International Civil Aviation Organization

Third Meeting of the Asia/Pacific Air Traffic Management Automation System Task Force (APAC ATMAS TF/3)

Video Tele-Conference, 8– 10 June 2022

Agenda Item 2: Review of Outcomes of Relevant Meetings

OUTCOMES OF THE SEVENTH MEETING OF THE SURVEILLANCE IMPLEMENTATION COORDINATION GROUP (SURICG/7)

(Presented by Secretariat)

SUMMARY

This paper presents the outcomes of the Seventh Meeting of the Surveillance Implementation Coordination Group (SURICG/7) for information and action.

1. INTRODUCTION

1.1 The Seventh Meeting of the Surveillance Implementation Coordination Group (SURICG/7) was held from 24 to 27 May 2022 via video teleconference. The meeting was attended by 117 participants from 21 States/Administrations, 4 International Organizations and 2 service providers from industry (IATA, ICCAIA, IFATCA, RTCA, CDATC and PCCW Global). The SURICG/7 meeting considered 12 working papers, 17 information papers and 1 presentation and endorsed three (3) Draft Conclusions for consideration and endorsement in CNS SG/26, and adopted one (1) Decision. The meeting report, working papers, information papers and other resources can be accessed at https://www.icao.int/APAC/Meetings/Pages/2022-SURICG-7.aspx.

1.2 SURICG/7 reviewed the report of the Fifth Meeting of Mode S Downlinked Aircraft Parameters Working Group (DAPs WG/5) which was held from 23 to 25 March 2022 via video Tele-conference. DAPS WG/5, together with the APAC Regional Workshop on Mode S Implementation held on 22 March 2022 before the meeting, was attended by 114 participants from 18 States/Administration and 2 International Organizations. The DAPs WG/5 meeting report, working papers, information papers, and other resources can be accessed at https://www.icao.int/APAC/Meetings/Pages/2022-Mode-S-DAPs-WG5.aspx .

1.3 SURICG/7 also reviewed the report of the Second Meeting of the Surveillance Study Group (SURSG/2) which was held from 15 to 17 March 2022 held via video tele-conference. The meeting was attended by 97 participants from 16 States/Administration, 2 International Organizations and 1 industry partner. The SURSG/2 meeting report, working papers, information papers, and other resources can be accessed at https://www.icao.int/APAC/Meetings/Pages/2022-SURSG2.aspx .

1.4 This paper summarized relevant information and updates from the meeting.

2. DISCUSSION

2.1. The summary of discussion in the meeting is given in following paragraphs.

Outcome of Relevant Meetings on Surveillance (WP/02)

2.2. The meeting reviewed relevant information and updates on Surveillance and related matters arising from SURICG/6, CNS SG/25 an APANPIRG/32.

2.3. The meeting noted the discussion during CNS SG/25 on points of contact for CNS for timely, effective, and efficient response from States/Administration, which was important in addressing CNS-related operational deficiencies notified to the Regional Office. The meeting supported the suggestion from the ICAO Secretariat on the need for DAPs WG to set up the list of Points of Contact for Mode S matters, such as the Mode S Interrogator Identifier (II)/ Surveillance Identifier (SI) code coordination.

2.4. The SURICG Co-Chair suggested that States to present surveillance related implementation matter in SURICG or its contributory bodies meetings first before considering to present in higher level meetings such as CNS SG / APANPIRG.

Review Report of Mode S DAPs WG/5 (WP/03)

APAC Regional Workshop on Mode S Implementation

2.5. The Workshop organized in conjunction with the Mode S DAPs WG/5 was moderated by Mr Ho Wee Sin, Co-Chair of Mode S DAPs WG, and presented by Mr Chen Yang (Isaac), an experienced radar engineer who was recommended by the Air Traffic Management Bureau (ATMB) of Civil Aviation Administration of China (CAAC). Mr Robert Witzen supported the presentation. The Workshop discussed various topics under Mode S operations and know-how of flight inspection to a Mode S Radar, and the introduction of APAC's proposed modifications to Appendices H and J of Doc 9924 to facilitate the implementation of Mode S.

Update on Interregional IC Coordination

2.6. The latest updates about the procedures on Interrogator Codes (IC) interregional coordination were discussed at a virtual meeting organized for technical officer CNS, ANB, and all ICAO Regional Officers CNS on 20 January 2022 to review and understand procedures established for SSR IC code assignment and Inter-regional coordination mechanism. This 20 January 2022 meeting reviewed the relevant documents for SSR IC code assignment and inter-regional coordination mechanism including excerpts from Annex 10 Volume 4 and Doc. 9924; an example of coordination conducted by APAC Region; a presentation on the coordination using SSR Module of the Frequency Finder tool and its future improvements; and a secretariat paper on International and inter-regional coordination of Mode S II and SI codes, and the outcome of this discussion was summarized into a draft procedure.

Guidance Material for Assignment of Interrogator Codes (IC) for MLAT and ADS-B

2.7. During Mode S DAPs WG/2, it was discussed whether interrogators that come with ADS-B need to be assigned with a distinct IC. Current practices suggested that II=0 can be used. However, the existing provisions in ICAO documents are not clear to the reader and can be confusing. The Surveillance Panel Aeronautical Surveillance Working Group is working on revising the text in the SARPS and guidance material. The paper provided the updates on the proposed amendments to Annex 10 Vol IV and ICAO Doc 9924 Appendix M which have been endorsed by the Technical Sub-group in Feb 2022. It will be further discussed at the Aeronautical Surveillance Working Group in Apr 2022 and

subsequent meetings before its formal adoption.

Reservation of IC Codes for Research and Military

2.8. The feasibility for the APAC Region to adopt the practice of reserving II code 14 for testing, research, and development of Mode S Radar and II 15 for military deployable and shipborne radar was discussed, and the practices in Europe and Australia were referenced in the meeting. An initial study was conducted on current situation in APAC and showed that not all current Mode S radars that are on II 14 and II 15 can be re-allocated to other codes in the II range 1-13 to ensure code uniqueness. Considering States are modernising with Mode S radars, APAC is in the direction of migrating from II to SI code to create capacity for more Mode S radars. An Action Item was recorded to decide when a significant number of radars migrated from II to Surveillance Identifier (SI) codes with ICAO APAC Office to make a conscious effort to avoid allocating II 14 and 15 (and the matching SI codes) to new radars unless due to capacity issue.

Options for Vacating the SSR Mode S II Codes 14 and 15 in the APAC Region

2.9. This paper provided the detailed analysis conducted by ICAO Mr Robert Witzen on the feasibility to replace the existing II codes 14 and 15 with the other codes within the range 1 to 13 using SSR II code module in Frequency Finder tool. Outcome of the study showed that it was not possible to replace all the existing II code 15 in the APAC Region, and in geographical area around Japan and Malaysia, the option of using alternative II codes is very limited and the alternative codes may be needed for additional Mode S II code assignment. For II Code 14 there were three (out of 15) current assignments to II code 14 that have no alternative II codes that are fully compatible with the planning criteria for SSR Mode S II codes. States were invited to provide necessary radar information to ICAO APAC Regional Office for II/SI code coordination.

Update on Mode S IC Code Module in Frequency Finder

2.10. The latest enhancements and functionalities brought to the SSR module of the Frequency Finder tool to assist ICAO Regional Offices and States to manage and coordinate SSR Mode S II/SI codes were presented. With the need for APAC Region to introduce SI code was identified, relevant change proposals to DOC 9924 are being reviewed in Surveillance Panel and these changes will be reflected in the Mode S IC Code Module to assess the compatibility of both Mode S II and SI Codes. The updated Frequency Finder tool is being tested by ICAO Head Quarters and APAC Regional Office and will be released in 2022. A demo was presented by Mr Robert Witzen in the meeting to show the interface and functions for updated Mode S IC Code Module. The meeting was invited to make extensive usage of the updated module, and provide feedback such as usage, suggestions, bugs and recommendations on the updated Frequency Finder tool.

An Abnormal Problem of CPR Decoding caused by the Incorrect Air-ground State of an Aircraft in China

2.11. China introduced an abnormal Compact Position Reporting (CPR) decoding problem caused by the airborne aircraft transmitting the Surface Position state, and proposed the corresponding solution. A case of ADS-B target position jumped was analysed by decoding the DF17 message received, and concluded the source of error was due to an airborne aircraft mistakenly transmitted a Surface Position state message by comparing different fields in various messages. Optimizing methods including initialisation state CPR check and change local-decode method, with the logic of CPR message processing, were introduced in depth.

