INTERNATIONAL CIVIL AVIATION ORGANIZATION
ASIA AND PACIFIC OFFICE

FINAL REPORT OF
THE SEMINAR ON AIR TRAFFIC MANAGEMENT AUTOMATION SYSTEM
AND
THE FIFTH MEETING OF THE ASIA/PACIFIC AIR TRAFFIC MANAGEMENT AUTOMATION SYSTEM TASK FORCE (ATMAS TF/5)

Chengdu, China

4 – 7 June 2024

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

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

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PART I – HISTORY OF THE MEETING

1. Introduction

1.1. The Seminar on Air Traffic Management Automation System and the Fifth Meeting of the Asia/Pacific Air Traffic Management Automation System Task Force (APAC ATMAS TF/5) were held at JoyHub Air Hotel, Chengdu, China, from 4 to 7 June 2024.

2. Attendance

2.1 The Meeting was attended by 82 participants from 15 Member States/Administrations namely Cambodia, China, Hong Kong China, Fiji, Indonesia, Lao PDR, Malaysia, Pakistan, Philippines, Republic of Korea, Singapore, Sri Lanka, Thailand, USA, and Viet Nam, 2 International Organizations namely IATA and ICAO, and 1 industry partner namely Chengdu Civil Aviation Air Traffic Control Science & Technology (CDATC). The List of participants is provided in **Attachment 1**.

3. Opening of the Seminar and the Meeting

3.1 The Seminar and Meeting was opened by Mr. Li Qiguo, Deputy Director General of Air Traffic Management Bureau of CAAC. Mr. Li welcomed the participants to the face-to-face meeting in the historical City of China, Chengdu. He highlighted the critical role of ATM Automation Systems in ensuring aviation safety and improving operational efficiency, and pointed out the increasing demands posed by the growing air transportation in the APAC region. He recalled the 50-year development journey of China's civil aviation in building ATM automation systems, and emphasized China's progress in independent innovation, including domestication and application of new technologies, in order to continuously enhance air-ground collaborative capabilities. Finally, he called for strengthened cooperation with APAC States/Administrations to jointly enhance regional ATM technological development, invited participants to experience the unique charm of the cultural city of Chengdu, China, and wished the meeting a complete success.

3.2 Mr. Luo Yi, Regional Officer CNS, on behalf of the ICAO APAC Regional Director, welcomed all participants and expressed deep gratitude to ATMB of CAAC for every effort to generously host this event in the beautiful city Chengdu, China. Recognizing the ATM Automation System is the critical system of ATM, he recalled the establishment and achievements of the ATMAS Task Force, and encouraged all participants to together achieve Seamless ANS and a safety, security and efficiency sky.

3.3 Mr. Kwek Chin Lin, ATC Specialist (Systems Technology), Civil Aviation Authority of Singapore, Co-Chair of ATMAS TF, extended a warm welcome to all participants and expressed appreciation to ATMB of CAAC for the excellent arrangements. He briefly introduced the schedule and topics going to discuss in the upcoming seminar and meeting, and encouraged the attendees to participate actively to share, learn, and exchange ideas during the meeting, and find time for the both historical and modernized city of Chengdu, China, and wished all to have an enjoyable and fruitful meeting.

4. Officers and Secretariat

4.1 Ms. Xie Yulan, Deputy Director General of the North Regional Air Traffic Management Bureau of CAAC, and Mr. Kwek Chin Lin, ATC Specialist (Systems Technology), Civil Aviation Authority of Singapore co-chaired the meeting.

4.2 Mr. Luo Yi, Regional Officer CNS, Regional Officer CNS, ICAO Asia and Pacific Regional Office, acted as the Secretary for the meeting.

5. Organization, Working Arrangements, Language and Documentation

5.1 The meeting met as a single body during the meeting. The working language for the meeting was English inclusive of all documentation and this Report. The meeting considered Fifteen (15) Working Papers, and Twenty-Two (21) Information Papers under its Eleven (11) Agenda Items. A List of Working Papers, and Information Papers is provided in **Attachment 2**.

6. Seminar on Air Traffic Management Automation System

6.1 The Seminar on Air Traffic Management Automation System was organized in conjunction with the ATMAS TF/5 meeting on 4 June 2024. The Seminar was attended by 85 participants from 15 Member States/Administrations namely Cambodia, China, Hong Kong China, Fiji, Indonesia, Lao PDR, Malaysia, Pakistan, Philippines, Republic of Korea, Singapore, Sri Lanka, Thailand, USA, and Viet Nam, 5 International Organizations namely EASA, EUROCAE, EUROCONTROL, IATA, and ICAO, and 1 industry partner namely Chengdu Civil Aviation Air Traffic Control Science & Technology (CDATC).

6.2 The objective of the Seminar is to facilitate the exchange of insights on the implementation and advancement of new technologies with ATM Automation Systems, both from the perspectives of Member States/Administrations and industries. It will underscore the significance of the Global Air Navigation Plan (GANP) and the relevant Aviation System Block Upgrades (ASBU). The Seminar received 9 comprehensive presentations from contributors as shown in the Seminar Program in **Attachment 3**. The presentations were uploaded to the ATMAS TF/5 website: https://www.icao.int/APAC/Meetings/Pages/2024-ATMAS-TF5.aspx

6.3 Ms. Xie Yulan, Deputy Director General of the North Regional Air Traffic Management Bureau of CAAC, and Mr. Kwek Chin Lin, ATC Specialist (Systems Technology), Civil Aviation Authority of Singapore facilitated the Seminar as moderators. The presentations were all well received by the attendees and there was active participation from the attendees who raised several questions which were discussed and clarified by the presenters.

7. Draft Conclusions, Draft Decisions and Decisions of ATMAS TF – Definition

7.1 ATMAS TF recorded its actions in the form of Draft Conclusions, Draft Decisions and Decisions within the following definitions:

Draft Conclusions deal with matters that, according to APANPIRG terms of reference, require the attention of States, or action by the ICAO in accordance with established procedures;

Draft Decisions deal with the matters of concern only to APANPIRG and its contributory bodies; and

Decisions of ATMAS TF that relate solely to matters dealing with the internal working arrangements of ATMAS TF.

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PART II - REPORT ON AGENDA ITEMS

Agenda Item 1: Adoption of Agenda

1.1. The provisional agenda presented in **WP/01** was adopted by the meeting as the agenda items for the meeting.

Agenda Item 2: Review of Outcomes of Relevant Meetings

Review of Relevant Meetings **-** *Sec (WP/02)*

2.1. The paper summarized relevant information and updates with the highlight on the reviewed outcomes of SURICG/8, ATMAS TF/4, and relevant discussions of other meetings of CNS SG/27 and APANPIRG/34.

2.2. The CNS SG/27 Meeting adopted Eight (8) Conclusions and Two (2) Decisions. In addition, based on the outcome of discussions on various agenda items, the CNS SG/27 Meeting developed Three (3) Draft Conclusions for consideration by the APANPIRG/34, which was adopted by the APANPIRG/34 Meeting. The Meeting noted the Conclusions/Decisions adopted by the CNS SG/27 and the APANPIRG/34 and discussed the follow-up.

Update from RASMAG/28 – Sec (WP/07)

2.3. The Twenty-Eighth Meeting of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/28) was held *from 21 to 24 August 2023*, at the ICAO Asia and Pacific Regional Office in Bangkok, Thailand. The RASMAG/28 meeting reviewed the outcomes of The Thirteenth Meeting of the FANS Interoperability Team-Asia (FIT-Asia/13), which was held *from 06 to 09 June 2023*. The ICAO secretariat provided a regional safety monitoring assessment summary, which highlighted the LHD Hot Spot Summary. During the RASMAG/28 meeting, the ICAO Secretariat reminded that AIDC implementation had been a regional performance expectation in the APANPIRG-adopted Asia/Pacific Seamless ANS Plan since 2013.

Outcomes of the Eleventh Meeting of Aeronautical Communication Services Implementation Coordination Group of APANPIRG (ACSICG/11) – Sec (WP/09)

2.4. The Eleventh Meeting of the Aeronautical Communication Services (ACS) Implementation Coordination Group (ACSICG/11) was held at ICAO APAC Regional Office, Bangkok, Thailand, *from 19 to 22 March 2024*. The ACSICG/11 meeting reviewed the report of the Twelfth meeting of Common aeRonautical VPN Operations Group (CRV OG/12) which was *from 23 to 26 January 2024* in Denarau Island, Fiji. The ACSICG/11 meeting report, working papers, information papers and other resources can be accessed at
https://www.icao.int/APAC/Meetings/Pages/2024-ACSICG11.aspx

Outcomes of SURICG/9 – Sec (WP/10)

2.5. The Ninth Meeting of the Surveillance Implementation Coordination Group (SURICG/9) was held at ICAO APAC Regional Office, Bangkok, Thailand, *from 7 to 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

2.6. The SURICG/9 reviewed the ICAO’s Recommendations and Guidance on Global Navigation Satellite System (GNSS) vulnerability, the regional surveillance requirements, ADS-B Implementation Status, reservation of Identifier Codes for Test Radars and Military Radars, update on the Surveillance Module in Frequency Finder, as well as revised ADS-B Implementation and Operations Guidance Document (AIGD).

Agenda Item 3: Global and Regional ATM Automation System Updates

Global and Regional Updates on Related Issues – Sec (WP/03)

3.1. The paper presented some background information at global and regional level which are deemed relevant to Air Traffic Management Automation System for review and action by the meeting. The meeting noted the discussions related to ATM Automation System on the Fourteenth Air Navigation Conference, Air Navigation World - ATM procedures, Future Connectivity for Aviation White Paper, User Requirements for Air Traffic Services by IATA, Job Cards of SP, Job Cards of CP-DCIWG, Job Cards of ATMRPP, Job Cards of IMP, ICNSS project. The meeting was invited to nominate/recommend experts, engage industry for required expertise, and share experiences with ATMAS TF. **ACTION ITEM 5-1**

Agenda Item 4: ATM Automation System Implementation Experience by States

4.1 ATM Automation System Implementation Issues Sharing

Optimizing Air Traffic Services in Papua through Centralization of Services with New Integrated ATM Automation System – Indonesia (IP/03)

4.1. The paper presented the replacement of old ATM Automation System (ATMAS) in Sentani APP/TMA, Papua Province, Indonesia, where initially only one APP/TMA was operated to become 9 sectors include neighboring APP/TMAs which were controlled centrally through a new integrated ATC system facility in Sentani. Airnav Indonesia plans to improve services by combining surveillance services throughout the Papua area, facilitated by the installation of 5 radars and 13 ADS-B systems. The new ATMAS features a 4k2k CWP screen for controllers, integrates weather radar for situational awareness, and includes an Information Display System for additional auxiliary information.

The Application and Tuning of the MTCD Function for Enroute Control - China (IP/08)

4.2. The paper presented the Medium Term Conflict Detection (MTCD) application experience in the Enroute control environment in Air Traffic Management Bureau of CAAC. By combining the track and flight plan information, the function can compute the potential conflicts by predicting the position and level of the aircraft with 240-480 seconds lookahead time. The paper explained the MTCD Algorithm, Application of MTCD, included Warning of CFL, Warning of rerouting, and Prediction with the uncontrolled aircraft, and Comparison with STCA. With intensive practice including the tuning of the relevant parameters, the MTCD function has achieved the expected effect.

Research on Integrating Weather Radar Data into ATMAS - China (IP/12)

4.3. The paper presented the requirement analysis, overview, capability of pre-processing server, and HMI display on ATMAS of the Research on Integrating Weather Radar Data into ATMAS. By fusing data from various weather radar sources and integrating it into ATMAS, the synchronous processing and unified display of weather echoes and aircraft tracks can be achieved. This integrated approach facilitates air traffic controllers in establishing a more comprehensive situational awareness, thereby enabling them to provide more optimized flight services to aircrews.

Introduction of AIOps Application in ATMAS - China (IP/17)

4.4. The paper presented the requirements, architecture and implementation of Algorithmic IT Operations (AIOps) for ATMAS in China, and demonstrated the future plans to enhance the automation, integration, and intelligence levels of technical maintenance work. The meeting noted that AIOps provided a novel approach to the technical maintenance for ATMAS, which effectively enhanced the efficiency of daily maintenance work and helped to promptly identify issues that are manually undetectable. China will continue to validate the rationality of application architecture, enhance the depth and breadth of data analysis, deeply analyze business requirements, and enrich its functions.

4.2 Resilience Consideration and Contingency Planning

Nil

4.3 Life Cycle Management

Nil

4.4 Integration with External Systems

Space-Based ADS-B Integration in Philippine ATM Automation System (IP/04)

4.5. The paper presented the integration of Space-Based ADS-B data into the Philippine Air Traffic Management Automation System. It outlined the current surveillance capabilities of the Philippine Air Traffic Management Center and the ongoing discussions with Aireon for the subscription of Space-Based ADS-B data. By sharing of the technical considerations, the meeting noted that the date for integration will be at the end of 3Q2024, followed by tuning and with the target of completion and acceptance at the end of 4Q2024. With the integration of Space-Based ADS-B into the Philippine ATM Automation System, the surveillance performance in the western oceanic region will significantly increase and give a safe, orderly flow of air traffic at various reporting points.

Integration of Bataraza ADS-B Data in Philippine ATM Automation System (IP/05)

4.6. The paper provided an update on the joint Philippine-Singapore ADS-B project, focusing on the integration of BATARAZA ADS-B data into the Philippine ATM Automation System. The collaboration agreement between the Civil Aviation Authority of the Philippines and the Civil Aviation Authority of Singapore aims to enhance surveillance coverage in the southwestern part of Palawan on air routes N884 and M767. The integration involves a software support and services contract with the vendor of the Philippine ATM Automation System, with the ADS-B data already being transmitted and monitored at the Philippine ATM Center. It was also emphasized that the integration of BATARAZA ADS-B will significantly improve surveillance capabilities and contribute to the safe and efficient flow of air traffic in the region.

