, highlight best practices and share lessons learned from ID discrepancy incidents. By increasing awareness and knowledge, employees at all levels can actively contribute to preventing and mitigating ID discrepancies.

(c) Review of the standard operating procedures (SOPs)

It is a crucial step to ensure that SOPs are comprehensive, up-to-date and effective in preventing ID discrepancies. Emphasizing cross-check procedures by flight operations supervisors and/or the captain-in-flight adds an additional layer of verification and validation to the identification process. This helps catch potential errors and ensures accuracy before the information is entered into the system.

(d) Automation and System Upgrades

Automating the flight data handling process through software or system upgrades can significantly reduce the likelihood of ID discrepancies. By automating data entry and verification processes, the potential for human error is minimized as reliance on manual input is reduced.

3.2.3 To address **database errors** and **aircraft defects**, timely maintenance of the defective part(s) and software upgrades could be prioritized. Proactive and continuous monitoring could be followed to promptly address identified issues.

(a) Timely Maintenance

By conducting timely maintenance, organizations can identify and rectify issues that may contribute to ID discrepancies. This involves inspecting, repairing, or replacing faulty parts to ensure their proper

functioning. Timely maintenance helps prevent further errors or malfunctions that could impact the accuracy of aircraft identification.

(b) Software Upgrades

Regular software upgrades help address known issues, bugs, or vulnerabilities that may exist in the system. Upgrades can include improvements in data validation processes, error handling mechanisms, and enhanced compatibility with other systems.

(c) Proactive Monitoring

Continuous monitoring and analysis of data can detect any anomalies or inconsistencies, allowing for timely intervention. By promptly addressing identified issues, organizations can prevent the occurrence of ID discrepancies and ensure the integrity of the database and aircraft systems.

3.3 AD DISCREPANCY

3.3.1 To mitigate the discrepancy, the following measures are recommended in collaboration with regulars and/or operators concerned to address **database-related deficiency** and **software defects** as identified in Section 2.3

(a) Comprehensive Database Overhaul and Update for Operator's Fleet

It is recommended to conduct a comprehensive overhaul of the entire database and updating the operator's fleet ensures that all data is properly maintained and up to date, reducing the potential of AD discrepancies caused by outdated information.

(b) Procedures for Timely Removal of Obsolete Aircraft Data

It is recommended to develop implementation procedures for the removal of obsolete aircraft data could ensure regular review and timely removal of outdated information from the database, maintaining a clean and reliable database.

(c) Communication Protocol for Sharing Aircraft Information between Engineering and Flight Operations

It is recommended to devise communication protocol for sharing aircraft information between the engineering team and flight operations for

establishing effective communication channels to ensure that all relevant parties have access to current accurate aircraft data, particularly in case of revised aircraft registration and acquisition of new aircraft.

(d) Development of an Automated System for Aircraft Database Updates

It is recommended to automate the update process, so that organizations can ensure that the database remains current and accurate without relying solely on manual efforts. This helps reduce the likelihood of human errors and enhances the efficiency of maintaining the aircraft database.

3.3.2 To mitigate the recurring trend of **human errors** and erroneous data input, operators could issue reminders and safety notices to maintain a high level of vigilance of their employees to the importance of the accuracy of AD filed in the flight plans. Alongside regular reminders and safety notices, operators could implement comprehensive training programs to address human errors and improve data input accuracy.

3.3.3 **Aircraft defects** could be tackled by timely maintenance of the defective part(s) in the mode S transponder system to prevent problematic data from being transmitted.

4. COORDINATION BETWEEN REGULATOR AND AIR OPERATOR

4.1 COORDINATION ISSUE

4.1.1 It is of great importance to work with the regulators and air operators to rectify the ID/AD discrepancy issues. There are a number of issues with the coordination:

- The time delay between an event and the regulator not being able to contact the operator, especially those domiciled overseas;
- Inadequate details on the operator, particularly for non-scheduled international traffic;
- The ability of the overseas operator’s regulator to action requests from another country;
- Lack of feedback from the regulator and/or operator.

4.1.2 To rectify the coordination issue, it is essential to strengthen international cooperation between regulatory authorities and operators to promote a

coordinated approach, ensuring the root cause is identified and the issue is addressed in a timely and comprehensive manner.

4.2 REPORTING AND FEEDBACK

4.2.1 A reporting-and-feedback mechanism should be in place to allow ATC to alert flight crews, and ANSP to advise the air operators and/or regulatory authority of an issue, allowing them to remedy the issue.

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