Mode S Interrogator Codes Allocation and Conflict Analyses

2.12. China shared the information about their Mode S II codes allocation principles and the related conflicts with neighbouring countries. There are 140 SSRs in service in China, with 78 of them

are Mode S radars and allocated II codes between 1-13. II code 14 and 15 are reserved for test and military respectively. Without the usage of SI codes, II codes are a shortage in the eastern coastal areas in China. Therefore, interrogation strategies of all-call lockout override protocol, roll-call non-lockout, or intermittent lockout commands have been set to radars with overlapping coverage. To solve the II codes shortage issues effectively, China centralised allocation of II codes, analysed conflict of code allocation inside China and with neighbouring countries. China recommended the release of II 14 for civilian radars and reserve II code 15 for both testing and military purposes. China actively supports ICAO APAC as the centre for the distribution and coordination of II codes in the APAC region. China will also further confirm the issue of II code conflicts with neighbouring countries and apply to ICAO APAC for coordination.

Progress on the Trials of Mode S Surveillance Co-ordination Network in China

2.13. China informed DAPs WG/5 about the implementation background and progress of the trials on Surveillance Co-ordination Network (SCN) of the Mode S secondary radar in China. Based on results, China plans to formulate guidelines to regulate the SCN structure, operation mode, and corresponding interface. The trial of SCN implemented surveillance co-ordination functions (SCF) such as target information sharing, track fusion, and smoothing among multiple radars, thereby improving the quality of target detection in a specific area. The implementation of SCN could solve the problem of insufficient II code; alleviate 1090MHz spectrum occupancy; and overcome defects by a single radar source. The Mode S SCN trials in China are carried out in three stages which are expected to complete by end of 2022.

Upper Air Wind Speed Estimation based on Mode S SSR DAPs

2.14. China introduced the research for upper air wind speed estimation based on Mode S SSR DAPs and discussed the issue of airborne magnetic deviation from DAPs. Wind speed estimation includes completed part of aircraft observed wind speed estimation and its verification; and the regional wind speed estimation is in progress and further results verification required. The paper explained the estimation progress and the data used in detail. Observing the data of aircrafts on the runway, certain error was observed for magnetic deviation. The paper introduced how they worked around with the issue in their estimation.

Suggestions of Performance Parameters and Benchmarking of Radar System for APAC Region

2.15. China presented a brief overview of the radar performance parameters included in the Guidance Material on Surveillance Technology Comparison (GMST) and Doc 8071 Vol 3, and proposed some suggestions for the related study of the radar performance parameters study group. General surveillance system performance parameters, issues to be considered and recommended performance parameters are summarized. The paper recommended to study the radar performance parameters based on the GMST and Doc 8071 Vol3, and develop corresponding standard software for the test and analysis of the above parameters according to the research results. China was suggested to consider taking lead in the ad-hoc group for responding in a WP in SURICG/7. While EUROCONTROL Specification for ATM Surveillance System Performance (Volume 1) Edition 1.1 issued in September 2015 was suggested for additional reference, some commented that this document could be too complex to refer to and it lacked the necessary measurement on performance.

SI Operation Plan at Incheon Airport

2.16. ROK reported their 15-day trial of using SI code in Incheon Airport, and their future plan to adapt Mode S SI operation at the Incheon airport to expand Mode S IC availability. The paper reported that the target detection performance of SI code was same with II code, and provided update information about the SI operation at Incheon airport, including a summary of SI operation test results

from DAPS WG/4 IP/07. The paper suggested that SI flag must not be used to decide the capability of SI/II at transponders. The radar issues lock-out command to SI capable transponder leaving non-SI capable transponder to reply to all-calls. Incheon airport is planning to install a third PSR/MSSR by 2023, which will use SI code as all II code already allocated in Republic of Korea. Considering a reduced number and types of aircraft being flown during the pandemic, ROK agreed for a more thorough test could better warrant the performance of SI operations.

A GPS Interference Identification Method based on ADS-B Data

2.17. China introduced a GPS interference source identification and screening method in civil aviation operations. Using the changes of aircraft ADS-B report data, combined with the change rule of historical data when GPS was interfered and the principle of satellite navigation signal, this paper presented the construction of an index of GPS interference, which can check and locate interference area and time sensitively. By providing two examples of GPS signal interference and illustrating the change pattern in ADS-B data, it was shown that when NIC index changes due to GPS interference, ground speed and position information would also change. If only NIC changed but other indicators do not, GPS interference did not occur in most cases. Such analysis of GPS signal could be applicable to other States as the method introduced analyses ADS-B report data.

An Evaluation Example of a Non-Cooperative Method for DAPS Data Recognition

2.18. Japan introduced an evaluation result of a non-cooperative DAPs data recognition and determination method, which may enable DAPs data interception and avoid BDS swap phenomenon. As reported in previous DAPs WG meetings, a candidate solution was proposed in SURICG/6 via IP/19 by China, and ENRI evaluated the basic mechanism of the method using measurement data from our experimental SSR. The BDS code in a reply is estimated by examining agreement with the standardized message format. Some values, such as the Mach number, must be within the physical boundaries. It is noted that the original method including identification of BDS 50 and 60 by comparing with ADS-B was not conducted in the evaluation. Further improvements such as adding a new physical boundary were made in our evaluation. An experimental Mode S SSR was set up in the ENRI campus in Tokyo. BDS was estimated by using only the reply data, and the estimated result was compared with the correct BDS known from the interrogation data. Good performance of high success (estimated BDS agreed with the transmitted BDS) on BDS 20, 40, 50 and 60, showing the potential of the proposed method. Future evaluation includes other BDS such as 10, 17, 30 and performance improvement. The meeting identified that this evaluation exercise from one State independently verified the study and model done by other States, which was an example of a great collaboration.

Management of 1030/1090MHz Utilization

2.19. The utilization of the 1030/1090 MHz frequencies has greatly increased in certain areas of the world. If no action is taken, the situation will reach an unacceptable level that will result in harmful corruption or loss of information to the aeronautical surveillance and collision avoidance systems, resulting in an increase in the probability of mid-air collisions, disruption to Air Traffic Services, and a reduction in airspace efficiency. It must be ensured that the spectrum capacity is being utilized in the most efficient way to preserve the performance of current systems and to consider future applications that require an increase in capacity. The Surveillance Panel therefore established the Surveillance Spectrum Focus Team (SSFT) in September 2019 to look into the overall issue of 1030/1090 MHz utilization, including the impact of evolving systems that will potentially share the 1030/1090 MHz link contributing to the spectrum load. It also covers examining techniques and capabilities that could be considered to reduce 1030/1090 MHz congestion. The SSFT will develop specific solutions, which can be transferred into Proposals for Amendment for Annex 10 Volume IV or change proposals for ICAO Manuals. A list of identified issues related to 1030/1090 MHz spectrum load and possible mitigations is provided in Annex A to the paper. Information on affected ICAO documents and specific aspects like regulations and already available standards were also provided. All material is considered as a basis to

formulate appropriate text for ICAO SARPs and guidance material.

Roadmap on Mode S Implementation for APAC Region

2.20. The ICAO Secretariat summarised the history of the Roadmap on Mode S implementation for APAC Region and proposed the future work on it for information and attention by the meeting. Being one of the key deliverables since established, this Working Group has continued its effort and the Roadmap was adopted as Conclusion **APANPIRG/32/10 (CNS SG/25/09) - The APAC Regional Roadmap for Mode S Implementation**. The adopted Roadmap was circulated through State Letter with ref: T 8/5.11-AP200/21 (CNS), Subject: Mode S Implementation in APAC Region, dated 22 December 2021. The meeting was informed that the Roadmap is a regional planning reference to provide certainty to stakeholders in the near term, while as a living document which is subject to change with the revision of APAC Surveillance Strategy and the new relevant outcome from Assembly 41st Session.

Planning Criteria for II/SI Code Assignment

2.21. The ICAO Secretariat presented the planning criteria for the coordination and planning of SSR Mode S II/SI codes, which was in line with the modifications to the Aeronautical Surveillance Manual (Doc. 9924) which was coordinated by the APAC Team and approved by the Technical Sub Group of the Surveillance Panel (SP/TSG). The paper introduced an initial Mode S II/SI code assignment planning based on the need to accommodate transponders, and the consideration of II/SI Code assignment planning criteria under different combinations of these criteria, which are further summarized in the table for ease of reference for the planning of Mode S II/SI code by States. The meeting thanked Mr Robert Witzen for his dedicated effort in summarising all the necessary requirements for consideration by States into this concise and precise paper.