Implementation and Application of Data Exchange Between ATM Information Systems - China (IP/09)

4.7. The paper introduced the technical implementation, functions, and significance of the data exchange between ATMAS, A-SMGCS and ATFM systems, taking the Beijing site as an example. Inter-facility data exchange reduces the burden on controllers to operate multiple systems, enhances operational efficiency and ensures safety in increasingly congested airspace. In the future, China will further research the data exchange between AMAN function in ATMAS and ATFM to enhance approach and surface coordination efficiency.

Integration of Airport Emergency Grid Map with Tower ATMAS - China (IP/15)

4.8. The paper primarily introduced the role of the Airport Emergency Grid Map, proposed an application method integrated with the Tower ATMAS, and described and explained issues encountered during its application. The deep integration of the Airport Emergency Grid Map with the Tower ATMAS utilizes automated technology and algorithms to achieve real-time monitoring and precise analysis of the airport's operational status. The application of this innovative method greatly improves rescue efficiency, reduces decision-making time, and provides strong security for the safe operation of airports.

4.5 Development of New Technology

Considerations in Design of Integrated Arrival and Departure Manager for Hong Kong International Airport – Hong Kong China (WP/13)

4.9. The paper presented the design considerations of an Integrated Arrival and Departure Manager (IAD) for the Hong Kong International Airport. It highlighted the enhanced features of the IAD and its integration with the air traffic management system to enhance efficiency and streamline decision-making processes for air traffic controllers in handling complex arrival and departure air traffic. The paper also introduced the Mixed-mode Runway Capacity Management & Traffic Off-loading, Red Lightning Warning at HKIA, Weather Mode & Weather Deviation Factor, and Integration with Approach Spacing Tool. The meeting agreed to consider incorporating the relevant design considerations of an Integrated Arrival and Departure Manager into the ATMAS IGD after implementation and verification. **ACTION ITEM 5-2**

Development of Incheon ARTS for Second Stage of A-CDM Operation – ROK (IP/02)

4.10. The paper presented the development status, application technology, and plans of Incheon Automated Radar Terminal System (ARTS) for the advancement of A-CDM of Incheon International Airport Corporation. The paper explained the airspace adjustment and introduction of new flight procedures following the start of the 4th runway operation. The details of the application of the ATM automation system in Departure Management (DMAN) and the development status of the Arrival Management (AMAN) were also shared. The paper also introduced the ARTS features to be developed and applied in the future.

Achieving Environmental Benefits Through Implementation of Wake Turbulence Group and Approach Spacing Tool at the Hong Kong International Airport - Hong Kong China (IP/07)

4.11. The Hong Kong International Airport has taken proactive steps to address climate change and promote environmental sustainability. By implementing ICAO’s Wake Turbulence Separation Minima Based on Aircraft Groups and the Approach Spacing Tool, which has been implemented and transitioned into full operation since March 2024 to support the management of air traffic in the final approach airspace before landing on the HKIA, the HKIA has successfully increased runway capacity, improved efficiency, and reduced fuel consumption and CO2 emissions. The paper aimed to highlight the HKIA's experiences and positive outcomes in achieving these goals.

The Container Application and Microservices Exploration of Air Traffic Management Automation System Servers - China (IP/10)

4.12. The paper outlined the endeavors and challenges addressed in the exploration of container applications and microservices for traditional ATMAS servers, conducted by a team from ATMB of CAAC. Furthermore, it highlighted several crucial issues that merit attention in future developments of ATMAS microservices.

Introduction to the Implementation of Cross Region ATFM Collaborative Platform - China (IP/11)

4.13. The paper briefly introduced the implementation of Cross Region ATFM Collaborative Platform. In 2014, China, Japan, and ROK established the Northeast Asia Region Air

Traffic Flow Management Harmonization Group (NARAHG) to collaborate on managing the increasing air traffic in Northeast Asia. By 2021, the Cross Region ATFM Collaborative Platform (CRACP) using FIXM was developed for data sharing and coordination. Currently, NARAHG members exchange the ATFM Daily Plan (ADP) through the CRACP client and test the collaborative capabilities of cross-regional ATFM. CRACP improves operational efficiency and future enhancements include refined functionalities and typhoon detour procedures for better air traffic flow management.

Optimization of Arrival Management System Based on PBN - China (IP/13)

4.14. The paper presented the optimization of Arrival Management System based on PBN. The paper explained the problems of the implementation of Arrival Management System (AMAN) in Chengdu China. Accordingly, China introduced the solutions that have been proposed based on PBN in the TMA area. The future plan was put forward to enhance the architecture and performance of AMAN.

The Requirements and Expectations of the Next-Generation ATMAS - China (IP/14)

4.15. The paper presented a next-generation air traffic control automation system (ATMAS) solution from China to address current system issues and future operational challenges in air traffic management. The meeting noted that the complexity of system functionality increases the challenge for the safety operation of the current ATMAS. The next-generation ATMAS is expected to undergo multiple transformations, such as the composition and implementation of computer systems, software architecture, functionalities, and the relationship between systems to meet the development of operational requirements. The goals, operational concept, key elements, and exploration of the next-generation ATMAS were elaborated.

Introduction of Function Design and Operation Mode of Tower ATM Automation System - China (IP/18)

4.16. Taking the Guangzhou Tower ATM Automation System as an example, the paper introduced the functional design, operation mode, application situation, and main problems encountered in implementing a new-type Tower ATM Automation System based on overall planning and integrated construction, and also discussed the future development of the system.

Test and Application of Wide Area Multilateration System in ATMAS - China (IP/19)

4.17. The paper presented the testing and application experience of Wide Area Multilateration (WAM) in the ATMAS. The meeting noted that to improve regional surveillance capabilities and air traffic control efficiency, CAAC has promoted the testing and application of WAM in the ATMAS. After integrating WAM data into the ATMAS, it is conducive for controllers to utilize the advantages of WAM's high accuracy and fast update rate to assist in determining spacing allocation, thereby enhancing their perception of airspace situations. China's WAM systems are still in the testing and verification stage and based on current research results, the main improvements schemes were also explained.

Agenda Item 5: Review ATMAS Implementation Status in APAC

Repository of the ATMAS in APAC – Sec (WP/04)

5.1. The paper presented the updated table of the ATMAS Status in the APAC region, the preliminary analysis of the current status, and invited States/Administrations to review and take necessary actions to make the regional repository. Since the State Letter for establishing the Air Traffic Management Automation System (ATMAS) Repository for APAC Region circulated on 21 October 2022, total 12 updates have been received from States/Administrations, namely Cambodia, Hong Kong China, Fiji, Lao PDR, Malaysia, New Zealand, Pakistan, Philippines, Republic of Korea, Singapore, Sir Lanka, and Thailand. The meeting invited participants to review and update the information contained in the ATMAS Repository. **ACTION Item 5-3**.

5.2. The updated table of ATMAS Status in the APAC region, which is provided in **Appendix A** to this report.

Agenda Item 6: Review of Guidance Material of Implementation of ATM Automation System in Asia/Pacific Region (APAC ATMAS IGD)

Updates to the Guidance Material of Implementation of ATM Automation System – China & Hong Kong China & Singapore (WP/14)

6.1. The paper presented the revised draft (Edition 1.4) of the Air Traffic Management Automation System Implementation and Operations Guidance Document (ATMAS IGD). The new draft adds some subsections, describing enhanced functions of ATMAS and experience about Cyber Security and SAT for consideration and endorsement by the meeting.

6.2. The meeting noted regarding the enhanced function of ATMAS and implementation expedience of the system, China cooperated with the Ad-hoc working group had developed the draft (Edition 1.4) of the ATMAS IGD. The main amendments to this edition are amending words according to ICAO Doc 4444, and supplementing some subsections, which include CFL Predicted Detection Advisory, QNH Mismatch Warning, Suggested Cyber Security Devices Configuration, and Site Acceptance. The revised draft (Edition 1.4) of the ATMAS IGD has been circulated to Member States/Administrations for review and comments on 11 May 2024. Suggestions from New Zealand and Hong Kong China had been received and adopted for consideration and endorsement by this meeting.

6.3. With the aforementioned, the ATMAS TF/5 meeting agreed on the following Conclusion.

<table>
<tr><td colspan="2">Conclusion ATMAS TF/05/01 - ATMAS IGD Edition 1.4</td></tr>
<tr><td>What: The Air Traffic Management Automation System Implementation and Operations Guidance Document Edition 1.4 provided in Appendix B to this report be adopted.</td><td>Expected impact:
☐ Political / Global
☐ Inter-regional
☐ Economic
☐ Environmental
☒ Ops/Technical</td></tr>
<tr><td>Why: New subsections have been added in the revised draft.</td><td>Follow-up: ☐Required from States</td></tr>
<tr><td>When: 7-Jun-24</td><td>Status: Draft to be adopted by Subgroup</td></tr>
<tr><td colspan="2">Who: ☒Sub groups ☐APAC States ☐ICAO APAC RO ☐ICAO HQ ☒Other: ATMAS TF</td></tr>
</table>

Agenda Item 7: ATS Inter-Facility Data - Link Communication (AIDC) Implementation Experience by States

Review of Core AIDC Messages in AIDC Implementation and Operations Guidance Document (IGD) Based on Singapore's Implementation Experience - Singapore (WP/08)

7.1. The paper proposed establishing a select AIDC group to reassess the core AIDC messages in AIDC IGD, drawing from Singapore's experience in the technical testing of exchanging ABI, CDN, and MAC messages. As different ATM automation systems have their own design considerations with respect to the handling of Field 15 (Route) of the Flight Plan, a possible solution would be to allow AIDC messages to be configurable with respect to the inclusion of Field 15. To achieve this, there will be a need to review of the core AIDC messages in the AIDC IGD to enable States in the APAC region to progress with AIDC implementation.

7.2. The meeting appreciated the experience sharing by Singapore and agreed to form an expert group within ATMAS TF to review the core AIDC messages in the IGD, China, Hong Kong China, Malaysia, Pakistan, Philippines and Singapore would join this group on voluntary basis, which will work in offline mode and conduct online meeting when necessary, Singapore will act as the rapporteur of the group. **ACTION ITEM 5-4**

AIDC Implementation Status in Manila FIR - Philippines (IP/16)

7.3. The paper presented the updates on the AIDC implementation status in Manila FIR. Philippines updated that Phase 2 of AIDC operational trial with Singapore was conducted on March 15, 2024, hopefully, the issues on CDN will be resolved by the coming update of the system tentatively by September 2024. The operational trials with Kota Kinabalu is currently underway, and the actual implementation of AIDC is estimated in the 4th quarter of 2024 (4Q2024).

Review of the Implementation and Experience of AIDC in China (IP/20)

7.4. The paper presented the review of the AIDC implementation in China. The meeting noted China has been continuously promoting the efficient application of the AIDC with its neighboring countries. China elaborated key technological solutions of implementation of AIDC function in main and fallback ATMAS and selection of dedicated and shared AFTN Link. In the future, China will continue to promote the application of flight message exchange methods, to improve the utilization of various messages during AIDC exchange, and to make AIDC exchange more practical, effective and flexible.

Progress of AIDC Implementation in Sri Lanka (IP/21)

7.5. The paper presented the status of the AIDC implementation in Sri Lanka, the progress of implementation with adjacent ATSUs in 2024, and the related issues and suggestions encountered during the implementation. By the end of first quarter of 2024, Sri Lanka's ATM automation systems are capable of the AIDC ICD V3.0 interface. Sri Lanka plans to fully implement AIDC electronic handover with Chennai ACC - India & Male ACC - Maldives before Q4 of 2024 and Melbourne ACC - Australia & Jakarta ACC - Indonesia by Q4 2025.

Agenda Item 8: Review AIDC Implementation Issues Reported and Discuss Recommended Solutions

AIDC Implementation Issues Report - Indonesia, India, and Singapore (WP/15)

8.1. The paper presented the AIDC implementation issues reported by Member States/Administrations. The aim of this information sharing is to become a lesson learned for other Member States/Administrations and try to find solutions for these issues. The meeting was updated that there are no new reported AIDC implementation issues provided since the ATMAS TF/3, while few updates on AIDC implementation issues are reported from Australia (3 reports), India (12 reports) and Malaysia (9 reports). Indonesia and Singapore inform that there is no issue and updates during the ATMAS TF/4 to ATMAS TF/5 period. The number of AIDC implementation issues reported by Member States/ Administration, based on fault categories are as shown in the table below:

Table 1. AIDC Issues reported in ATMAS TF/5

Fault Categories	ATMAS TF/5 (2024)		
	Issues Reported	Closed	Open
a. Communication Link	9	9	0
b. ATM System	65	56	9
c. AIDC Message	23	22	1
d. Airspace Design/Procedures	13	12	1
e. Other	6	4	2
Total	**116**	**103**	**13**

8.2. The meeting appreciated Indonesia's efforts for consolidating the report and presenting the working paper, encouraged all States/Administrations to continue to update/report the AIDC implementation issues. A list of identified issues consolidated from States/Administrations after meeting review is attached in **Appendix C**.

Agenda Item 9: Review AIDC Implementation Status in APAC

Repository of AIDC Implementation Status in APAC – Sec (WP/05)

9.1. The paper presented the latest repository of AIDC Implementation Status in APAC region and invited States/Administrations to review and continue to update the AIDC implementation status and Focal Point for AIDC Implementation if necessary. Until now, a total of 21 States/Administrations have already implemented AIDC, 3 States/Administrations are still under testing, and 19 States/Administrations have not implemented AIDC yet. The meeting updated the table of AIDC Implementation Status in APAC region, which is provided in **Appendix D**, and the list of focal point for AIDC Implementation, which is provided in **Appendix E** to the report.

Progress and Plan of AIDC Implementation in the Republic of Korea (IP/06)

9.2. The paper presented the AIDC implementation status between the Republic of Korea and adjacent countries, and the suggestion to implement AIDC between Incheon and Shanghai ACC. The meeting noted the ROK had implemented AIDC between Incheon and Fukuoka, Daegu and Dalian. Meanwhile, the implementation of AIDC between Incheon and Shanghai is planned. ROK's operation of AIDC links are CRV network and dedicated line. The means of transmitting AIDC messages between Korea and Japan were migrated successfully from IPLC(X.25) to CRV in Feb 2024. The meeting noted that ROK will make every effort as a contracting country to improve the safety and efficiency of airspace users of the Incheon FIR through consultation with China and Japan.