Updates to the Mode S DAPs Implementation and Operations Guidance Document

2.22. China proposed the revised draft of Edition 4.0 of the Mode S DAPs Implementation and Operations Guidance Document, developed based on the adopted edition 3.0. The revised draft supplemented the guidance material of ADS-B DAPs, including:

- Introduce ADS-B DAPs and their benefits
- Describe ADS-B DAPs data and the differences between Mode S SSR DAPs and ADS-B DAPs
- Supplement the mandate of implementing ADS-B DAPs, and the Mode S extended squitter transponder capability to broadcast ADS-B DAPs
- Add a new section to describe ADS-B DAPs broadcast by Mode S extended squitter
- Insert the application of ADS-B DAPs in the ATM automation system
- Give one example of ADS-B DAPs application

2.23. Other amendments included the revision of the description of the use of Mode S DAPs data for the weather forecast, the addition of a new appendix about guidance on measurement of 1030/1090 MHz usage. Upon review and discussion, SURICG/7 endorsed the updates to the IGD as in the following Draft Conclusion for further consideration CNS SG/26:

Draft Conclusion SURICG/7/1 (DAPs WG/5/1): Mode S DAPs IGD 4.0	
What: The Mode S DAPs Implementation and Operation Guidance Document Edition 4.0 provided in Appendix A to the Report be adopted	Expected impact: ☐ Political / Global ☐ Inter-regional ☐ Economic

	☐ Environmental ☒ Ops/Technical
Why: The revised draft includes ADS-B DAPs and adds guidance on the measurement of 1030/1090 MHz usage.	Follow-up: ☒Required from States
When: 19-Aug-22	Status: Draft to be adopted by Subgroup
Who: ☒Sub groups ☐APAC States ☐ICAO APAC RO ☐ICAO HQ ☐Other: -	

Review of Terms of Reference

2.24. SURICG/7 reviewed and deliberated the proposal from DAPs Working Group to rename the Group and update its Terms of Reference (ToR) to better reflect the current work scope that covers 0not only DAPs but also Mode S radars. After deliberation, SURICG/7 considered it appropriate to rename the Group as "Mode S and DAPs Working Group", and the relevant contents of the ToR were updated accordingly, provided in **Appendix A to this paper**, and endorsed in the following Decision:

Decision SURICG/7/2 (DAPs WG/5/2): Revised ToR of the Mode S and DAPs Working Group	
That, the Revised Terms of Reference of the **Mode S and DAPs Working Group** provided in Appendix B to the Report be adopted.	Expected impact: ☐ Political /Global ☐ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical
Why: SURICG/6 suggested that DAPs Working Group be renamed, and its Terms of Reference be amended to better reflect the current work scope that covers not only DAPs but also Mode S radars.	Follow-up: ☐ Required from States
When: 19-May-22	Status: Adopted by SURICG
Who: ☐ Sub groups ☐ APAC States ☐ICAO APAC RO ☐ICAO HQ ☐APANPIRG ☐ Other: -	

Clarification of II/SI Code Allocation in Doc 9924 Appendices H and J (IP/03)

2.25. China, Singapore and the ICAO Secretariat shared the current proposals for amending the Aeronautical Surveillance Manual (Doc. 9924) Appendix H and J. Amendments in Appendix H will clarify the steps that can be taken to secure a safe introduction of Mode S II/SI capable interrogators and transponders with the focus on an environment where both Mode S II only and Mode S II/SI capable systems are being introduced. Amendments in Appendix J will update the Mode S II code assignment planning with Mode S SI code and provide for compatibility with Mode S interrogators and transponders that are not Mode S SI capable. Enhancement of the material would help States and regions migrate from II to SI under a mixed environment. They are proposed to clarify and elaborate the acquisition and detection of Mode S II-only (non-SI capable) transponders by Mode S II/SI capable interrogators as well as the acquisition and detection of Mode S II/SI capable transponders by Mode S II-only interrogators as currently described in paragraphs 1.2.5 – 1.2.11 of Appendix H to the Aeronautical Surveillance Manual (Doc. 9924); and introduce the planning criteria in Appendix J for co-existence of II and SI codes under the environment where there are non-SI capable transponders still in operations. Following the discussion at the Aeronautical Surveillance Working Group in Apr 2022, EUROCONTROL proposed improvements to the document. The meeting reviewed the latest proposal provided in Annex A of the paper. The proposed text was still being worked out, and SP Chair commented that the enhancement work could be completed by SP/5 in Fall 2023.

Review Report of the Second Meeting of the Surveillance Study Group (SURSG/2) (WP/04)

Surveillance Study Group: Progress Report, Recommendations in Study Report on surveillance sharing, and moving forward

2.26. SURSG/2 provided a progress summary of SURSG tasks since SURSG/1, lists out major recommendations in the Study Report and proposed way forwards for the recommendations for members' discussion and decisions. The list of tasks, volunteer task leads, and members along with latest status, was provided by Table 1 "Progress of SURSG Tasks in Feasibility Study Stage" in the paper. The Study Report on Surveillance Sharing was prepared following the framework set out in the task list, which the report was provided in Appendix A to the paper. A list of the high-level recommendations extracted from the Study Report is provided in Table 1 "High-level Recommendations from Study Report" in the paper. SURSG/2 reviewed and deliberated the recommendations and moving forward proposals provided in the Table. The details of revised high-level recommendation and moving forward agreed by SURSG/2 was given in the paper.

2.27. SURSG/2 deliberated the necessity for establishment of the Surveillance Sharing in SWIM Trial Implementation Group (S3TIG) to oversee such a trial proposed by the recommendation. China, Hong Kong China, IATA, Singapore, and Thailand seconded the proposal, with PCCWG also indicated its interest in participating in the trial. SURSG/2 agreed for PCCWG to participate in the trial and accepted that the recommendations agreed upon would be tabled for SWIM TF/6 and SURICG/7 endorsement. Draft ToR of S3TIG was prepared in mid-April 2022 offline and it was agreed that the draft ToR would be revised based on comments from the SURSG/2 delegates and it would be presented to SURICG/7 for endorsement along with the proposal to endorse formation of S3TIG. SWIM TF/6 was invited to review the ToR and support the establishment of S3TIG as an ad-hoc group, and participate in S3TIG. As per SURSG ToR, outcome of its meetings shall be reported to and sought endorsement from the SURICG, the proposal for establishment of S3TIG shall be further discussed in SURICG/7. SWIM TF/6 supported the need for establishment of S3TIG.

2.28. SURICG/7 discussed the proposal for establishment of S3TIG. The meeting noted that the S3TIG proposal was raised in SURSG/2 meeting and ToR was drafted offline in April 2022 so that the group can start working as soon as possible. Therefore, it would be more effective to form S3TIG as an ad-hoc group within SURSG in lieu of a contributory body under SURSG. As S3TIG members includes the members from SWIM TF, it would not be an issue even not getting consensus for adding SWIM TF in reporting channel of S3TIG in SWIM TF/6. The meeting considered there is no need for endorsement of a separate ToR of S3TIG in SURICG, as S3TIG will be working as an ad-hoc group within the ToR of SURSG. The meeting suggested to add ATFM SG into Liaison bodies in S3TIG and requested to add drafting and proposing surveillance data exchange model in the task list of S3TIG ad-hoc group. In addition, in SURICG/7, enquiries were raised on the difference between the adopted values of service level of shared data for Tiers 1 and 2 in the SURSG outcome and those specified in the AIGD. The Study group adopted the specifications from the AIGD v13.0, therefore, the abovementioned specification should be discussed and further reviewed. The meeting agreed to further discuss this matter.

Surveillance Data Sharing Proof of Concept

2.29. The paper introduced the Surveillance Data Sharing Proof of Concept (POC) conducted by HKCAD, PCCWG and Frequentis ComSoft. PCCWG shared the outcomes of a POC conducted on 4 March 2022, which was the collaboration of HKCAD, PCCWG and partner Frequentis ComSoft to demonstrate sharing ADS-B data in a simulated SWIM over CRV environment and the benefits of a Surveillance Central Data Processor (SCDP). The POC focused on ADS-B Asterix CAT21 ver2.1 data sharing and AMQP 1.0 was used for EMS-to-EMS communication and introduced 3 different scenarios. PCCWG further shared and compared the three scenarios in detail in the paper, including Scenario 1-

Direct surveillance data sharing through SWIM registry Publish and Subscribe mechanism, Scenario 2 - Surveillance data sharing through SCDP, and Scenario 3 - Tailor-made services by SCDP. Furthermore, PCCWG summarized the benefits of SCDP with SWIM over CRV in the POC demonstration. The benefits include (i) eliminating potential bottlenecks of the data contributor and consequently the efforts of trouble shooting; (ii) promoting the service of the data contributor in the centralized Service Registry listing; (iii) enabling Data Consumer without SWIM capability to contribute and receive surveillance data; (iv) minimizing the dilemma and concerns of commitment of a data contributor; (v) offering tailor-made services to interested parties; and (vi) expediting the surveillance data sharing enablement by Tailor-made services. PCCWG prepared a video to introduce the POC exercise which was presented in SURICG/7.

Implementation of FF-ICE Interoperability using GUFI in SWIM

2.30. ROK presented its efforts to Implement FF-ICE Interoperability using Globally Unique Flight Identifier (GUFI) in SWIM Environment. ROK has been researching to find a way to improve the usage of surveillance data in SWIM by introducing the GUFI to the surveillance data which enables intuitive and unambiguous association surveillance data with FPL without inconsistency and redundancy. Since 2016, for ROK SWIM R&D, KAC developed mediation services and information services related on FPL and Surveillance Messaging/Web Services. By introduction of GUFI to the surveillance data, it not only solved mismatch problems on co-relation between FPL and surveillance data by Call sign, DoF, departure/arrival aerodrome, but also made the co-relation become simple and reliable. Additionally, ROK shared the detailed method of introducing the GUFI in the surveillance information domain.

ATS Surveillance and Direct Controller and Pilot Communication VHF Coverage Charts for APAC Region (WP/05)

2.31. The work and progress of updating the coverage charts of ATS Surveillance and Direct Controller and Pilot Communication (DCPC) for APAC Region were discussed and expected to be incorporated in the next update of the APAC Seamless ANS Plan. The ICAO APAC Regional Office has issued the State Letter AP027/22 (CNS) in February 2022 for States/Administrations to respond to the survey. As of mid-May 2022, ICAO APAC Regional Office received replies from 13 States/Administrations to the survey. With the great assistance by Thailand/AEROTHAI, data received were being validated for correctness and the work was in progress. Coverage charts on DCPC and surveillance will be produced and expected to discuss in CNS SG/26 meeting in August 2022, and subsequently, be included in the next update of the APAC Seamless ANS Plan. SURICG/7 noted that the work is essential for the APAC Region to produce the overall pictures of ATS surveillance and DCPC VHF coverage, especially in the areas and regions identified in the APAC Seamless ANS Plan, to identify any gaps in coverage thus formulating improvement plans in reducing such gaps, and States which have not yet responded to the survey were invited to contribute by replying the State Letter.

Review of Regional Requirements for Surveillance in APAC e-ANP and Seamless ANS Plan (WP/06)

2.32. The ICAO Secretariat reviewed and consolidated the Regional surveillance requirements specified in the APAC Regional e-ANP and the Seamless ANS Plan (Version 3.0, November 2019). The paper introduced the nature of all three volumes in APAC Regional e-ANP, listed out the surveillance-related content in e-ANP, and provided updates on the current status of e-ANP. States are encouraged to review TABLE CNS II-APAC-3 SURVEILLANCE in the Specific Regional Requirements in e-ANP Volume II, and provide update to ICAO APAC Regional Office as necessary through the PfA Process mentioned in the paper. The meeting noted the Surveillance-related components in the Asia/Pacific Seamless ANS Plan version 3.0, which would be reviewed in the Second Half of 2022.

1090MHz Occupancy Monitoring (WP/07)

2.33. Singapore and ICCAIA discussed in this paper on the need to measure 1090MHz channel occupancy at flight levels as well as at ground level, and proposed some congestion mitigations. Congestion in the 1090MHz band could be driven by various factors and initiated by different sources e.g. non-legal interferences, and it also depends on the numbers of interrogators and their interrogation rates and power, numbers of aircraft, site monitors, ground vehicles and other transmitters. The impact of high channel occupancy is collision and consequential corruption of messages, which can result in reduced detection probability for both ground systems as well as ACAS, ADS-B IN and Space-based ADS-B. The paper suggested that congestion seen by receivers depends on "coverage volume", as the proper operation of the aviation system overall requires both terrestrial and airborne receivers to operate correctly. Various methodologies to avoid/reduce channel congestion at 1090Mhz were discussed and provided in the paper. States were encouraged to 1090 MHz channel occupancy monitoring at operating Flight levels and at ground level, and to always seek to minimise 1090MHz channel occupancy commensurate with their operational needs and environment. The meeting agreed to extract suitable contents from the paper into the AIGD for providing guidance materials for 1090Mz congestion measurement and mitigating measures.

The Sharing of the Software Resource for Benchmarking Radars (WP/09)

2.34. To address the need to access the radar performance among APAC ANSPs for the maintenance and the evaluation purpose, this paper proposed that each member states share the relevant radar analysis software for the radar benchmark. ROK introduced their radar analysis software "Astecat" developed by Incheon International Airport as one of the cost-free software tools for benchmarking radar performance that is openly shared for APAC States to use with no warranty and minimum maintenance support. The paper introduced the details of benchmarking of their surveillance systems, and their use of software in evaluating SI operation tests in Incheon International Airport. ROK was invited to provide their point of contact to ICAO on sharing their software.

Inconsistent ICAO Aircraft Address and Target Identification between Surveillance Data and Flight Plan (WP/10)

2.35. SURICG/7 noted of the update on the observed discrepancies and contributing factors of ICAO Aircraft Address and Target Identification between surveillance data and flight plans for some aircraft flying within the Hong Kong Flight Information Region (HKFIR). Despite Conclusion CNS SG/25/13 (SURICG/6/7) endorsed to urge States/Administrations to proactively follow up with air operators to address discrepancies, the problems still persist and improvement in the overall situation has not been seen. Detailed analysis of the causal factors contributing to "Aircraft Address" (AD) / "Target Identification" (ID) discrepancies were provided in the paper and discussed in the meeting. The paper further discussed the remedial and preventive measures taken by Hong Kong China to mitigate the impact on operation caused by the recurring discrepancies. IATA appreciated the effort by Hong Kong China and agreed to continue their effort to communicate with airlines for any ANSPs that encounter such discrepancies by copying to IATA when following up with airline operators. The meeting further suggested three action items: (i) Hong Kong China to consider submitting a Working Paper to RASG-APAC to facilitate discussion of the issue with the aviation flight safety community; (ii) A workshop to be organized with Hong Kong China, IATA and ICAO to educate stakeholders and the aviation community, as well as the exploration of follow-up procedure with proper points of contact; and (iii) Hong Kong China to redress this paper into a guidance document and ICAO to issue State Letter to communicate with the APAC Region.

Suggestions of Performance Parameters of Radar System and Relevant Test Methods for APAC Region (WP/12)

2.36. China presented a minimal set of performance parameters that can effectively evaluate radar systems as the follow-up on ACTION ITEM 6-4 of SURICG/6 that an ad-hoc group was formed to study performance specifications and benchmarking of radar for APAC Region. China updated the

minimal set of performance parameters from last paper WP10 in DAPs WG/5 with the continued research on these documents, and provided the updated two minimal sets of radar performance parameters before and after updates with relevant test methods in the paper. Parameters to consider including Probability of Detection (PD), Valid Mode A/C Detection Rate, False Target Rate, Accuracy, Processing Delay, and PSR/SSR Combination Rate were discussed in detail with specific test methods given in the Appendix of the paper. Considering it an interesting paper that could benefit the Region, and China's courtesy to share their research work documents with SURICG, the meeting agreed to include these useful information in this paper into a guidance document for the Region. The ad-hoc group established for ACTION ITEM 6-4 could carry on the discussion on generating the proposed guidance document.

ADS-B Equipage and Quality Performance in the U.S. (IP/05)

2.37. FAA provided a summary of observed NIC/NACp performance compared to the requirements of the USA ADS B mandate, as well as ADS-B equipage trends in the USA. It was informed that during the two-year reporting period ending 9 April 2022, the NIC and NACp results are relatively consistent with NIC <7 ranges between 0.0438% and 0.2398%, and NACp <8 ranges between 0.0050% to 0.0188% in each of 2-month monitoring periods. FAA informed that NIC >=7 and NACp >=8 are ranges which the ADS-B position qualities meet the requirements for ATC use to support 3nm or closer separation minima. The paper demonstrated how the performance benchmarking from airlines fleet were performed. FAA added that FAA's ADS-B Performance Monitor (APM) has capabilities for tracking ADS-B equipage trends, including ADS-B versions and the link type of aircraft (1090ES, UAT or DUAL). The meeting discussed the figures presented in the paper, the way to improve ADS-B coverage for low levels and gap area with complementary technologies such as WAM and radars with ADS-B, the challenges on the use of UAT with DME using same frequency, as well as the concerns on using Dual-Out ADS-B data broadcasting on both 1090 and 978MHz/UAT. The paper further provided the FAA ADS-B coverage map at FL350, which extends somewhat beyond the airspace of U.S. ADS-B mandate. FAA clarified that the figures presented in this paper were from the monitoring of mandate data in all airspace.