Agenda Item 10: Review of the Terms of Reference (ToR) and Task List

Review of ToR and Task List – Sec (WP/06)

10.1. The paper presented the ToR and Action Items arising from ATMAS TF/4. The updated Action Item List by ATMAS TF/5 is provided in **Appendix F** of this report.

Agenda Item 11: Next Meeting and Any Other Business

ICAO Recommendations and Guidance on GNSS Vulnerability – Sec (WP/11)

11.1. 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 and airspace users (through IATA) to report GNSS occurrences to ICAO APAC Office using the reporting templates proposed by SRWG/8 and circulated through 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.

ADS-B Implementation Workshop – Sec (WP/12)

11.2. The paper presented the planning for an ADS-B Implementation Workshop to assist States with issues in the implementation of ADS-B including using ADS-B for surveillance separation. Noting the challenges faced by some States in implementing ADS-B based surveillance, ICAO ANB approved SIP fund for ADS-B Implementation Workshop for APAC. The Secretariat and the experts from Airways New Zealand have been preparing since then, a provisional agenda was reviewed by SURICG/9, HKCAD, CAAS, FAA committed to support the workshop, and the invitation for this 3-day hybrid event held in Bangkok, Thailand, from 14 –16 August 2024, has been circulated through State Letter Ref.: T8/5.14 – AP062/24 (CNS) in May 2024.

Date and Venue for the Next Meeting

11.3. Singapore would host the ATMAS TF/6 meeting in June 2025. The meeting appreciated the offer by Singapore and the Secretariat will coordinate with co-chairs and Singapore for the actual dates and venue then advise Member States/Administrations in due course.

Note of appreciation

11.4. Ms. Xie Yulan, Co-Chair of ATMAS TF, expressed thanks to all participants from Member States/Administrations for their active involvement and contribution in this task force. She summarized that the Seminars and Task Force meetings allowed Member States/Administrations to share insightful implementation experiences, introduce new technology in application, and foster a deeper comprehension of the future trajectory of the Air Traffic Management Automation System. Meanwhile, the Implementation and Operations Guidance Document has been finished drafting and continuously improved. These achievements also helped to enhance understanding and strengthen cooperation of APAC Member States/Administrations, which are in favor of implementing the ICAO APAC Seamless ATM Plan collaboratively and efficiently.

11.5. The ICAO Secretariat extended sincere gratitude to the leadership and ownership of the two Co-Chairs and the group, and expressed appreciation for the sponsorship of the Seminar and ATMAS TF/5 by Chengdu Civil Aviation Air Traffic Control Science and Technology Co. Ltd. (CDATC).

List of Participants

		STATE/NAME	TITLE/ORGANIZATION	E-MAIL	ATTENDANCE	
1.		**CAMBODIA (4)**			**SEMINAR**	**MEETING**
	1.	Mr. Anucha Kammong	Executive Adviser, AIM Director., Cambodia Air Traffic Services	kanucha@cats.com.kh;	✓	✓
	2.	Mr. Sivarak Chutipong	Director of Technical Development, Cambodia Air Traffic Services Co., Ltd.	sivarakc@cats.com.kh;	✓	✓
	3.	Ms. Phoumith Tith	Deputy Director ANS, State Secretariat of Civil Aviation – Cambodia	tphoumith9999@gmail.com;	✓	✓
	4.	Mr. Parinya Paiboolpoonpol	Senior Engineer of Technical Development, Cambodia Air Traffic Services Co., Ltd.	Prarinya.p@cats.com.kh;	✓	✓
2.		**CHINA (21)**				
	5.	Mr. Huo Zhenfei	Deputy Director of CNS Division, Air Traffic Management Bureau, CAAC	huozhenfei@atmb.net.cn;	✓	✓
	6.	Ms. Xie Yulan	Deputy Director, North China Regional Air Traffic Management Bureau, CAAC	xie_yulan@qq.com;	✓	✓
	7.	Ms. Cao Susu	Assistant of Safety Management Division, Air Traffic Management Bureau, CAAC	caosusu_atmb@qq.com;	✓	✓
	8.	Mr. Li Liang	Assistant of CNS Division, Air Traffic Management Bureau, CAAC	znliliang@atmb.net.cn;	✓	✓

	STATE/NAME		TITLE/ORGANIZATION	E-MAIL	ATTENDANCE	
	9.	Mr. Zhang Shuo	Senior Engineer, Technical Center of Air Traffic Management Bureau, CAAC	Zhangshuokexin@sina.com;	✓	✓
	10.	Ms. Liu Yawei	Senior Engineer, North China Regional Air Traffic Management Bureau, CAAC	liuyawei_natmb@qq.com;	✓	✓
	11.	Mr. Chen Yukun	Engineer, North China Regional Air Traffic Management Bureau, CAAC	cykjason0@gmail.com;	✓	✓
	12.	Ms. Wu Yingping	Senior Engineer, North China Regional Air Traffic Management Bureau, CAAC	abeany@sina.com;	✓	✓
	13.	Mr. Cao Ruoyu	Engineer, North China Regional Air Traffic Management Bureau, CAAC	cry7300@163.com;	✓	✓
	14.	Mr. Chai Xin	Engineer, North China Regional Air Traffic Management Bureau, CAAC	307288139@qq.com;	✓	✓
	15.	Mr. Wang Yingheng	Engineer, North China Regional Air Traffic Management Bureau, CAAC	AlanWang2018@outlook.com ;	✓	✓
	16.	Mr. Wang Wenhao	Senior Engineer, North China Regional Air Traffic Management Bureau, CAAC	475925001@qq.com;	✓	✓
	17.	Mr. Chen Weiqing	Project Manager of Equipment Maintenance Center, East China Regional Air Traffic Management Bureau, CAAC	cwq3545@163.com;	✓	✓

		STATE/NAME	TITLE/ORGANIZATION	E-MAIL	ATTENDANCE	
	18.	Mr. Li Yun Peng	Senior Engineer, East China Regional Air Traffic Management Bureau, CAAC	475935702@qq.com;	✓	✓
	19.	Mr. Niu ZhongWei	Senior Engineer, Middle South China Regional Air Traffic Management Bureau, CAAC	244541697@qq.com;	✓	✓
	20.	Mr. Yang Changjin	Engineer, Middle South China Regional Air Traffic Management Bureau, CAAC	872326669@qq.com;	✓	✓
	21.	Ms. Ruan Min	Senior Engineer, South West China Regional Air Traffic Management Bureau, CAAC	minerruan@163.com;	✓	✓
	22.	Mr. Gong Xinyu	Senior Engineer, South West China Regional Air Traffic Management Bureau, CAAC	26822445@qq.com;	✓	✓
	23.	Ms. Yuhua Xi	Deputy General Manager, Nanjing LES Information Technology Co., LTD	xi_yh@les.cn;	✓	✓
	24.	Mr. Hanwen Zhang	Senior Software Engineer, Nanjing LES Information Technology Co., LTD	zhang_hw@les.cn;	✓	✓
	25.	Mr. Guofeng Lin	Senior Software Engineer, Nanjing LES Information Technology Co., LTD	lin_gf@les.cn;	✓	✓
3.		**HONG KONG, CHINA (5)**				
	26.	Ms. Yumi TUNG	Electronics Engineer, Civil Aviation Department Hong Kong, China	yymtung@cad.gov.hk;	✓	✓

		STATE/NAME	TITLE/ORGANIZATION	E-MAIL	ATTENDANCE	
	27.	Ms. Ada LAU	Electronics Engineer, Civil Aviation Department, Hong Kong, China	antlau@cad.gov.hk;	✓	✓
	28.	Mr. Joey CHUNG	Evaluation Officer, Civil Aviation Department, Hong Kong, China	jhychung@cad.gov.hk;	✓	✓
	29.	Mr. Neil Tang	Evaluation Officer, Civil Aviation Department, Hong Kong, China	nkctang@cad.gov.hk;	✓	✓
	30.	Mr. Ronald Ka Chung Lam	Air Traffic Management Standards Officer, Civil Aviation Department, Hong Kong, China	rkclam@cad.gov.hk;	✓	✓
4.		**FIJI (2)**				
	31.	Mr. Peni Tikosaya Tubakibau	Team Coordinator - ATM Center, Fiji Airports	PeniT@fijiairports.com.fj;	✓	✓
	32.	Mr. Jared Wong	Team Leader – ANES, Fiji Airports	JaredW@fijiairports.com.fj;	✓	✓
5.		**INDIA (5)**				
	33.	Mr. Prince Paul	Deputy General Manager (ATM), Airport Authority of India	princepaul@aai.aero;	✓	✓
	34.	Mr. Chandan Kumar Samal	AGM ATSEP, Airports Authority of India	csamal@aai.aero;	✓	✓
	35.	Mr. Bibhuti Bhushan	AIR TRAFFIC SERVICE, Airports Authority of India (AAI)	bibhuti.jnu@gmail.com;	✓	✓
	36.	Mr. Yogesh Kumar	Joint General Manager (ATM), Airports Authority of India (AAI)	k.yogesh@aai.aero;	✓	✓

		STATE/NAME	TITLE/ORGANIZATION	E-MAIL	ATTENDANCE	
	37.	Ms. Lakshmi Chandala	Joint General Manager, National Institute of Aviation Management & Research, Airports Authority of India	lakshmica@aai.aero;	✓	✓
6.		**INDONESIA (5)**				
	38.	Mr. Justinus Aries Pancoro	ATC System and Service Facility Planning Junior Manager, AirNav Indonesia	justinus2208@gmail.com;	✓	✓
	39.	Mr. Lanang Wibisono	Planning of System and Service Facility Requirements, AirNav Indonesia	lanang.wibisono@gmail.com;	✓	✓
	40.	Ms. Mardiana Diri	Air Navigation Inspector, DGCA INDONESIA	dhy_en@yahoo.com;	✓	✓
	41.	Mr. Achmad Budi Fathoni	Air Navigation Inspector, DGCA Indonesia, Directorate of Air Navigation	bfathoni@yahoo.com;	✓	✓
	42.	Mr. Mohamad Ali Said	ATC Automation Facilities Readiness, Ministry of Transportation of Indonesia	mohamad.ali@airnavindonesia .co.id;	✓	✓
7.		**LAO PEOPLE'S DEM. REP. (3)**				
	43.	Ms. Sengmany PHENGSOMPHAN	Officer, Department of Civil Aviation of Lao People's Democratic Republic	sengmany.1@hotmail.com;	✓	✓
	44.	Mr. Kongla PHOMMAHANE	Radar, Lao Air Navigation Services (LANS)	phommahane.k@gmail.com;	✓	✓
	45.	Mr. Xaygnasith Xouymanivong	Chief of Vientiane Area Control Center, Lao Air Navigation Services (LANS)	xaygnasith@gmail.com;	✓	✓
8.		**MALAYSIA (4)**				

		STATE/NAME	TITLE/ORGANIZATION	E-MAIL	ATTENDANCE	
	46.	Mr. Sharudin Hashim	Principal Assistant Director, CAAM	sharudin@caam.gov.my;	✓	✓
	47.	Ms. Dayang Atiqah Abg Alli Abdul Rahman	Air Traffic Controller, Civil Aviation Authority of Malaysia (CAAM)	atiqah@caam.gov.my;	✓	✓
	48.	Mr. Mohd Shahril Abdul Razak	CNS-ATM Engineer, Civil Aviation Authority of Malaysia (CAAM)	mshahril@aat.my;	✓	✓
	49.	Mr. Kandasamy K Kumarasamy	Engineer, Civil Aviation Authority of Malaysia	kandasamy@novatis.com.my;	✓	✓
9.		**PAKISTAN (4)**				
	50.	Mr. Ali Mansoor	Senior Deputy Director ATS, Pakistan Civil Aviation Authority	Ali.Mansoor@caapakistan.com.pk;	✓	✓
	51.	Mr. Muhammad Asad khan Niazi	Joint Director CNS, Pakistan Civil Aviation Authority	innovative.one@hotmail.com;	✓	✓
	52.	Mr. Abdul Musawwer	Sr. Deputy Director (ATM), PAKISTAN Civil Aviation Authority - Ops. Directorate	Abdul.Musawwer@caapakistan.com.pk;	✓	✓
	53.	Mr. Muhammad IMran			✓	✓
10.		**PHILIPPINES (2)**				
	54.	Mr. Sonnel Malantic	ATMO V, Air Traffic Service - Civil Aviation Authority of the Philippines	enrouteradar24.7@gmail.com;	✓	✓
	55.	Mr. Gilmar Tiro	CNS Systems Officer, CAA PHILIPPINES	gilmar.tiro@gmail.com;	✓	✓
11.		**REPUBLIC OF KOREA (5)**				
	56.	Mr. SooHyoung Kim	Senior Manager, Incheon International Airport Corporation (IIAC)	soohyoung82@airport.kr;	✓	✓

		STATE/NAME	TITLE/ORGANIZATION	E-MAIL	ATTENDANCE	
	57.	Mr. Sanghyun Chun	Air Route Traffic Facility Center, Korea Airport Corporation	upstring@airport.co.kr;	✓	✓
	58.	Mr. Taehwan Kim	Air Navigation Facilities Department, Korea Airport Corporation	kth0206@airport.co.kr;	✓	✓
	59.	Mr. Gwangjin Lee	Air Navigation Facilities Division, Seoul Regional Office of Aviation, Ministry of Land, Infrastructure and Transport	acelkj@korea.kr;	✓	✓
	60.	Mr. Jinyoung Kim	Assistant Officer, Seoul Regional Office of Aviation, Ministry of Land, Infrastructure and Transport	kimjy7795@korea.kr;	✓	✓
12.		**SINGAPORE (4)**				
	61.	Mr. Hong Heng Lim	Senior Principal Engineer (Air Traffic Management Systems Platform Management), Civil Aviation Authority of Singapore	lim_hong_heng@caas.gov.sg;	✓	✓
	62.	Mr. Wee Jui Chua	Senior Chief (Operations Technology), Civil Aviation Authority of Singapore (CAAS)	joe_chua@caas.gov.sg;	✓	✓
	63.	Mr. Wilson Wee	Senior Air Traffic Control Manager (Operations Technology Planning), Civil Aviation Authority of Singapore (CAAS)	wilson_wee@caas.gov.sg;	✓	✓
	64.	Mr. Kwek Chin Lin	ATC Specialist (Systems Technology) 8, Civil Aviation Authority of Singapore (CAAS)	kwek_chin_lin@caas.gov.sg;	✓	✓

		STATE/NAME	TITLE/ORGANIZATION	E-MAIL	ATTENDANCE	
13.		**SRI LANKA (1)**				
	65.	Ms. Mihiri Kumari	Chief Electronics Engineer, Airport and Aviation Services (Sri Lanka) Ltd.	mihi.yapa@gmail.com;	✓	✓
14.		**THAILAND (8)**				
	66.	Mr. Phakanit Chaiyakam	Air Traffic Controller, Aeronautical Radio of Thailand Co., Ltd.	Torokomutsu@gmail.com;	✓	✓
	67.	Mr. Pattharasit Phankrawee	Engineer, AEROTHAI	phankrawee@gmail.com;	✓	✓
	68.	Ms. Sarinna Suwanrak	Air Traffic Engineering Manager, AEROTHAI, Aeronautical Radio of Thailand Ltd.	sarinna.si@aerothai.co.th;	✓	✓
	69.	Ms. Achiraya Dechanuntasin	Air Traffic Standards Division Officer, Civil Aviation Authority of Thailand (CAAT)	achiraya.d@caat.or.th;	✓	✓
	70.	Mr. Napatra Chuepan	Officer, Civil Aviation Authority of Thailand (CAAT)	napatra.c@caat.or.th;	✓	✓
	71.	Mr. Chavalit Ithiapa	Air Navigation Services Standards Senior Officer, The Civil Aviation Authority of Thailand	chavalit.i@caat.or.th;	✓	✓
	72.	Mr. Nattapol Witsuwat	CNS Officer, The Civil Aviation Authority of Thailand	nattapol.w@caat.or.th;	✓	✓
	73.	Mr. Sikarate Tarasak	Officer, The Civil Aviation Authority of Thailand (CAAT)	sikarate.t@caat.or.th;	✓	✓
15.		**USA (2)**				

		STATE/NAME	TITLE/ORGANIZATION	E-MAIL	ATTENDANCE	
	74.	Ms. Almira Ramadani	Sr ATO Representative for APAC, United States Federal Aviation Administration (FAA)	almira.ramadani@faa.gov;	✓	✓
	75.	Mr. Shayne Campbell	Senior International Air Traffic Representative Asia Pacific, United States Federal Aviation Administration (FAA)	shayne.a.campbell@faa.gov;	✓	✓
16.		**VIETNAM (4)**				
	76.	Mr. Nguyen Anh Nhan	Deputy Director of Central Department - Head of delegation	nhan_na76@yahoo.com;	✓	✓
	77.	Mr. Phan Tan Quang	Deputy Director of SORATS	quangtanp@gmail.com;	✓	✓
	78.	Mr. Ngo Huu Trinh	Deputy Director of NORATS' CNS Operations Center	trinhnh@vatm.vn;	✓	✓
	79.	Mr. Kien Nguyen Trung	Pans-ops Inspector, Civil Aviation of Vietnam	kiennt@caa.gov.vn;	✓	✓
17.		**EASA (1)**				
	80.	Mrs. Anne Senechal*	Senior ATM/ANS Expert, EASA	Anne.SENECHAL@easa.europa.eu;	✓	
18.		**EUROCAE (1)**				
	81.	Mr. Alex Milns*	Technical Programme Manager, EUROCAE	alex.milns@eurocae.net;	✓	
19.		**EUROCONTROL (1)**				

		STATE/NAME	TITLE/ORGANIZATION	E-MAIL	ATTENDANCE	
	82.	Mr. Alexander Engel*	Senior Expert Standardisation ASTERIX Manager EUROCAE Liaison EGSD/PCS/SCS/STAN, Eurocontrol	alexander.engel@eurocontrol.int;	✓	
20.		**IATA (1)**				
	83.	Mr. George Chan	Regulatory Affairs Manager - Operations and Industry, IATA	george_g_chan@cathaypacific.com;	✓	✓
21.		**CHENGDU CIVIL AVIATION AIR TRAFFIC CONTROL SCIENCE & TECHNOLOGY (CDATC) (5)**				
	84.	Mr. Zhenya Wu	General Manager,CDATC, CASRI	wuzhenya@cdatc.com;	✓	✓
	85.	Mr. Changbo Hou	Deputy General Manager, CDATC, CASRI	houchangbo@cdatc.com;	✓	✓
	86.	Mr. Jun Zhang	Senior Engineer, CDATC, CASRI	zhangjun@cdatc.com;	✓	✓
	87.	Mr. Xudong Zhang	Engineer, CDATC, CASRI	zhangxudong@cdatc.com;	✓	✓
	88.	Mr. Yi Wen	Engineer, CDATC, CASRI	wenyi@cdatc.com;	✓	✓
22.		**ICAO (1)**				
	89.	Mr. Luo Yi	Regional Officer CNS International Civil Aviation Organization Asia and Pacific Office	yluo@icao.int;	✓	✓

* Online Attendance

LIST OF WORKING, INFORMATION PAPERS AND PRESENTATIONS

WP/IP No.	Agenda	Subject	Presented by
WORKING PAPERS			
WP/01	1	Provisional Agenda	Secretariat
WP/02	2	Review of Relevant ICAO Meetings	Secretariat
WP/03	3	Global and Regional Updates on Related Issues	Secretariat
WP/04	5	Repository of the ATMAS in APAC	Secretariat
WP/05	7	Repository of AIDC Implementation Status in APAC	Secretariat
WP/06	10	Review of TOR and Task List	Secretariat
WP/07	2	Updates from RASMAG/28	Secretariat
WP/08	7	Review of Core AIDC Messages in AIDC Implementation and Operations Guidance Document (IGD) Based on Singapore's Implementation Experience	Singapore
WP/09	2	Outcomes of the Eleventh Meeting of Aeronautical Communication Services Implementation Coordination Group of APANPIRG (ACSICG/11)	Secretariat
WP/10	2	Outcomes of the Ninth Meeting of the Surveillance Implementation Coordination Group (SURICG/9)	Secretariat
WP/11	11	ICAO Recommendations and Guidance on GNSS Vulnerability	Secretariat
WP/12	11	ADS-B Implementation Workshop	Secretariat
WP/13	4	Considerations in Design of Integrated Arrival and Departure Manager for Hong Kong International Airport	Hong Kong China
WP/14	6	Updates to the Guidance Material of Implementation of ATM Automation System	China, Hong Kong China, Singapore
WP/15	8	AIDC Implementation Issue Report	India, Indonesia and Singapore
INFORMATION PAPERS			
IP/01	-	Meeting Bulletin	Secretariat

WP/IP No.	Agenda	Subject	Presented by
IP/02	4	Development of Incheon Arts for Second Stage of A-CDM Operation	Republic of Korea
IP/03	4	Optimizing Air Traffic Services in Papua Through Centralization of Services with New Integrated ATM Automation System	Indonesia
IP/04	4	Space-Based ADS-B Integration in Philippine ATM Automation System	Philippines
IP/05	4	Integration of Bataraza ADS-B Data in Philippines ATM Automation System	Philippines
IP/06	9	Progress and Plan of AIDC Implementation in the Republic of Korea	Republic of Korea
IP/07	4	Achieving Environmental Benefits Through Implementation of Wake Turbulence Group and Approach Spacing Tool at the Hong Kong International Airport	Hong Kong China
IP/08	4	The Application and Tuning of the MTCD Function for Enroute Control	China
IP/09	4	Implementation and Application of Data Exchange between ATM Information Systems	China
IP/10	4.5	The Container Application and Microservices Exploration of Air Traffic Management Automation System Servers	China
IP/11	4	Introduction to the Implementation of Cross Region ATFM Collaborative Platform	China
IP/12	4.1	Research on Interating Weather Radar Data into ATMAS	China
IP/13	4.5	Optimization of Arrival Management System Based on PBN	China
IP/14	4.5	The Requirements and Expectations of the Next-Generation ATMAS	China
IP/15	4.4	Integration of Airport Emergency Grid Map with Tower ATMAS	China
IP/16	7	AIDC Implementation Status in Manila FIR	Philippines
IP/17	4	Introduction of AIOPS Application in ATMAS	China
IP/18	4.5	Introduction of Function Design and Operation Mode of Tower ATM Automation System	China

WP/IP No.	Agenda	Subject	Presented by
IP/19	4.5	Test and Application of Wide Area Multilateration System in ATMAS	China
IP/20	7	Review of the Implementation and Experience of AIDC in China	China
IP/21	7	Progress of AIDC Implementation in Sri Lanka	Sri Lanka
IP/22	6	Better Automation Support to Display Position or Route to ATC When Deviating from a SID/STAR	Sri Lanka
LIST OF PRESENTATIONS – ATMAS SEMINAR			
SP/01		Experience Sharing of A-SMGCS Level IV Operation in Daxing International Airport	China
SP/02		Design and Implementation of the Integrated Cybersecurity Solution for ATMAS and Tower ATMAS	China
SP/03		Research on Key Technologies and Applications for Preventing Runway Incursions	China
SP/04		Application of Virtualisation Technology in Air Traffic Management Systems of CAAC	China
SP/05		Large Area ATM Automation System Analysis and Optimization	China
SP/06		Safety Operation and Intelligent Control Solutions for Major Airports	China
SP/07		EUROCAE Presentation	EUROCAE
SP/08			
SP/09		New regulatory framework with ATM/ANS equipment conformity assessment	EASA

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<table>
<tr><td colspan="2">The Seminar on Air Traffic Management Automation System

4 June 2024, Chengdu, China

SEMINAR PROGRAM</td></tr>
<tr><td>Time</td><td>Schedule</td></tr>
<tr><td>08:30-09:00</td><td>Registration</td></tr>
<tr><td>09:00-09:30</td><td><u>Session 1</u> Opening
• Opening Remarks by Mr. Li Qiguo, DDG of ATMB
• Opening Remarks by Mr. Luo Yi, RO CNS, ICAO APAC Office
• Opening Remarks by Mr. Kwek Chin Lin, Co-Chair of the ATMAS TF
• Administrative Information
Group Photo
Note:
1) Please use <u>IP/01- Meeting Bulletin</u> for guidance to join the meeting.
2) Download <u>meeting documents</u> before meeting start.</td></tr>
<tr><td>09:30-10:20</td><td>Tea/Coffee Break</td></tr>
<tr><td>10:20-12:00</td><td><u>Session 2</u>
• Introduction of Participants

Moderators: Mrs. Xie Yulan, co-chairs of ATMAS TF

Presentation 1: Experience Sharing of A-SMGCS IV operation in Daxing International Airport
Mr. Xin CHAI, Mr. Yaodong SONG, Mr. Xiaoyu CHEN
ATMB

Presentation 2: Design and implementation of the integrated cyber-security solution for ATMAS and Tower ATMAS
Mr. Xinyu GONG
ATMB

Presentation 3: Safety Operation and Intelligent Control Solutions for Large Airports_
Dr. Jianhua GUO, Dr. Jing LI, Mr. Zhi YANG, Mr. Yi WEN
The Second Research Institute of CAAC</td></tr>
<tr><td>12:00-13:00</td><td>Lunch Break</td></tr>
<tr><td>13:00-14:00</td><td><u>Session 3</u>

Moderators: Mr. Kwek Chin Lin, co-chairs of ATMAS TF

Presentation 4: Application of Virtualisation Technology in Air Traffic Management Systems of CAAC
Mr. Hanwen ZHANG
Nanjing LES Information Technology, nominated by ATMB

Presentation 5: Large Area ATM Automation System Analysis and Optimization
Mr. Baojun WEI, Mr. Yingheng WANG, Ms. Yuanli WANG
Air Traffic Management Bureau (ATMB), China

Presentation 6: Research on Key Technologies and Applications for Preventing Runway Incursions</td></tr>
</table>

	Mr. Weiqing CHEN, Ms. Xuedi ZHAO, Mr. Yunpeng Li *ATMB*
14:00-14:30	**Tea/Coffee Break**
14:30-16:00	**Session 4** ***Moderators*: *Mrs. Xie Yulan, co-chairs of ATMAS TF*** **Presentation 7:** *Surveillance and Automation provisions* *Mr. Alex Milns, Technical Programme Manager* *EUROCAE* *Mr. Alexander Engel, ASTERIX Manager* *EUROCONTROL* **Presentation 8:** *ASTERIX Status* *Mr. Alexander Engel, ASTERIX Manager* *EUROCONTROL* **Presentation 9:** *ATM Certification Framework* *Mrs. SENECHAL Anne , Senior ATM/ANS Expert* *EASA*
!7:30-19:30	**Welcome Dinner hosted by ATMB**

Explanation of the Table of ATMAS Status in APAC Region

Note: If the ATM Automation System has the capability on certain function listed below but not implement yet, please marked in red ; if the ATM Automation System has already implemented certain function listed below, please keep it in black.