Recent ADS-B Avionics Issues Observed in the United States (IP/07)

2.38. FAA described two recent ADS-B avionics issues observed in the USA with DO-260B/ED-102A systems, namely Embraer 17x track jumping and Honeywell Primus II RCZ. FAA informed that it monitors all ADS-B Version 2 information received in all airspace covered by FAA-contracted ADS-B ground stations via a tool called the ADS-B Performance Monitor (APM). FAA described the issue of early 2018 related to ADS-B "track" jumping by an Embraer 175 regional jet equipped with Honeywell Version 2 transponders and similar issue in October 2016 with a SkyWest E175. Details of issues and actions taken by FAA were provided in the paper. FAA mentioned the latest revision of the SB and SIL for Honeywell issue was referenced in the Safety Airworthiness Information Bulletin (SAIB) AIR-21-15 R1 issued by the FAA on 16 September 2021. The SAIB will bring further awareness to the problem, its impacts, and inform the aviation community of the resolutions available to ensure aircraft compliance when operating in ADS-B required airspace. In addition, FAA Flight Standards personnel have begun a campaign to reach out to aircraft owners, operators, and certificate holders that operate this equipment to inform them of the Service Bulletin available to correct the issue.

Performance-Based Operations Aviation Rulemaking Committee (PARC) Action Team (AT) Exemption 12555 Report (IP/08)

2.39. FAA presented the report by the Performance-based Operations Aviation Rulemaking Committee (PARC) to the FAA that contained an assessment of how well operators (exemption holders) will be able to achieve planned position source upgrades prior to the expiration of Exemption No. 12555 by December 31, 2024. The meeting was informed that the Exemption was published in 2015 to permit exempted operators to continue using Global Positioning System (GPS) position sources that may not always meet the integrity and accuracy requirements of FAA and one of the conditions of the

Exemptions was that each operator must create, maintain, and update a GPS position source equipage plan for aircraft equipped for ADS-B Out. It was explained that the report included assessments to different factors related to the exemption and certain recommendations made by the Action Team, which have been submitted to FAA for their review and evaluation. In response to a recommendation by PARC Action Team, FAA published a Notice in the Federal Register, available at https://www.federalregister.gov/d/2022-09936, which announces revisions to the FAA's policy on performance requirements for aircraft with ADS-B Out equipment using the Selective Availability (SA)-Aware GPS receivers in ADS-B rule airspace. The FAA no longer expects operators of aircraft with this equipment to perform a preflight availability prediction before operating in ADS-B rule airspace, with details of requirements and applicability of this policy given in the paper.

Study on Application Optimization and Improvement of ADS-B technology for CAAC Air Traffic Control (IP/11)

2.40. China introduced the outcomes of the ADS-B application study carried out by ATMB CAAC between 2020 and 2021, which stemmed from issues that affected the quality of ATC surveillance for the National ADS-B Project. This study was dedicated to standardising the construction and operation of ADS-B ground equipment in China, making them in better accordance with the needs of ADS-B operation in China. The study identified issues in three aspects, including data outputting of ground stations, data pre-processing of the data centres, and application of ATM automation systems, with details of the issues and corresponding solutions given in the paper. With the adjustment contents including the data output rules of ADS-B ground stations, the enhanced pre-processing of abnormal ADS-B data by the data processing centres, and upgraded fusion algorithm and couple functions by ATM automation systems, the experimental results showed that the study conclusions are reasonable, the issues could be well resolved by those adjustments and the fusion performance of ADS-B and radar data improved.

An Anomaly of Mode A/C only Transponder Reply to Mode S Interrogation (IP/12)

2.41. China introduced a case where an aircraft equipped with the Mode A/C only transponder generated false targets in response to Mode S radar interrogation in January 2022, and explained how they analysed the causation of the phenomenon in combination with the relevant ICAO Annex 10 specifications, and provides some suggestions for Mode S radar manufacturers and aircraft maintenance engineers. The paper described the symptom observed with the detailed procedure of analysis. The paper recommended that radar manufacturers to measure the pulse amplitude of P6 or choose other phase inversion implementation methods before leaving the factory, and the aircraft maintenance personnel regularly test the Mode A/C-only transponder to ensure the effectiveness of the 3.1.1.7.4 SUPPRESSION function in "ICAO Annex 10 Volume IV". Australia shared that they have also experienced a similar issue in 2015 and by increasing the tolerance of pulse width from the radar, thus reducing the instances of false targets.

ADS-B IN Retrofit Spacing (AIRS) Evaluation Project (IP/06)

2.42. United States presented the updates to the ADS-B In Retrofit Spacing (AIRS) evaluation project after the introduction in SURICG/6 IP/08, a large-scale operational evaluation of two ADS-B In applications since September 2017, namely Cockpit Display of Traffic Information (CDTI)-Assisted Visual Separation (CAVS) and Interval Management (IM). It was informed that the project aimed to promote early adoption of ADS-B In applications and benefits data will be gathered for one year after operation commenced. Details of equipage and trials were explained. It was added that FAA and AAL are also planning to conduct an operational trial using CAVS avionics functionality in ceiling and visibility conditions that would not currently qualify for "pilot-applied visual separation" in the USA, which is referred as "CDTI-Assisted Separation" (CAS). These operational trial are tentatively expected to commence in Fall 2022 for equipped AAL A321 aircraft and data will be gathered for one year after operations commence as well. FAA commented that some time taken on building up and certifying necessary equipment, the installation on airplane started only in January 2020 before the pandemic.

Update on Air Traffic Control Surveillance Activities in Australia (IP/09)

2.43. Australia presented updates on their ATC surveillance activities. Nine new radars with both Primary and Mode S Secondary capabilities will be in operation by 2025 and surveillance data will be shared with Airservices Australia for civil use with a plan to migrate data transport from dedicated serial lines to an IP based network over the next 1 to 2 years. Additionally, WAM systems, which are expected to end their operational life by 2025/6, are not planned for replacement and more reliance will be placed on ADS-B, with parallel runway operation in Sydney under review that might place less reliance on WAM in Sydney. For A-SMGCS, Sydney is in the process of upgrading the ground display system where A-SMGCS is integrated into the tower automation system and over 50 ADS-B installations will be replaced over the next 3 years. Australia informed about a trial ground surface movement situational awareness system and a work on low-cost ADS-B avionics for VFR and added that future joint Civilian/Military Australia wide ATM system will provide a "Multi Sensor" surveillance tracking function. Australia is in the implementation phase of an Integrated Drone Surveillance System (IDSS) Trial, aiming to demonstrate existing market capability in drone detection and surveillance along with associated data management, tracking and display and control systems.

Update on Surveillance Activities in New Zealand (IP/10)

2.44. New Zealand presented an overview of their current and planned surveillance activities. New Zealand's current surveillance structure is based on MSSRs, PSRs, Multilateration and ADS-B. With current MSSRs/PSRs at the end of operational life and new MSSR/PSR procurement is in progress, ADS-B, the prime surveillance system, provides countrywide coverage of controlled airspace and a significant amount of uncontrolled airspace. From Dec 31 2022, ADS-B will be mandated for use within all controlled airspace in NZZC FIR. Regulatory requirements state that ADS-B is to be backed up by a non-GNSS contingency surveillance system to cover the main trunk Jet routes. If a GNSS failure the contingency system cannot rely on GNSS for continued operation. WAM at Queenstown used for approach and en-route surveillance and MLAT at Auckland for surface movement will reach their operational life around 2024/25 and programmed for replacement, and airports other than Auckland have been using ADS-B only for enhanced situation awareness of surface movement since 2018. All data from surveillance systems migrated to IP-based network over the last few years. Since the Covid Pandemic no further work was done on trial drone surveillance system. UAS Traffic Management (UTM) system "Airshare" was in operational use since 2014, and New Zealand will continue to follow the use of low-cost ADS-B avionics such as electronic conspicuity (EC) devices. The paper also shared the other surveillance-associated projects, such as their new Air Traffic Management system "SkyX" which will be operational in Q1 2023, and a joint project between Australia and New Zealand for the introduction of a Satellite-based augmentation system called the Southern Positioning Augmentation Network (SouthPAN) to improve GNSS accuracy to be less than a metre, and down to 10 centimetres, with some initial services expected in late 2022.

The Update Activity of ATC Surveillance in China (IP/13)

2.45. China introduced their current status of civil ATC surveillance system business and the latest development, including the large number of radars which more than half are Mode S radars, the extensive use of SMRs, MLAT and ADS-B ground stations, with local, regional and national data processing centres as their hierarchal processing infrastructure. Initial operation of ADS-B based ATC operation implementation commenced since October 2019 into two phases with details provided in the paper. Besides wide deployment of Mode S Radars and ADS-B, CAAC actively carries out research on Mode S DAPs application, including BDS SWAP Recognition, DAPs based Upper Air Wind Speed Estimation, DAPs application in Safety Net of ATMAS and DAPs Extraction Strategy Research, and the development of Mode S DAPs IGD. It has launched surveys on II conflict and II/SI mix operation capabilities for the APAC Region, launched Mode S Clustering trials to evaluate its feasibility in China, and further promote Surveillance Coordination Network (SCN) trials in three stages. For A-SMGCS, 24 airports in China have installed A-SMGCS with Level-II function, and CAAC issued "The

Suggestions on Promoting Deployment and Application of A-SMGCS" which suggested all airports install Stop Bars for their importance and effectiveness, and new/reconstructed/expanded large busy multi-runway airports to equip taxiing guidance and runway status lights as Level IV requirements. The first Level IV A-SMGCS has been put into operation in Beijing Daxing Airport. The paper also presented the Development Plan for CNS approved by CAAC in 2021. Upon enquiry, China expressed that they are increasing the use of Beidou in addition to conventional GNSS means.