Column	Element	Explanation	Reference Chapter in ATMAS IGD	Relevant ASBU Block
1.	State/Administration	Name of the State/Administration		
2.	FIR	Name of the Flight Information Region (FIR)		
3.	ATS Unit / Location	Location of the ATM Automation System		
4.	Number of ATS positions	Number of ATS positions in this ATM Automation System (to evaluate the system workload)		
5.	Manufacturer / Brand / Version	Manufacturer / Brand / Version of the system		
6.	System Status	the system is used as Main, Backup, or Emergency		
7.	Surveillance Data Processing Function (SDP)	Surveillance data can be processed by the system, including PSR, Mode A/C, Mode S, ADS-B, WAM, or others	Chapter 3.1.1 & 3.2.1	ASUR B0/1, ASUR B0/2
8.	Bypass Surveillance Data Processing （BSDP）	BSDP is a redundancy module of SDP, which can independently receive, process and distribute surveillance data independently to SDP. When the SDPs fail, the system will switch to BSDP automatically. When the system switches to bypass mode, the HMI should clearly indicate if controller is working in BSDP mode.	Chapter 3.1.3	
9.	Flight Data Communication Network	Type of Flight Data Communication Network used by the system (AFTN, AMHS, or both)		COMI B0/7
10.	Flight Data Processing Function (FDP)	The system can support flight data processing, including Flight Message Processing, Life Cycle Management, 4D Profile Trajectory Caculation, SSR Code Management, Sector Management and Posting Computation	Chapter 3.1.2	
11.	Flight Strip	The system can support print Paper Flight Progress Strip, display Electronic Flight Strip, or both		
12.	Mode S conspicuity code Identification	The flight plan with A1000 will use a 24-bit address or ACID to correlate with system tracks, and warnings/alerts should not be generated when SSR duplication occurs due to Mode S conspicuity code.	Chapter 3.1.2.4	

Column	Element	Explanation	Reference Chapter in ATMAS IGD	Relevant ASBU Block
13.	Correlation of surveillance and flight data	The system can perform an automatic correlation between the flight plan and the system track based on the SSR code, aircraft 24-bit address, or Aircraft Identification (ACID)	Chapter 3.1.4 & 3.2.2	ASUR-B0/3
	Safety Net Function	Essential alerts or warnings can be generated automatically		
14.	Emergency code warning (7500,7600,7700)	Once the emergency codes were received, the system is suggested to process it and display the Emergency on the concerned positions.	Chapter 3.1.5.2	
15.	Short Term Conflict Alert (STCA)	The system will provide a separation alert for a potential or actual infringement of separation minima between aircraft as basic STCA, using aircraft intent parameters (Selected Flight Level), considering ATC practices (level-off prediction test and turn prediction test).	Chapter 3.1.5.3	SNET-B0/1 & SNET-B1/1 & SNET-B1/2
16.	Minimum Safe Altitude Warning (MSAW)	The system will assist controllers with alerts of the potential risk of an aircraft infringing a defined minimum safe altitude over a concerned region.	Chapter 3.1.5.4	SNET-B0/2
17.	Area Proximity Warning (APW)	The system will alert controllers of any potential or actual unauthorized penetration of aircraft into Special Use Airspaces (SUA).	Chapter 3.1.5.5	SNET-B0/3
18.	Approach Path Monitoring (APM) Warning	The system will monitor the aircraft's vertical and lateral deviation from the final approach profile in ATMAS, and generate visual and/or aural alerts when an aircraft exceeds or is predicted to exceed the defined tolerance of deviation.	Chapter 3.1.5.6	SNET-B0/4
19.	Route Adherence Monitoring (RAM)	The system will monitor if an aircraft (i.e., surveillance track) is following the planned route, as stated in the associate flight plan.	Chapter 3.2.3.4	FRTO B0/4
20.	Cleared Level Adherence Monitoring (CLAM)	The system will monitor the conformance of the Actual Flight Level (AFL) of an aircraft to the Cleared Flight Level (CFL) issued by the air traffic controller and provide warnings if the deviation between the two levels (i.e. Level Bust) was found after the aircraft has been level-off.	Chapter 3.2.3.5	FRTO B0/4

Column	Element	Explanation	Reference Chapter in ATMAS IGD	Relevant ASBU Block
21.	Meteorological Information Processing	The system is capable of receiving, processing, and displaying meteorological information, including GRIB, QNH, and weather data derived from mono-radar, or other	Chapter 3.1.6	AMET
22.	Air Ground Data Link Function (AGDL)	The AGDL function mainly processes the information based on the data link communication, including ADS-C (Automatic Dependent Surveillance-Contract), CPDLC (Controller-Pilot Data Link Communication), and DCL (Departure Clearance).	Chapter 3.1.7	COMS
23.	System Parameter Management Function	The system is capable of managing the variable system parameters through a user/ops orientated adaptation interface used by trained adaptors.	Chapter 3.1.8	
24.	ATS Inter-facility Data Communication Function (AIDC)	The system can support ATS-related information exchanges within the ATMAS of adjacent Control Units and Flight Information Regions adopted in the Asia-Pacific region, including Handover and Coordination	Chapter 3.1.9	FICE B0/1
25.	Human Machine Interface Function (HMI)	Operational users can monitor air traffic situations and modify flight plans and other relevant information through physical peripherals and/or onscreen control interfaces.	Chapter 3.1.10	
26.	Recording and Playback Function	The system has the basic, enhancement, none, or both recording and playback function.	Chapter 3.1.11 & 3.2.8	
27.	System Monitoring and Control Function	The system can provide the monitoring and controlling function, and the failure of the monitoring and controlling function should not affect the operation of other modules.	Chapter 3.1.12	
28.	GNSS Time Synchronization	The system can synchronize with the external GNSS signals or not	Chapter 3.1.13	
	Extended Alerts and Warning			
29.	Departure No Transgression Zone (DTZ)	The DTZ function informs the controller if a track is predicted to infringe a Departure No Transgression Zone area within a predefined time interval, or has already infringed a Departure No Transgression Zone area. The DTZ function also may suppress improper STCA generate between two normal flights in DMA (Departure Monitoring Area).	Chapter 3.2.3.1	

Column	Element	Explanation	Reference Chapter in ATMAS IGD	Relevant ASBU Block
30.	No Transgression Zone (NTZ)	The system will warn controllers of a predicted or actual unauthorized penetration of NTZ by aircraft during final approach.	Chapter 3.2.3.2	
31.	Medium Term Conflict Detection Warning (MTCD)	The system will provide warnings to controllers for potential conflict for "aircraft-to aircraft" or "aircraft-to-airspace" encounters up to a looking ahead time.	Chapter 3.2.3.3	FRTO B0/4
32.	Similar Callsign Advisory (SCA)	The system will provide advisory to alert controllers when an aircraft carries a similar callsign with another one in the same jurisdiction controlled by a controller.	Chapter 3.2.3.6	
33.	Reduce Vertical Separation Minimum (RVSM) Warning	The system will provide alerts to controllers when a non-RVSM approved/compliant aircraft is within or is predicted to enter RVSM airspace.	Chapter 3.2.3.7	
34.	Position Report Monitoring (PMON)	The system will monitor ATO/ETO and provide warnings to controllers accordingly.	Chapter 3.2.3.8	
35.	Last Known Position Display	Last Known Position Display occurs when correlated tracks, uncorrelated, or ADS-C tracks with critical alerts are lost.	Chapter 3.2.3.9	
36.	SSR Inconsistency Warning	For correlated flight plan tracks, when the Mode 3/A code in the surveillance data is inconsistent with the SSR code in the flight plan, the system is suggested to raise ASSR Inconsistency Warning.	Chapter 3.2.3.10	
37	PBN Capability Indication	The system will provide PBN indicator and/or PBN route mismatch indication for controllers in order to indicate whether the aircraft match the RNAV/RNP Route or Arrival.	Chapter 3.2.3.11	APTA
38	Downlink Aircraft Parameters Processing and Display	The system have the capability to process and display aircraft downlink aircraft parameters (DAPs) in Track Fusion, Related Warnings, or Downlink Data Window	Chapter 3.2.4	ASUR-B0/3
39	Integrated Technology	the system has integrated some new technologies, including Arrival Manager (AMAN), Departure Manager (DMAN), or Enhanced Wake Turbulence Separation and Pairwise Separation Tools, or None	Chapter 3.2.5 & 3.2.6 & 3.2.9	RSEQ, WAKE

Column	Element	Explanation	Reference Chapter in ATMAS IGD	Relevant ASBU Block
40	System Log Management	The system is able to collect and manage operational logs and error messages.	Chapter 3.2.7	
41	Interoperability	The system supports exchange messages with other external systems, including Integrated Tower System, A-SMGCS, Tower Electronic Strip System, Others, or None, to implement information sharing		SURF, SWIM
42	Operational Data Synchronization	The system can synchronize operational data to the backup system when in master mode, including flight data, operational setting data.	Chapter 3.2.10	
43	Statistics and Analysis Function	The system can generate reports on the surveillance data, flight plan, alarm information and traffic flow data.	Chapter 3.2.11	
44	Remarks	Any other need to be mentioned		

ATM Automation System Repository in APAC Region

													Safety Net Function															Extended Alerts and Warning															
State/Administration	FIR	ATS Unit / Location	Number of ATS positions	Manufacturer / Brand / Version	System Status	Surveillance Data Processing Function (SDP)	Bypass Surveillance Data Processing (BSDP)	Flight Data Communication Network	Flight Data Processing Function (FDP)	Flight Strip	Mode S conspicuity code Identification	Correlation of surveillance and flight data	Emergency code warning (7500,7600,7700)	Short Term Conflict Alert (STCA)	Minimum Safe Altitude Warning (MSAW)	Area Proximity Warning (APW)	Approach Path Monitoring (APM) Warning	Route Adherence Monitoring (RAM)	Cleared Level Adherence Monitoring (CLAM)	Meteorological Information Processing	Air Ground Data Link Function (AGDL)	System Parameter Management Function	ATS Inter-facility Data Communication Function (AIDC)	Human Machine Interface Function (HMI)	Recording and Playback Function	System Monitoring and Control Function	GNSS Time Synchronization	Departure No TRANSGRESSION Zone (DTZ)	No Transgression Zone (NTZ)	Medium Term Conflict Detection Warning (MTCD)	Similar Callsign Advisory (SCA)	Reduce Vertical Separation Minimum (RVSM) Warning	Position Report Monitoring (PMON) Warning	Last Known Position Display	SSR Inconsistency Warning	PBN Capability Indication	Downlink Aircraft Parameters Processing and Display	Integrated Technology	System Log Management	Interoperability	Operational Data Synchronization Function	Statistics and Analysis Function	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
AFGHANISTAN																																											
AUSTRALIA																																											
BANGLADESH																																											
BHUTAN																																											
BRUNEI DARUSSALAM																																											
CAMBODIA	Phnom Penh FIR	ACC, APP/ Phnom Penh	14	THALES / TopSky-ATC	Main	PSR+Mode A/C+Mode S+ADS-B+WAM	No	AFTN+AMHS	Flight Message Processing+ Life Cycle Management+ 4D Profile Trajectory+ SSR Code	Paper	No	SSR code+24-bit Address+ACID	Yes	Basic+ATC practices	Yes	Yes	Yes	Yes	Yes	QNH	None	Offline	Basic+Handover+Coordination	Yes	Basic+Enhancemen	Monitor+Control	Yes	No	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Track Fusion+Related Warnings+Downlink Data Window	None	Yes	None	operational setting data	Yes	Statistic - only Flight statistic is available
	Phnom Penh FIR	ACC, APP/ Phnom Penh TWR	4	THALES / TopSky-ATC	Emergency	PSR+Mode A/C+Mode S+ADS-B+WAM	No	AFTN+AMHS	Flight Message Processing+ Life Cycle Management+ 4D Profile Trajectory+ SSR Code	Paper	No	SSR code+24-bit Address+ACID	Yes	Basic+ATC practices	Yes	Yes	Yes	Yes	Yes	QNH	None	Offline	Basic+Handover+Coordination	Yes	Basic+Enhancemen	Monitor+Control	Yes	No	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Track Fusion+Related Warnings+Downlink Data Window	None	Yes	None	operational setting data	Yes	Statistic - only Flight statistic is available
CHINA	China FIR	China	1382	THALES(EUROCAT-X), INDRA(AIRCORN), Nanjing Les(Numen), CDATC(AirNet), Best(SkyNet-X)	Main+Backup	PSR+Mode A/C+Mode S+ADS-B+WAM	Yes	AFTN+AMHS	Flight Message Processing+ Life Cycle Management+ 4D Profile Trajectory+ SSR Code Management+Sec Manage&Posting Comput	Paper+Electronic	No	SSR code+24-bit Address+ACID	Yes	Basic+Aircraft Intention+ATC practices	Yes	Yes	Yes	Yes	Yes	Flight data+Surveillance data	ADS-C+CPDLC+DCL	Online+Offline	Basic+Handover+Coordination	Yes	Basic+Enhancement	Monitor+Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Track Fusion+Related Warnings+Downlink Data Window	AMAN	Yes	Integated Tower System+A-SMGCS+ Tower Electronic Strip System	flight data+ operational setting data	Yes	
HONG KONG, CHINA	Hong Kong FIR	Hong Kong	113	Raytheon	Main+Backup+Ultimate backup	PSR+Mode A/C+Mode S+ADS-B+WAM	Yes	AFTN+AMHS	Flight Message Processing+ Life Cycle Management+ 4D Profile Trajectory+ SSR Code Management+Sec Manage&Posting Comput	Electronic	Yes	SSR code+24-bit Address+ACID	Yes	Basic+ATC practices	Yes	Yes	Yes	Yes	Yes	QNH+mono-radar	ADS-C+CPDLC+DCL	Online+Offline	Basic+Handover+Coordination	Yes	Basic+Enhancement	Monitor+Control	Yes	No	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Track Fusion+Related Warnings+Downlink Data Window	AMAN	Yes	Tower Electronic Strip System	flight data	Yes	
MACAO, CHINA																																											
COOK ISLANDS																																											
DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA																																											
FIJI	NFFF	ACC/NADI	8	ADACEL Aurora Alpha	Main	PSR+Mode A/C+Mode S+ADS-B	Yes	AFTN+AMHS	Flight Message Processing+ Life Cycle Management+ 4D Profile Trajectory+ SSR Code Management+Sec Manage&Posting Comput	Paper+Electronic	Yes	SSR code+24-bit Address+ACID	Yes	Basic+Aircraft Intention+ATC practices	Yes	Yes	No	Yes	Yes	QNH+mono-radar+GRIB	ADS-C+CPDLC	Online+Offline	Basic+Handover+Coordination	Yes	Basic+Enhancement	Monitor+Control	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Track Fusion+Related Warnings+Downlink Data Window	None	Yes	Tower Electronic Strip System	flight data+ operational setting data	No	
FRANCE FRENCH POLYNESIA NEW CALEDONIA																																											
INDIA																																											
INDONESIA	JATSC	JATSC	60	COMSOFT / PRISMA	Main	PSR+Mode A/C+Mode S+ADS-B	Yes	AFTN	Flight Message Processing+ Life Cycle Management+ SSR Code Management+Sec Manage&Posting Comput	Paper	Yes	SSR code+24-bit Address+ACID	Yes	Basic+Aircraft Intention	Yes	Yes	Yes	Yes	Yes	QNH	CPDLC	Offline	Basic	Yes	Basic	Monitor	Yes	No	No	No	No	No	Yes	Yes	Yes	Yes	Track Fusion	None	Yes	tegated Tower System+A-SMG	flight data+ operational setting data	No	
	MATSC	MATSC	46	THALES / TOPSKY	Main	PSR+Mode A/C+Mode S+ADS-B	Yes	AFTN	Flight Message Processing+ Life Cycle Management+ 4D Profile Trajectory+ SSR Code Management+Sec Manage&Posting Comput	Paper+Electronic	Yes	SSR code+24-bit Address+ACID	Yes	Basic+ATC practices	Yes	Yes	Yes	Yes	Yes	QNH+mono-radar+GRIB	ADS-C+CPDLC	Online+Offline	Basic+Handover+Coordination	Yes	Basic+Enhancement	Monitor+Control	Yes	No	No	Yes	No	Yes	Yes	Yes	Yes	Yes	None	None	Yes	Integated Tower System	flight data	Yes	
JAPAN																																											
KIRIBATI																																											
LAO PEOPLE'S DEMOCRATIC REPUBLIC	Vientiane FIR	Vientiane ACC	25	Thales Topsky (EUROCAT-C)	Main	PSR+Mode A/C+Mode S+ADS-B	No	AFTN+AMHS	SSR Code Management	Paper	Yes	SSR code+24-bit Address	Yes	Basic	Yes	Yes	Yes	Yes	Yes	QNH+mono-radar+GRIB	ADS-C+CPDLC	Offline	Basic+Handover+Coordination	Yes	Basic+Enhancement	Monitor+Control	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Track Fusion+Related Warnings	None	Yes	Integated Tower System	flight data+ operational setting data	Yes	
	Vientiane FIR	Vientiane ACC	25	Thales Topsky (EUROCAT-C)	Backup	Mode A/C+Mode S+ADS-B	No	AFTN+AMHS	SSR Code Management	Paper	Yes	SSR code+24-bit Address	Yes	Basic	Yes	Yes	Yes	Yes	Yes	QNH+mono-radar+GRIB	ADS-C+CPDLC	Offline	Basic+Handover+Coordination	Yes	Basic+Enhancement	Monitor+Control	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Track Fusion+Related Warnings	None	Yes	Integated Tower System	flight data+ operational setting data	Yes	
MALAYSIA	KLFIR	KL ACC/Kuala Lumpur	50	Leonardo SpA	Main	PSR+Mode A/C+Mode S+ADS-B+WAM	Yes	AFTN+AMHS	Flight Message Processing+ Life Cycle Management+ 4D Profile Trajectory+ SSR Code Management+Sec Manage&Posting Comput	Paper+Electronic	Yes	SSR code+24-bit Address+ACID	Yes	Basic+Aircraft Intention+ATC practices	Yes	Yes	Yes	Yes	Yes	QNH+mono-radar+GRIB	ADS-C+CPDLC+DCL	Online+Offline	Basic+Handover+Coordination	Yes	Basic+Enhancement	Monitor+Control	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Track Fusion+Related Warnings+Downlink Data Window	AMAN+DMAN	Yes	Integated Tower System+A-SMGCS+ Tower Electronic Strip System	flight data+ operational setting data	Yes	
	KLFIR	KL ACC/Kuala Lumpur	34	Leonardo SpA	Backup	PSR+Mode A/C+Mode S+ADS-B+WAM	Yes	AFTN+AMHS	Flight Message Processing+ Life Cycle Management+ 4D Profile Trajectory+ SSR Code Management+Sec Manage&Posting Comput	Paper+Electronic	Yes	SSR code+24-bit Address+ACID	Yes	Basic+Aircraft Intention+ATC practices	Yes	Yes	Yes	Yes	Yes	QNH+mono-radar+GRIB	ADS-C+CPDLC+DCL	Online+Offline	Basic+Handover+Coordination	Yes	Basic+Enhancement	Monitor+Control	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Track Fusion+Related Warnings+Downlink Data Window	AMAN+DMAN	Yes	Integated Tower System+A-SMGCS+ Tower Electronic Strip System	flight data+ operational setting data	Yes	
	KLFIR	KL ACC/Kuala Lumpur	29	Leonardo SpA	Emergency	PSR+Mode A/C+Mode S+ADS-B+WAM	Yes	None	None	Paper+Electronic	No	SSR code+24-bit Address+ACID	Yes	NO	No	No	No	No	No	mono-radar	None	Online+Offline	None	Yes	Basic+Enhancement	Monitor+Control	Yes	No	No	No	No	No	No	No	No	No	None	None	Yes	Integated Tower System	flight data+ operational setting data	Yes	
	KKFIR	KK ACC/ Kota Kinabalu	63	THALES	Main	PSR+Mode A/C+Mode S+ADS-B	Yes	AFTN+AMHS	Flight Message Processing+ Life Cycle Management+ 4D Profile Trajectory+ SSR Code Management+Sec Manage&Posting Comput	Paper+Electronic	Yes	SSR Code+24-bit Address+ACID	Yes	Basic+Aircraft Intention+ATC practices	Yes	Yes	Yes	Yes	Yes	QNH+mono-radar+GRIB	ADS-C+CPDLC+DCL	Online + Offline	Basic+Handover+Coordination	Yes	Basic+Enhancement	Monitor + Control	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Track Fusion+Related Warnings+Downlink Data Window	AMAN+DMAN	Yes	Integated Tower System+A-SMGCS+ Tower Electronic Strip System	flight data+ operational setting data	Yes	
	KKFIR	KCH ACC/ Kuching	47	THALES	Backup	PSR+Mode A/C+Mode S+ADS-B	Yes	AFTN+AMHS	Flight Message Processing+ Life Cycle Management+ 4D Profile Trajectory+ SSR Code Management+Sec Manage&Posting Comput	Paper+Electronic	Yes	SSR Code+24-bit Address+ACID	Yes	Basic+Aircraft Intention+ATC practices	Yes	Yes	Yes	Yes	Yes	QNH+mono-radar+GRIB	ADS-C+CPDLC+DCL	Online + Offline	Basic+Handover+Coordination	Yes	Basic+Enhancement	Monitor + Control	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Track Fusion+Related Warnings+Downlink Data Window	AMAN+DMAN	Yes	Integated Tower System+A-SMGCS+ Tower Electronic Strip System	flight data+ operational setting data	Yes	
MALDIVES																																											
MARSHALL ISLANDS																																											
MICRONESIA (FEDERATED STATE OF)																																											
MONGOLIA																																											
MYANMAR																																											
NAURU																																											
NEPAL																																											
	NZZC	All/Christchurch+Auckland	132	Leidos Sky-X	Main	PSR+Mode A/C+Mode S+ADS-B+WAM	Yes	AFTN+AMHS	Flight Message Processing+ Life Cycle Management+ 4D Profile Trajectory+ SSR Code Management+Sec Manage&Posting Comput	Paper+Electronic	Yes	SSR code+24-bit Address+ACID	Yes	Basic+ATC practices	Yes	Yes	Yes	Yes	Yes	QNH+mono-radar+GRIB	CPDLC+DCL	Online+Offline	Basic+Handover+Coordination	Yes	Basic+Enhancement	Monitor+Control	Yes	No	Yes	No	No	Yes	Yes	No	Yes	Yes	Track Fusion+Related Warnings	AMAN	Yes	Tower Electronic Strip System	flight data+ operational setting data	Yes	Current ATMS Live Nov 2023