Introduction to the Test of the WAM Technology in the Final Approach Monitoring (IP/14)

2.46. China introduced the construction of WAM system for testing the final approach monitoring at Chengdu Shuangliu airport, and evaluated the position accuracy of the WAM data from 2020 to 2021. The system directly uses the MODE S downlink response triggered by the Mode S interrogator and the 1090 ES downlink broadcast to perform the positioning solution. The WAM test system deploys 5 receiving stations (RXU) around the runways' extension lines, use 9 receiving stations (RXU) of the airport MLAT as its supplement. The position accuracies of WAM and ADS-B are about 6-7 meters and about 20 meters respectively. WAM has high accuracy in detecting aircraft position, and could provide controllers with more accurate situation prediction, and WAM stations could be placed with good visibility on both sides of the runway extension line. The shielding and radio interference of buildings near the proposed site should be fully analysed to avoid the influence of signal reception caused by environmental factors. The selection of WAM sites is flexible and has low requirements for the electromagnetic environment, but it is necessary to consider the balance of the layout of each site in the system network. The site selection and construction need to comprehensively consider factors such as GDOP, operation and maintenance costs, and implementation difficulty.

Exploration and Practice of Electronic Handover in Complex Transfer Environment between Adjacent ATC units (IP/15)

2.47. Further to the verification and practical application of the industry standard "Civil Aviation Air Traffic Control Automation System - Part 3: Flight data exchange" (MH/T 4029.3) screen handover in SURICG/4, this paper introduced the experimental operation of electronic handover in complex transfer environment between adjacent ATC units, gives and analyses the test verification results, puts forward the follow-up measures and plans. As in preliminary work, the design of the technical solution was discussed in IP15 of APA TF/7 "Application of electronic handover technology between high level and low-level sectors". The coordination message is extended based on the open structure and extensible characteristics of MH/T 4029.3, to facilitate the rapid feedback of control intention. Safety evaluation was conducted in December 2021 in handling handover failure caused by link delay, timeout by manual operation delay, and unreasonable parameter settings. Details of experimental operation scenarios, messages and procedures, transmission link of Category C handover and Statistics of handover flight data, the test verification results, and problems observed and solution measures were discussed in the paper. Optimization of the automatic sending of Category C messages and the controller operational process in HMI of the automation system to further improve the efficiency of Category C handover in adjacent control areas.

Surface Security Enhancement Application Based on Voice and Photoelectric Intelligent Assistant (IP/16)

2.48. This paper described the exploration and application of various new technologies that China put forward the application of panoramic photoelectric video and two-way recognition technology of tower control voice, to realize the application of airport scene intelligent security enhancement. CAAC has built the intelligent surface security assistant system, which is independently operated at Shanghai Hongqiao Airport to serve basic functions including the monitoring of surface operation information, the consistency of voice information between the controller and the crew, and combining the Electronic Flight Strip information to judge the conflicted relationship between the scene and the intention, and provision of real-time warnings of aircraft crossing runway-holding position or

road-holding position, readback error, and allowed round taxi type error, as well as post-event analysis and review. The paper introduced in depth components of key technology implemented. The system is added to the traditional control and command operation system based on A-SMGCS and the tower Electronic Flight Strip, which provides auxiliary surface operation monitoring supplements and alarm function enhancement applications to improve the alarming accuracy in specific runway intrusion scenarios. The Tower ATM Automation System (Integrated Tower) will be promoted and applied in the new towers in the future to provide differentiated, efficient, and integrated interface display information for various control work positions to support the airport tower control operation.

Evaluation of Space Based ADS-B (IP/17)

2.49. This paper describes how low-cost evaluation of Space based ADS-B at customer premises was supported. ICCAIA mentioned that the space-based ADS-B provider, Aireon, has developed the capability to demonstrate and test the integration of Space based ADS-B into customer ATC automation systems. This system has been used in a number of States to allow ANSP staff to evaluate and become familiar with Space based ADS-B and its capabilities, as well as to allow specialists to convince and demonstrate the benefits. To support ANSP decision making, the provider can provide a space based ADS-B service at a very low cost, for typically a 3 months as evaluation period, using a VPN circuit over the internet as service with certain limitations presented in the paper. Evaluation of output from the trial system can be used to assess coverage and update interval, conduct initial integration to ATC automation test systems and allow ANSPs to better assess the benefits. The paper also shared the experience and the way forward to arrange such evaluation.

ICAO Surveillance Panel Activities (IP/02)

2.50. Chair of the ICAO Surveillance Panel updated SURICG/7 about the information and discussions from the Fourth Meeting of the Surveillance Panel (SP/4) held on 28 March – 8 April 2022, and the current plans for SP/5. The two working groups of SP, i.e. the Fifteenth Meeting of Aeronautical Surveillance Working Group (SP-ASWG/15) and the Thirteenth Meeting of Airborne Surveillance Working Group (SP-AIRBWG/13), were held as breakout sessions during the SP/4 period.

2.51. SP/4 considered and agreed to recommend that the Air Navigation Commission consider a Proposal for Amendment (PfA) to Annex 10 Volume III - Communication Systems. This proposal will increase the 24-bit aircraft address allocation of all States that currently are allocated 1024 addresses to 2048 addresses. SP/4 also considered a proposal for amendment to Annex 10, Volume IV —Surveillance and Collision Avoidance Systems. The proposal updates technical provisions related to Secondary surveillance radar (SSR) Mode S transponder and 1090 MHz extended squitter (Initial Proposal 1), airborne collision avoidance systems (ACAS) III (Initial Proposal 2), and airborne surveillance applications (Initial Proposal 3), with details of these Proposals given in the paper with consequential amendments to other Annexes and Docs introduced. SP/4 considered and agreed to recommend that Doc 9924, the Aeronautical Surveillance Manual be amended to make changes proposed by the SP-ASWG. SP/4 considered and agreed to recommend a change to the Panel's Terms of Reference (ToR), and reviewed and propose revisions to the Job Cards assigned by the Air Navigation Commission to the Panel. Current plans are that SP/5 will consider the significant PfA to Annex 10, Volume IV to align SARPs with the latest EUROCAE/RTCA avionics standards. Additionally, it is expected that consequential changes to Doc 9871 will accompany the SARPs changes to be considered at SP/5. Consequential changes to other ICAO documents under the purview of the SP, such as Doc 9924 and Doc 9863, may either be presented for consideration at SP/5, or will be prepared for SP/6. SP/5 was scheduled to be held in September 2023.

RTCA Status (SP/01)

2.52. RTCA introduced their operations as an independent standards development organization which supports ICAO, coordinates with EUROCAE and supports certain organisations including FAA. Their non-profit nature supports various domains across the aviation industry. The presentation

explained the background and objectives of SC-186 WG-4 with a summary of their activities of this group. Future meeting topics to work on, including human-in-the-loop study results, recommended updates to IM Sample Algorithm, overview of FAA Tech Center capabilities, update on SESAR activities, tactical uses of IM in en-route and terminal environments and ADS-B In benefits updates and were provided in the presentation. In addition, outcomes to date were identified, including increased industry awareness of CAS operations and opportunity to provide input on operational concepts, increased awareness of FAA activities in support of operational trials and CAS and IM deployment, identified and mitigated challenges with using CAVS application + supplemental requirements for all CAS operations, ongoing FAA/industry discussion on how FIM MOPS, requirements support IM operations, and increased awareness of how ADS-B In applications will be integrated with TBO. The ICAO Secretariat appreciated the effort from RTCA, and the coordination by SP Chair.