ATM Automation System Repository in APAC Region

													Safety Net Function															Extended Alerts and Warning															
State/Administration	FIR	ATS Unit / Location	Number of ATS positions	Manufacturer / Brand / Version	System Status	Surveillance Data Processing Function (SDP)	Bypass Surveillance Data Processing (BSDP)	Flight Data Communication Network	Flight Data Processing Function (FDP)	Flight Strip	Mode S conspicuity code Identification	Correlation of surveillance and flight data	Emergency code warning (7500,7600,7700)	Short Term Conflict Alert (STCA)	Minimum Safe Altitude Warning (MSAW)	Area Proximity Warning (APW)	Approach Path Monitoring (APM) Warning	Route Adherence Monitoring (RAM)	Cleared Level Adherence Monitoring (CLAM)	Meteorological Information Processing	Air Ground Data Link Function (AGDL)	System Parameter Management Function	ATS Inter-facility Data Communication Function (AIDC)	Human Machine Interface Function (HMI)	Recording Playback Function	System Monitoring and Control Function	GNSS Time Synchronization	Departure No TRANSGRESSION Zone (DTZ)	No Transgression Zone (NTZ)	Medium Term Conflict Detection Warning (MTCD)	Similar Callsign Advisory (SCA)	Reduce Vertical Separation Minimum (RVSM) Warning	Position Report Monitoring (PMON) Warning	Last Known Position Display	SSR Inconsistency Warning	PBN Capability Indication	Downlink Aircraft Parameters Processing and Display	Integrated Technology	System Log Management	Interoperability	Operational Data Synchronization Function	Statistics and Analysis Function	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
New Zealand	NZZO	AKL Oceanic ACC/ Auckland	2	Adacel OCS	Main		No	AFTN+AMHS	Flight Message Processing+ Life Cycle Management+ 4D Profile Trajectory+ SSR Code Management+Sec Manage&Posting Comput	Electronic	No	Yes	Yes	No	No	No	No	No	No	GRIB	FANS1/A CPDLC + ADS-C		Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	No	No	Yes	No	No	Yes	No	Yes	Yes	OCS is an automated procedural Oceanic system with appropriate functionality for this function. Functionality includes: Long Term Conflict Detection (LTCD), Procedural Conformance Monitoring (Route, Level, and time), display and correlation of pre-processed PSR,SSR, ADS-B, WAM track data, 4D profile calculation appropriate to a procedural environment including upper lower level, and lateral deviation protection. The new Asia/Pac ATMAS IGD and this document does not adequately cover the requirements for procedural based oceanic control ATM.
PAKISTAN	OPKR	ACC/KARACHI	18 SDD	INDRA Aircon 2100	Main	PSR+Mode A/C+Mode S	Yes	AFTN+AMHS	Flight Message Processing+ Life Cycle Management+ 4D Profile Trajectory+ SSR Code Management+Sec Manage&Posting Comput	Paper+Electronic	No	SSR code+ACID	Yes	Basic+ATC practices	Yes	Yes	No	Yes	Yes	QNH+mono-radar	None	Online+Offline	Basic+Handover+Coordination	Yes	Basic	Monitor+Control	Yes	No	No	Yes	Yes	Yes	No	No	Yes	No	Track Fusion+Related Warnings+Downlink Data Window	None	Yes	None	None	No	7 - ADS-B data could not be integrated with ATM in Asterix Category-21. MLAT is not available at ACC JIAP. 8 - No safety alerts in Bypass SDP 21 - Auto GRIB support n/a 22- ADS-C and CPDLC are not available at ACC JIAP 26 - Synchoronized Replay of multiple CWP is not available. Screen capture file format is not supported by non-proprietary softwares. The video recording data is NOT available common video formats. Synchronized replay mode does not support change in replay speed, forward, etc. 27 - Export of logs by time on USB or on any other media is not available , however, print option is available. 38 - Resolution Advisory (RA) alert indication NOT AVAILABLE
	OPLR	ACC Lahore	21	INDRA Aircon 2100	Main	PSR+Mode A/C+Mode S	Yes	AFTN+AMHS	Flight Message Processing+ Life Cycle Management+ 4D Profile Trajectory+ SSR Code Management+Sec Manage&Posting Comput	Paper+Electronic	No	SSR code+ACID	Yes	Basic+ATC practices	Yes	Yes	No	Yes	Yes	QNH+mono-radar	None	Online+Offline	Basic+Handover+Coordination	Yes	Basic	Monitor+Control	Yes	No	No	Yes	No	Yes	No	No	Yes	No	Track Fusion+Related Warnings+Downlink Data Window	None	Yes	None	None	No	For Downlink Aircraft Parameters Processing and Display Limited DAP Related Warnings capability exist i.e. 24 Bit Code and Call Sign Mismatch Warnings
	OPLR	ACC IIAP	21	SiATM	Main	PSR+Mode A/C+Mode S+ADS-B	Yes	AFTN+AMHS	Flight Message Processing+ Life Cycle Management+ 4D Profile Trajectory+ SSR Code Management+Sec Manage&Posting Comput	Paper+Electronic	Yes	SSR code+ACID	Yes	Basic+Aircraft Intention+ATC practices	Yes	Yes	Yes	Yes	Yes	QNH+mono-radar	CPDLC	Online+Offline	Basic+Handover+Coordination	Yes	Basic+Enhancement	Monitor+Control	Yes	No	No	Yes	No	Yes	No	Yes	Yes	Yes	Track Fusion+Related Warnings+Downlink Data Window	AODB / ACDM	Yes	Integated Tower System+Tower Electronic Strip System	None	No	MSAW is not implemented due operational limitation.
PALAU																																											
PAPUA NEW GUINEA																																											
Philippines	Manila FIR	ACC/APP/Manila	38	Thales/TopSky ATC/HE	Main	PSR+Mode A/C+Mode S+ADS-B+WAM	Yes	AFTN	Flight Message Processing+ Life Cycle Management+ 4D Profile Trajectory+ SSR Code Management+Sec Manage&Posting Comput	None	Yes	SSR code+24-bit Address+ACID	Yes	Basic	Yes	Yes	Yes	Yes	Yes	QNH+mono-radar+GRIB	ADS-C+CPDLC	Offline	Basic+Handover+Coordination	Yes	Basic	Monitor+Control	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Track Fusion	AMAN	Yes	Integated Tower System	flight data+ operational setting data	Yes	Initial Assesment
REPUBLIC OF KOREA	INCHEON FIR	Seoul APP/Incheon Incheon TWR/Incheon Gimpo TWR/Gimpo	41	INDRA Aircon 2100	Main	PSR+Mode A/C+Mode S+ADS-B	Yes	AFTN	Flight Message Processing+ Life Cycle Management+ 4D Profile Trajectory+ SSR Code Management+Sec Manage&Posting Comput	Electronic	No	SSR code+ACID	Yes	Basic+Aircraft Intention	Yes	Yes	Yes	Yes	Yes	QNH+mono-radar+GRIB	None	Online+Offline	Basic+Handover	Yes	Basic+Enhancement	Monitor+Control	Yes	No	Yes	No	No	No	Yes	Yes	Yes	Yes	Track Fusion+Related Warnings+Downlink Data Window	AMAN+DMAN	Yes	Tower Electronic Strip System	flight data+ operational setting data	Yes	
	INCHEON FIR	Seoul APP/Incheon Incheon TWR/Incheon Gimpo TWR/Gimpo	41	INDRA Aircon 2100	Backup	PSR+Mode A/C+Mode S+ADS-B	No	AFTN	Flight Message Processing+ Life Cycle Management+ 4D Profile Trajectory+ SSR Code Management+Sec Manage&Posting Comput	Electronic	No	SSR code+ACID	Yes	Basic+Aircraft Intention	Yes	Yes	Yes	Yes	Yes	QNH+mono-radar+GRIB	None	Online+Offline	None	Yes	Basic+Enhancement	Monitor+Control	Yes	No	Yes	No	No	No	Yes	Yes	Yes	Yes	Track Fusion+Related Warnings+Downlink Data Window	AMAN+DMAN	Yes	Tower Electronic Strip System	flight data+ operational setting data	Yes	
	INCHEON FIR	DAEGU ACC/ DAEGU	70	Leidos/SKYLINE/V 6.0	Main	PSR+Mode A/C+Mode S+ADS-B	Yes	AFTN+AMHS	Flight Message Processing+ Life Cycle Management+ 4D Profile Trajectory+ SSR Code Management+Sec Manage&Posting Comput	Paper+Electronic	Yes	SSR code+24-bit Address	Yes	Basic	Yes	No	No	Yes	Yes	QNH+mono-radar+GRIB	ADS-C+CPDLC+DCL	Online+Offline	Basic+Handover+Coordination	Yes	Basic+Enhancement	Monitor+Control	Yes	No	No	Yes	No	Yes	No	Yes	Yes	No	Track Fusion	None	Yes	None	flight data+ operational setting data	Yes	
	INCHEON FIR	INCHEON ACC/INCHEON	70	Leidos/SKYLINE/V 6.0	Main	PSR+Mode A/C+Mode S+ADS-B	Yes	AFTN+AMHS	Cycle Management+ 4D Profile Trajectory+ SSR Code Management+Sec Manage&Posting	Paper+Electronic	Yes	SSR code+24-bit Address	Yes	Basic	Yes	No	No	Yes	Yes	QNH+mono-radar+GRIB	ADS-C+CPDLC+DCL	Online+Offline	Basic+Handover+Coordination	Yes	Enhancement	Monitor+Control	Yes	No	No	Yes	No	Yes	No	Yes	Yes	No	Track Fusion	None	Yes	None	flight data+ operational setting data	Yes	
	INCHEON FIR	BUSAN	18	SKYCONTOL ATM	Main	PSR+Mode A/C+Mode S	Yes	AFTN+AMHS	Cycle Management+ 4D Profile Trajectory+ SSR Code Management+Sec Manage&Posting	Paper+Electronic	Yes	SSR code+24-bit Address+ACID	Yes	Basic+Aircraft Intention+ATC practices	Yes	Yes	Yes	Yes	Yes	QNH+mono-radar	None	Offline	None	Yes	Enhancement	Monitor+Control	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Track Fusion+Related Warnings+Downlink Data Window	None	Yes	Integated Tower System+A-SMGCS+ Tower Electronic Strip System	flight data+ operational setting data	Yes	
	INCHEON FIR	JEJU	4	TERN TAATAS-2010	Main	PSR+Mode A/C+Mode S	Yes	AFTN+AMHS	Flight Message Processing	Paper	Yes	SSR code+24-bit Address	Yes	Basic	Yes	Yes	Yes	Yes	Yes	QNH+mono-radar	None	Online+Offline	None	Yes	Basic	Monitor+Control	Yes	No	No	No	No	No	No	No	No	No	None	None	Yes	None	None	No	
	INCHEON FIR	JEJU	3	TERN MTAATAS-2010	Backup	PSR+Mode A/C+Mode S	Yes	AFTN+AMHS	Flight Message Processing	Paper	Yes	SSR code+24-bit Address	Yes	Basic	Yes	Yes	Yes	Yes	Yes	QNH+mono-radar	None	Online+Offline	None	Yes	Basic	Monitor+Control	Yes	No	No	No	No	No	No	No	No	No	None	None	Yes	None	None	No	
SAMOA																																											
SINGAPORE	WSJC	Singapore	60	THALES LORADS III	Main+ Backup	PSR+Mode A/C+Mode S+ADS-B+WAM	Yes	AFTN+AMHS	Flight Message Processing+ Life Cycle Management+ 4D Profile Trajectory+ SSR Code Management+Sec Manage&Posting Comput	Paper+Electronic	Yes	SSR code+24-bit Address+ACID	Yes	Basic+Aircraft Intention+ATC practices	Yes	Yes	No	Yes	Yes	QNH+mono-radar	ADS-C+CPDLC+DCL	Online+Offline	Basic+Handover+Coordination	Yes	Basic+Enhancement	Monitor+Control	Yes	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Track Fusion+Related Warnings+Downlink Data Window	AMAN+DMAN+AST	Yes	Integated Tower System+A-SMGCS+ Tower Electronic Strip System	flight data+ operational setting data	Yes	
SOLOMON ISLANDS																																											
SRI LANKA	VCCF	ACC/Colombo	17	INTELCAN SKYCONTROL	Main	PSR+Mode A/C+Mode S+ADS-B	No	AFTN+AMHS	Flight Message Processing+ Life Cycle Management+ 4D Profile Trajectory+ SSR Code Management+Sec Manage&Posting Comput	Paper+Electronic	Yes	SSR code+24-bit Address+ACID	Yes	Basic+Aircraft Intention+ATC practices	Yes	Yes	Yes	Yes	Yes	QNH	ADS-C+CPDLC	Online+Offline	Basic	Yes	Basic+Enhancement	Monitor+Control	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Track Fusion+Related Warnings+Downlink Data Window	AMAN	Yes	Integated Tower System	flight data+ operational setting data	Yes	
	VCCF	Approach Control Center / BIA	14	Thales Topsky	Backup	PSR+Mode A/C+Mode S+ADS-B+WAM	Yes	AFTN+AMHS	Flight Message Processing+ Life Cycle Management+ 4D Profile Trajectory+ SSR Code Management+Sec Manage&Posting Comput	Paper+Electronic	Yes	SSR code+24-bit Address+ACID	Yes	Basic+Aircraft Intention+ATC practices	Yes	Yes	Yes	Yes	Yes	QNH+mono-radar+GRIB	ADS-C+CPDLC+DCL	Online+Offline	Basic+Handover+Coordination	Yes	Basic+Enhancement	Monitor+Control	Yes	No	No	Yes	No	Yes	No	Yes	Yes	Yes	Track Fusion+Related Warnings+Downlink Data Window	AMAN+DMAN	Yes	Tower Electronic Strip System	flight data+ operational setting data	Yes	This ATM system is currently available under Trial Operations.
	VCCF	Approach Control Center / BIA	6	Selex TRDP	Main	PSR+Mode A/C	Yes	AFTN	Flight Message Processing	Paper+Electronic	No	SSR code	Yes	Basic	Yes	Yes	Yes	No	No	QNH	None	Online+Offline	None	Yes	Basic	Monitor+Control	Yes	No	No	No	No	Yes	No	Yes	Yes	No	None	None	Yes	Integated Tower System	flight data+ operational setting data	No	This system is to be decommissioned in 3 months, after completing trial operations of Thales Topsky system.
	BANGKOK	BACC / Bangkok		Thales / TopSky-ATC / V 20.2.9.0	Main	PSR+Mode A/C+Mode S+ADS-B+WAM	Yes	AMHS	Flight Message Processing+ Life Cycle Management+ 4D Profile Trajectory+ SSR Code Management+Sec Manage&Posting Comput	None	No	SSR code+24-bit Address+ACID	Yes	Basic	Yes	Yes	Yes	Yes	Yes	QNH	None	Online+Offline	Basic	Yes	Enhancement	Monitor+Control	Yes		No	Yes		Yes	Yes	Yes	Yes		Track Fusion+Related Warnings+Downlink Data Window	AMAN	Yes	None	None	Yes	Mode A/C+Mode S+ADS-B
	BANGKOK	BACC / Bangkok		Thales / TopSky-ATC / V 20.2.9.0	Emergency	PSR+Mode A/C+Mode S+ADS-B+WAM	Yes	AMHS	Flight Message Processing+ Life Cycle Management+ 4D Profile Trajectory+ SSR Code Management+Sec Manage&Posting Comput	Electronic	No	SSR code+24-bit Address+ACID	Yes	Basic	Yes	Yes	Yes	Yes	Yes	QNH	None	Online+Offline	Basic	Yes	Enhancement	Monitor+Control	Yes		No	Yes		Yes	Yes	Yes	Yes	Yes	Track Fusion+Related Warnings+Downlink Data Window	AMAN	Yes	None	None	No	Mode A/C+Mode S+ADS-B

ATM Automation System Repository in APAC Region

													Safety Net Function															Extended Alerts and Warning															
State/Administration	FIR	ATS Unit / Location	Number of ATS positions	Manufacturer / Brand / Version	System Status	Surveillance Data Processing Function (SDP)	Bypass Surveillance Data Processing (BSDP)	Flight Data Communication Network	Flight Data Processing Function (FDP)	Flight Strip	Mode S conspicuity code Identification	Correlation of surveillance and flight data	Emergency code warning (7500,7600,7700)	Short Term Conflict Alert (STCA)	Minimum Safe Altitude Warning (MSAW)	Area Proximity Warning (APW)	Approach Path Monitoring (APM) Warning	Route Adherence Monitoring (RAM)	Cleared Level Adherence Monitoring (CLAM)	Meteorological Information Processing	Air Ground Data Link Function (AGDL)	System Parameter Management Function	ATS Inter-facility Data Communication Function (AIDC)	Human Machine Interface Function (HMI)	Recording and Playback Function	System Monitoring and Control Function	GNSS Time Synchronization	Departure No TRANSGRESSION Zone (DTZ)	No Transgression Zone (NTZ)	Medium Term Conflict Detection Warning (MTCD)	Similar Callsign Advisory (SCA)	Reduce Vertical Separation Minimum (RVSM) Warning	Position Report Monitoring (PMON) Warning	Last Known Position Display	SSR Inconsistency Warning	PBN Capability Indication	Downlink Aircraft Parameters Processing and Display	Integrated Technology	System Log Management	Interoperability	Operational Data Synchronization Function	Statistics and Analysis Function	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
THAILAND	BANGKOK	BAPP / Suvarnabhumi		Thales / TopSky-ATC / V 20.2.9.0	Main		Yes	AMHS	Flight Message Processing+ Life Cycle Management+ 4D Profile Trajectory+ SSR Code Management+Sec Manage&Posting Comput	None	No	SSR code+24-bit Address+ACID	Yes		Yes	Yes		Yes		QNH		Online+Offline	Basic	Yes	Enhancement	Monitor+Control	Yes		No	Yes		Yes	Yes	Yes	Yes	Yes	Track Fusion+Related Warnings+Downlink Data Window	AMAN+DMAN+PST	Yes	Integated Tower System	None	Yes	PSR+Mode A/C+Mode S+ADS-B
	BANGKOK	BAPP / Suvarnabhumi		Thales / TopSky-ATC / V 20.2.9.0	Main		Yes	AMHS	Flight Message Processing+ Life Cycle Management+ 4D Profile Trajectory+ SSR Code Management+Sec Manage&Posting Comput	None	No	SSR code+24-bit Address+ACID	Yes							QNH		Online+Offline	Basic	Yes	Enhancement	Monitor+Control	Yes		No	Yes		Yes	Yes	Yes	Yes	Yes	Track Fusion+Related Warnings+Downlink Data Window	AMAN+DMAN+PST	Yes	Integated Tower System	None	Yes	PSR+Mode A/C+Mode S+ADS-B
	BANGKOK	CMAP / Chiangmai		Thales / TopSky-Tower	Main					Electronic				Basic									Basic	Yes								Yes				Yes				Tower Electronic Strip System			
	BANGKOK	CMAP / Chiangmai		Thales / TopSky-Tower	Emergency					Electronic													Basic	Yes								Yes				Yes		None		Tower Electronic Strip System			
	BANGKOK	PUAP / Phuket		Thales / TopSky-Tower	Main					Electronic													Basic	Yes								Yes				Yes		None		Tower Electronic Strip System			
	BANGKOK	PUAP / Phuket		Thales / TopSky-Tower	Emergency					Electronic													Basic	Yes								Yes				Yes		None		Tower Electronic Strip System			
	BANGKOK	HYAP / HatYai		Thales / TopSky-Tower	Emergency					Electronic													Basic									Yes				Yes		None		Tower Electronic Strip System			
	BANGKOK	HYAP / HatYai		Thales / TopSky-Tower	Emergency					Electronic													Basic	Yes								Yes				Yes		None		Tower Electronic Strip System			
	BANGKOK	STRT / Suratthanee		Thales / TopSky-Tower	Main					Electronic													Basic	Yes								Yes				Yes		None		Integated Tower System+A-SMGCS			
	BANGKOK	KSRT / Koh Samui		Thales / TopSky-Tower	Main					Electronic													Basic	Yes								Yes				Yes				Integated Tower System+A-SMGCS			
	BANGKOK	UDRT / Udonrathanee		Thales / TopSky-Tower	Main					Electronic	No												Basic	Yes	Enhancemen							Yes				Yes				Integated Tower System+A-SMGCS			
	BANGKOK	DMRT / Donmuang		Thales / TopSky-Tower	Main					Electronic													Basic	Yes		Monitor +Control	Yes		No	Yes		Yes	Yes	Yes	Yes		Track Fusion+Related Warnings+Downlink Data		Yes	Integated Tower System+A-SMGCS	None	Yes	Mode A/C+Mode S+ADS-B
	BANGKOK	BAPP / Suvarnabhumi		Thales / TopSky-Tower	Main					Electronic													Basic	Yes					No	Yes		Yes	Yes	Yes	Yes	Yes	Track Fusion+Related Warnings+Downlink Data	AMAN+DMAN+PST	Yes	Integated Tower System			
	BANGKOK	BAPP / Suvarnabhumi		Thales / TopSky-Tower	Emergency					Electronic													Basic	Yes					No	Yes		Yes	Yes	Yes	Yes		Track Fusion+Related Warnings+Downlink Data		Yes	Integated Tower System+A-SMGCS+ Tower Electronic			
TIMOR LESTE																																											
TONGA																																											
TUVALU																																											
VANUATU																																											
UNITED STATES	Anchorage Oceanic	Anchorage, Alaska	10	Cisco C220 M4	Main		Yes	AFTN+NAS	Flight Message Processing+ Life Cycle Management+ 4D Profile Trajectory+ SSR Code Management+Sec Manage&Posting Comput	Paper+ Electronic	Yes	SSR code+24-bit Address+ACID	Yes	Basic	Yes	Yes	Yes	Yes	Yes	QNH+mono-radar+GRIB	ADS-C+CPDLC	Online+Offline	Basic+Handover+Coordination	Yes	Yes	Monitor +Control	Yes			Yes	Yes	Yes	Yes	Yes	Yes	No			Yes		Yes (synchronized redundant channel is available)	Yes	
	Oakland Oceanic	Oakland, California	20	Cisco C220 M4	Main		Yes	AFTN+NAS	Flight Message Processing+ Life Cycle Management+ 4D Profile Trajectory+ SSR Code Management+Sec Manage&Posting Comput	Paper+ Electronic	Yes	SSR code+24-bit Address+ACID	Yes	Basic	Yes	Yes	Yes	Yes	Yes	QNH+mono-radar+GRIB	ADS-C+CPDLC	Online+Offline	Basic+Handover+Coordination	Yes	Yes	Monitor +Control	Yes			Yes	Yes	Yes	Yes	Yes	Yes	No			Yes		Yes (synchronized redundant channel is available)	Yes	
UNITED STATES																																											
VIET NAM																																											