Review APAC Regional Surveillance Strategy (WP/08)

2.53. The Surveillance Strategy for the APAC Region is expected to be regularly reviewed to cope with the prevailing circumstances and developments, and under this agenda, the ICAO Secretariat presented the last version of Surveillance Strategy for the APAC Region adopted in 2019 to the meeting for review and actions. The meeting reviewed the comments/views received for revising the Surveillance Strategy, discussed the amendment proposals, and formulated the revised Strategy provided in **Appendix B to this paper** as following Draft Conclusion for consideration by CNS SG/26:

<table>
<tr><th colspan="3">Draft Conclusion SURICG/7/3 - Revised Surveillance Strategy for the APAC Region</th></tr>
<tr><td colspan="2">What: That, the Revised Surveillance Strategy for the APAC Region provided in Appendix F to the Report be adopted.</td><td>Expected impact:
☐ Political / Global
☒ Inter-regional
☒ Economic
☐ Environmental
☒ Ops/Technical</td></tr>
<tr><td>Why: To reflect the outcome of the latest development in surveillance technology.</td><td colspan="2">Follow-up: ☒Required from States</td></tr>
<tr><td>When: 23-Nov-22</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: SURICG</td></tr>
</table>

Positive Effect of CPR Reasonableness Test on ADS-B Security (WP/11)

2.54. Japan presented the reasonableness test for Compact Position Reporting (CPR) decoding is useful for improving ADS-B security via numerical simulation, and reducing false information that is intentionally transmitted. ADS-B being a dependent surveillance and also an open system without encryption and authentication, there is a possibility of false position information caused by avionics and security issues. In Mode S DAPs WG/5, China presented in IP/06 the technique called reasonableness test for CPR Decoding, which was originally written in RTCA-DO260B. This technique addressed a false position caused by an airborne aircraft transmitting a surface position format. The reasonableness test is a technique to verify the decoded position. The basic mechanism was introduced in the paper. ENRI conducted a numerical simulation with the procedure, parameters and results provided in the paper. Based on the result, this paper also proposes to add a suggestion to ADS-B Implementation and Operation Guidance Document (AIGD).

Revision of Updates to AIGD

2.55. In addition to WP/11 by Japan, Hong Kong China led the discussion and incorporation of materials to update AIGD during the meeting with the methodologies to measure 1090MHz congestions and mitigating measures raised in WP07 by Singapore and ICCAIA. The meeting agreed to formulate the following Draft Conclusion for consideration by CNS SG/26 meeting.

Draft Conclusion SURICG/7/4 - Revised ADS-B Implementation and Operations Guidance Document (AIGD)			
What: That, the revised ADS-B Implementation and Operations Guidance Document (AIGD) provided in **Appendix J** to the Report, which consolidated all change proposals during SURICG/7, be adopted as Version 15.0.			Expected impact: ☐ Political / Global ☐ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical
Why:	Updates from SURICG/7	Follow-up:	☐Required from States
When:	19-Aug-22	Status:	Draft to be adopted by Subgroup
Who:	☒ Subgroup ☐APAC States ☒ICAO APAC RO ☐ICAO HQ ☒ Other: SURICG		

2.56. Hong Kong China clarified the reasons for the difference between the adopted values of service level of shared data for Tiers 1 and 2 in the SURSG outcome and those specified in the AIGD, and suggested a need to align the SURSG outcome as described in **Table 1 – High-Level Recommendations from Study Report** with the definitions of Appendix 6 of AIGD. After deliberation, Hong Kong China will take up an action to discuss with the Chair of SURSG to align the SURSG outcome with AIGD thus ensuring no misunderstanding and the specified performance requirements are suitable for the targeted services.

Amendment 91 to Annex 10 Volume IV - Introduction of ACAS Xa/Xo (IP/04)

2.57. The ICAO Secretariat presented the main points of State Letter Ref.: AN 7/66.2.2-22/27 Subject: Adoption of Amendment 91 to Annex 10, Volume IV was circulated to States on 29 March 2022 and the action required by the letter was to notify any disapproval before 18 July 2022; notify any differences and compliance before 3 October 2022; and consider the use of the Electronic Filing of Differences (EFOD) System for notification of differences and compliance regarding the Adoption of Amendment 91 to Annex 10, Volume IV, regarding the introduction of ACAS Xa/Xo, for review and action if necessary. The State Letter was provided in Appendix A to the paper, and the meeting was reminded to take note on the guidance on the determination and reporting of differences given in the Note on the Notification of Differences in the Attachment D of the State Letter. Information on implementation and available guidance material, as well as an impact assessment relevant to this adoption of an Annex amendment, are presented in the letter's Attachments E and F respectively, and the AMENDMENT 91 text is at the end of the State Letter package. As raised in 2.1.2 of the impact assessment on page 17 of the State Letter, the cost impact for States will be minimal as this simply gives an additional option to implement ACAS II. However, States that will accept ACAS Xa/Xo-compliant equipment in their airspace and that run an ACAS monitoring program need to update their message interpretation software.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this paper; and

b) discuss any relevant matter as appropriate

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Terms of Reference of Mode S and DAPs Working Group

Working Arrangement of the Mode S and DAPS WG

Membership: The Mode S and DAPS WG shall be composed of experts involved in technical and operation of surveillance services as well as operational experts. Member States of SURICG are encouraged to volunteer to form this Working Group. The working group shall normally invite representatives of International Organizations recognized by the ICAO Council and Industry Partners as required by the group which represent important civil aviation interests to participate in its work in a consultative capacity.

Meetings: The Mode S and DAPS WG shall convene annually with at least one face-to-face meeting per year and supplemented with WebEx meetings as required. The outcome of the meetings shall be reported to the SURICG.

Schedule and delivery: Subject to the extent of prioritized applications considered by the Mode S and DAPS WG, the schedule for delivery of the working group shall be 4 +2 years after initiation ~~of the Mode S DAPS WG~~ (28 March 2018). The delivery point(s) will be nominated by SURICG through discussion. The Mode S and DAPS WG shall report to the APANPIRG via the SURICG.

Terms of Reference. See next section.

Term of Reference

The Objectives of Mode S and DAPs Working Group are to:

1) Ensure harmonized implementation of Mode S and DAPs in the Asia and Pacific Regions according to Surveillance Strategy adopted by APANPIRG;

2) Facilitate the implementation of Mode S and DAPs application in the Asia and Pacific Regions using the project management principles where appropriate to maximize its benefit to region; and

3) Review, identify and address major issues in technical, operational and regulatory aspects to facilitate the Mode S and DAPs implementation in the Asia and Pacific Regions.

Deliverables to meet the Objectives:

1) Progress report to be submitted to SURICG addressing the Mode S and DAPs Working Group deliverables (listed in 2 to 7 below);

2) To study and identify applicable Mode S and DAPs applications in the Asia and Pacific Regions considering:

- Concept of use/operation;
- Cost of system;
- Requirement of surveillance systems (focusing on radar);
- Matching functionality in ~~ATC~~ATM automation system;
- Other currently available or emerging technologies;
- ICAO Global Air Navigation Plan (GANP) and Aviation System Block Upgrades (ASBU); and
- Evaluation method for Mode S and DAPs performance.

3) To identify and develop the regional requirements of Mode S and DAPs capability in the area of aircraft equipage, surveillance systems (focusing on radar) and ~~ATC~~ ATM automation system, taking into account the relevant performance expectations of the Asia/Pacific Seamless ANS Plan;

4) To develop roadmap for Mode S and DAPs application in the Asia and Pacific Regions taking into account of:
- Available equipment standards;
- Readiness of airspace users and ATS providers; and
- Development of standardized and systematic approach to Mode S and DAPs application.

5) To develop guidance materials to assist States and airspace users (where applicable) on the use of Mode S and DAPs in the Asia and Pacific Regions;

6) To encourage research and development, trials and demonstrations in the field of Mode S and DAPs application; and

7) Draft Conclusions and Decisions to be formulated relating to matters in the field of Mode S and DAPs that come within the scope of the SURICG work plan.

[Note: Mode S and DAPS Working Group will report to SURICG and SURICG will coordinate with CNS Sub-group.]

Current Members: The working group is currently comprised of representatives from Australia, Cambodia, China, Hong Kong China, India, Indonesia, Japan, Republic of Korea, Malaysia, Nepal, New Zealand, Pakistan, Philippines, Singapore, Sri Lanka, Thailand and Viet Nam, and is led by China and Singapore.

Term of Reference

		Efforts thus far
The Objectives of Mode S and DAPs Working Group are to:		
1	Ensure harmonized implementation of Mode S and DAPs in the Asia and Pacific Regions according to Surveillance Strategy adopted by APANPIRG;	a) Planning of II/SI code assignment in progress. b) Encouraged Mode S forward fit. c) Guidance material on the implementation of DAPs applications in ATM systems is created.
2	Facilitate the implementation of Mode S and DAPs application in the Asia and Pacific Regions using the project management principles where appropriate to maximize its benefit to region; and	High level principle is in the draft guidance material.
3	Review, identify and address major issues in technical, operational and regulatory aspects to facilitate the Mode S and DAPs implementation in the Asia and Pacific Regions.	a) Guidance material on measurement of frequency occupancy is created. b) Guidance material to address technical and operational issues is created. c) Guidance material to address regulatory issues is created.
Deliverables to meet the Objectives:		
1	Progress report to be submitted to SURICG addressing the Mode S and DAPs Working Group deliverables (listed in 2 to 7 below);	
2	To study and identify applicable Mode S and DAPs applications in the Asia and Pacific Regions considering: - Concept of use/operation - Cost of system - Requirement of surveillance systems (focusing on radar) - Matching functionality in ~~ATC~~ATM automation system - Other currently available or emerging technologies; - ICAO Global Air Navigation Plan (GANP) and Aviation System Block Upgrades (ASBU); - Evaluation method for Mode S and DAPs performance.	a) Guidance material on the implementation of DAPs applications in ATM systems is created. b) Means to test and validate DAPs are in the guidance document.
3	To identify and develop the regional requirements of Mode S and DAPs capability in the area of aircraft equipage, surveillance systems (focusing on radar) and ~~ATC~~ATM automation system, taking into account the relevant performance expectations of the Asia/Pacific Seamless ATM Plan;	a) Planning of II/SI code assignment in progress. b) Encouraged Mode S forward fit. c) Guidance material on the implementation of DAPs applications in ATM systems is created.
4	To develop roadmap with a view to formulate mandates for Mode S and DAPs application in the Asia and Pacific Regions taking into account of: - Available equipment standards - Readiness of airspace users and ATS providers - Development of standardized and systematic approach to Mode S and DAPs application;	Road map created.

5	To develop guidance materials to educate States and airspace users (where applicable) on the use of Mode S and DAPs in the Asia and Pacific Regions:	Guidance material to educated States is created. No need for guidance material for airspace users identified yet.
6	To encourage research and development, trials and demonstrations in the field of Mode S and DAPs application; and	Research and development activities are being shared in the Working Group. These include: a) Deriving weather related information from DAPs; b) Detection of BDS swab.
7	Draft Conclusions and Decisions to be formulated relating to matters in the field of Mode S and DAPS that come within the scope of the SURICG work plan.	On going.

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NOTES ON THE PRESENTATION OF THE PROPOSED AMENDMENT

1. The text of the amendment is arranged to show deleted text with a line through it and new text highlighted with grey shading, as shown below:

a) ~~Text to be deleted is shown with a line through it.~~	text to be deleted in
b) New text to be inserted is highlighted with grey shading.	new text to be inserted in
c) ~~Text to be deleted is shown with a line through it~~ followed by the replacement text which is highlighted with grey shading.	new text to replace existing text

REVISED SURVEILLANCE STRATEGY FOR THE APAC REGION

Considering that:

1. States are implementing CNS/ATM systems to gain safety, efficiency and environmental benefits, and have endorsed the move toward satellite and data link technologies;

2. The future air traffic environment will require increased use of aircraft-derived surveillance information for the implementation of a seamless automated air traffic flow management system;

3. The 11th Air Navigation Conference endorsed the use of ADS-B as an enabler of the global air traffic management concept and encouraged States to support cost-effective early implementation of ADS-B applications;

4. The 12th Air Navigation Conference endorsed the ICAO Aviation System Block Upgrades (ASBU) Framework with Modules specifying effective use of ADS-B/MLAT and associated communication technologies in bridging surveillance gaps and its role in supporting future trajectory-based ATM operating concepts. Cooperation between States is the key to achieve harmonized ATM system operations;

5. The 13th Air Navigation Conference endorsed the multilayer structure for the GANP, the ASBU and initial version of basic building block (BBB) frameworks and its change management process, which are available in an interactive format as part of the web-based GANP Portal. This allows ICAO to incorporate a flexible framework for new/emerging surveillance-related concepts such as space based ADS-B into future editions of the GANP;

6. APANPIRG has decided to use the 1090MHz Extended Squitter data link for ADS-B air-ground and air-air applications in the Asia/Pacific Region;

7. Use of surveillance systems that do not require GNSS will continue to meet many critical surveillance needs for the foreseeable future;

8. SARPs, PANS and guidance material for the use of ADS-B have been developed;

9. Availability of new technologies, such as space based ADS-B which is now operationally used by some States;

10. Mode S and ADS-B avionics (including DAPs) and processing systems are available;

11. ADS-B IN applications and equipment are now available in commercial airliners and ICAO ASBUs include ADS-B IN applications;

12. There are continuing significant pressures on the radio spectrum for purposes outside aviation, particularly in the primary radar spectrum; and

13. ADS-B security issues are addressed by the ADS-B regional guidance material and security issues of Mode S surveillance may need to be further considered in the future.

THE SURVEILLANCE STRATEGY FOR THE ASIA/PACIFIC REGION IS TO:

1. Minimize the reliance upon pilot position reporting, particularly voice position reporting, for surveillance of aircraft;

2. Maximize the use of ADS-B on major air routes and in terminal areas, giving consideration to the mandatory carriage of ADS-B Out as specified in *Note 1* and use of ADS-B for ATC separation service;

3. Reduce the dependence on Primary Radar for area surveillance, consider the ongoing need for primary radars in terminal areas with a view to reducing primary surveillance coverage or use of phased array radar or other technologies with coverage focusing on areas of concern, and the potential use of alternate technologies or procedures (e.g. transponder veil regulations);

4. Encourage deployment of Mode S systems instead of Mode A/C only radars when replacement is required;

5. Provide maximum contiguous ATS surveillance coverage of air routes using 1090MHz Extended Squitter (1090ES) ADS-B, Wide Area Multilateration and Mode S SSR to meet operational and safety requirements;

6. Make ~~full~~ use of aircraft Mode S capabilities, where suitable surveillance systems and ATM automation systems are available, to reduce reliance on 4-digit octal codes. Mode S capabilities such as DAPs should also be considered for use~~d~~ to support ATM services where appropriate;

7. Make use of alternative technologies where technical constraint or comparative cost benefit analysis does not support the use of ADS-B, SSR or Multilateration;

8. Make use of Multilateration and/or ADS-B for surface, terminal and area surveillance where appropriate, feasible and cost effective;

9. Monitor ADS-B OUT developments such as Version 3 (DO-260C) MOPS development, and Version 2 (DO260B) equipage in the APAC region. ~~At an appropriate time (circa 2020)~~ APAC States should review progress and consider development of transition plans where cost/benefit studies indicate positive advantages for the region;

10. Monitor ADS-B IN development and cost benefits to ensure that APAC States are able to take advantage of ADS-B IN benefits when appropriate, through procedures, rules and ATC automation capabilities;

11. To the extent possible, implement ADS-B in the non-radar environment as a priority. In the radar or other surveillance environment, use ADS-B to supplement or replace existing surveillance coverage, subject to local factors and risk assessment;

12. Make use of surveillance capability to support the GADSS as appropriate;

13. Implementation of surveillance capability should also include consideration of contingency surveillance requirements [Note 2] and multilayer surveillance provision should be implemented to enhance the availability of surveillance services;

14. Monitor development of surveillance systems to support integration of UAS including new technology capable to detect non cooperative targets such as UAS.

15. Encourage sharing of surveillance data, utilizing provisions in the Region such as CRV, to improve safety and efficiency in air traffic management with a justifiable cost; and

16. Monitor potential congestion on 1090 MHz by means of routine measurements of channel occupancy, at both terrestrial and airborne levels, and monitor the availability of 24-bit aircraft address

Note 1:

a) *Version 0 ES as specified in Annex 10, Volume IV, Chapter 3, Paragraph3.1.2.8.6 (up to and including Amendment 82 to Annex 10) and Chapter 2 of* Technical Provisions for Mode S Services and Extended Squitter *(ICAO Doc 9871) (Equivalent to DO260) to be used till at least 2020.*

b) *Version 1 ES as specified in Chapter 3 of* Technical Provisions for Mode S Services and Extended Squitter *(ICAO Doc 9871) (Equivalent to DO260A);*

c) *Version 2 ES as specified in Chapter 4 of* Technical Provisions for Mode S Services and Extended Squitter *(ICAO Doc 9871) (Equivalent to DO260B).*

d) *States/Administrations in APAC region are strongly encouraged to mandate aircraft with a maximum take-off mass exceeding 5 700 kg or having a maximum cruising true airspeed capability greater than 250 knots, to be equipped with ADS-B OUT avionics compliant with Version 2 ES (DO-260B) or later version with date of manufacture on or after 1 January 2020.*

Note 2:

Contingency surveillance requirements are requirements to handle contingency situations in surveillance thus retain capacity to continue providing/using air navigation services. Such situations include but are not limited to the followings:

- *failure of surveillance system or infrastructure such as ground stations or GNSS failure;*
- *avionics failure or equipped aircraft transmitting bad data in flight with good data integrity indicators.*

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