State/Administration	Last updated	Meeting	History
Afghanistan			
Australia			
Bangladesh			
Brunei Darussalam			
Bhutan			
Cambodia	6/29/2023	ATMAS TF/4	
China	6/13/2024	ATMAS TF/5	
Hong Kong, China	6/9/2022	ATMAS TF/3	
Macau China			
Cook Islands			
Democratic People's Republic of Korea			
France (New Caledonia, French Polynesia, and Wallis & Futuna)			
Fiji	12/16/2022	AP139/22 (CNS)	
India			
Indonesia	6/13/2024	ATMAS TF/5	
Lao PDR	6/11/2024	ATMAS TF/5	3/7/2023
Japan			
Kiribati			
Malaysia	4/3/2023	AP139/22 (CNS)	
Maldives			
Marshall Islands			
Micronesia (Federated States of)			
Mongolia			
Myanmar			
Nauru			
Nepal			
New Zealand	2/28/2024		2/22/2023
Pakistan	11/29/2022	AP139/22 (CNS)	
Papua New Guinea			
Palau			
Philippines	6/29/2023	ATMAS TF/4	
Republic of Korea	1/19/2023	AP139/22 (CNS)	
Samoa			
Solomon Islands			
Singapore	6/2/2022	ATMAS TF/3	
Sri Lanka	2/28/2023	AP139/22 (CNS)	
Tonga			
Thailand	5/31/2023	AP139/22 (CNS)	3/3/2023
Tuvalu			
Timor LESTE			
United States	6/17/2024	ATMAS TF/5	
Vanuatu			
Viet Nam			

INTERNATIONAL CIVIL AVIATION ORGANIZATION
ASIA AND PACIFIC OFFICE

AIR TRAFFIC MANAGEMENT AUTOMATION SYSTEM

IMPLEMENTATION AND OPERATIONS GUIDANCE DOCUMENT

Edition 1.4-June 2024

AMENDMENTS

The issue of amendments is announced, when an amendment has been agreed by a meeting of the ICAO Asia/Pacific Air Traffic Management Automation System Task Force (APAC ATMAS TF). The space below is provided to keep a record of such amendment.

RECORD OF AMENDMENTS

Amendment Number	Date	Amended by	Comments
0.0	Feb 2020	China	The framework of this document is firstly work out by China.
0.1	Sep 2021	China, Hong Kong China, Philippines	First completed draft based on the agreed document framework in ATMAS TF/1 for review and comment by States
1.0	Jun 2022	China, Singapore, Hong Kong China, New Zealand, Pakistan, United States	Revised the draft according to the inputs from States.
1.3	Jun 2023	China, Hong Kong China， Singapore, New Zealand, The Philippines	Add chapter 5 System Readiness.
1.4	Jun 2024	China, New Zealand, Hong Kong China，Singapore,	Add some subsections 3.2.3.12 CFL Predicted Detection Advisory 3.2.4.2 DAPs Related Warnings d.QNH Mismatch Warning 4.8.3 Suggested Cyber Security Devices Configuration 5.1 Site Acceptance

TABLE OF CONTENTS

ACRONYMS AND ABBREVIATIONS

ADS-B	Automatic Dependent Surveillance - Broadcast
ADS-C	Automatic Dependent Surveillance - Contract
ADEXP	ATS Data Exchange Presentation
AFTN	Aeronautical Fixed Telecommunications Network
AIDC	ATS Inter-facility Data Communication
AGDL	Air Ground Data Link
AMAN	Arrival Manager
ANSP	Air Navigation Service Provider
APP	Approach Center
APM	Approach Path Monitoring
APW	Area Proximity Warning
A-SMGCS	Advanced Surface Movement Guide Control System
AST	Approach Spacing Tool
ASTERIX	All-purpose Structured EUROCONTROL Radar Information Exchange Protocol
ATC	Air Traffic Control
ATFM	Air Traffic Flow Management
ATM	Air Traffic Management
ATMAS	Air Traffic Management Automation System
ATO	Actual Time Over
ATS	Air Traffic Service
ATSU	Air Traffic Service Unit
AWOS	Automatic Weather Observation System
BSDP	Bypass Surveillance Data Processing
CA	Conflict Alert
CFL	Cleared Flight Level
CLAM	Cleared Level Adherence Monitoring
CPDLC	Controller-Pilot Data Link Communications
CRC	Cyclic Redundancy Check
CWP	Controller Working Position
DAP	Downlink Aircraft Parameter
DBS	Distance-based Spacing
DCL	Data Link Departure Clearance
DMAN	Departure Management
DPM	Departure Path Monitoring
ELDT	Estimated Landing Time
ETO	Estimated Time Over
ETO	Expected Time Over
EUROCONTROL	European Organization for the Safety of Air Navigation
FAA	Federal Aviation Administration
FDP	Flight Data Processing
FIR	Flight Information Region
GNSS	Global Navigation Satellite System

GRIB	Processed Meteorological Data in the Form of Grid Point Values Expressed in Binary Form
HMI	Human Machine Interface
ICAO	International Civil Aviation Organization
ICD	Interface Control Document
LAN	Local Area Network
METAR	Aerodrome Routine Meteorological Report(in Meteorological Code)
MSAW	Minimum Safe Altitude Warning
MSP	Maintenance Service Provider
MTCD	Medium Term Conflict Detection
NTP	Network Time Protocol
NTZ	No Transgression Zone
PBN	Performance Based Navigation
PCA	Predicted Conflict Alert
PDC	Pre-Departure Clearance
PMON	Position Report Monitoring
PSR	Primary Surveillance Radar
QNH	Altimeter Sub-scale Setting to Obtain Elevation When on the Ground
RAM	Route Adherence Monitoring
RVSM	Reduced Vertical Separation Minimum
SCA	Similar Callsign Advisory
SDP	Surveillance Data Processing
SID	Standard Instrument of Departure
SMAN	Surface Management
SMD	Software Management Department
SP	System Supplier
SPI	Special Position Identification
SSR	Secondary Surveillance Radar
STAR	Standard instrument Arrival
STCA	Short Term Conflict Alert
TBS	Time-based Spacing
TLDT	Target Landing Time
UTC	Universal Time Coordinated
VSP	Variable System Parameter
WAM	Wide Area Multilateration

1. INTRODUCTION

1.1 Purpose

Since the Air Navigation Conference held in 2012, ICAO has been exploiting a global roadmap in the Aviation System Block Upgrades (ASBU) under its Global Air Navigation Plan (GANP), with a focus on harmonization and interoperability leading to a global Air Traffic Management (ATM) system.

Following the framework of GANP and the timeline of ASBU, the Asia/Pacific Seamless ATM Plan was adopted by the 24th Meeting of the Asia/Pacific Planning and Implementation Regional Group (APANPIRG/25) in 2013. It defines goals and the means of meeting State planning objectives for a Regional seamless ATM performance framework, focusing on technological and human performance.4

To facilitate and harmonize the provision of robust, safe, efficient and orderly ATM services in the region, it is considered necessary to develop regional guidance materials with recommendations on the development and implementation of Air Traffic Management Automation System (ATMAS).

This Air Traffic Management Automation System Implementation and Operations Guidance Document (ATMAS IGD) provides guidance for the planning, design, testing, and implementation of the ATMAS in the Asia and Pacific Regions, with the purpose of ensuring continuous and coherent development of the ATMAS that is harmonized with adjacent regions.

The system requirements and operational procedures for the ATMAS are detailed in the relevant States' projects and AIP. This ATMAS IGD is intended to provide guidelines on the primary and the most important function as well as performance requirements of the ATMAS, based on the operations and maintenance practices.

1.2 Background

1.2.1 ATM Operational Concept

The global ATM operational concept presents the ICAO vision of an integrated, harmonized, and globally interoperable ATM system. The planning horizon is up to and beyond 2025. The baseline against which the significance of the changes proposed in the operational concept may be measured is the global ATM environment in 2000.

Vision Statement
To achieve an interoperable global air traffic management system, for all users during all phases of flight, that meets agreed levels of safety, provides for optimum economic operations, is environmentally sustainable and meets national security requirements.

While the operational concept is visionary and even challenging, many current practices and processes will continue to exist through the planning horizon. In this sense, this operational concept document should be seen as evolutionary.

A key point to note is that the operational concept, to the greatest extent possible, is independent of technology; that is, it recognizes that within a planning horizon of more than twenty years, much of the technology that exists or is in development today may change or cease to exist. This operational concept has therefore been developed to stand the test of time.

Air Traffic Management Air traffic management is the dynamic, integrated management of air traffic and airspace — safely, economically and efficiently — through the provision of facilities and seamless services in collaboration with all parties.

1.2.2 ATM System and Its Sub-system

The objective of ATM is to provide safe, economic, efficient, and dynamic management of air traffic and airspace that includes Air Traffic Service (ATS), Air Traffic Flow Management (ATFM), and Airspace Management (ASM), as shown in Figure 1.2.2-1.

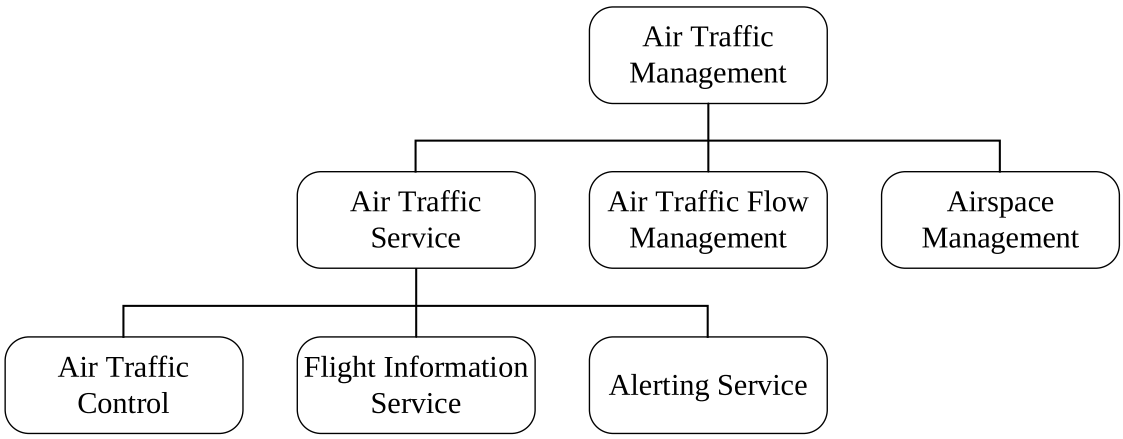


Figure 1.2.2-1 Composition of air traffic management

ATS is the central part of ATM, which includes Air Traffic Control (ATC), Flight Information Service (FIS), and Alerting Service (ALRS).

The Objective of:

a. ATC is to prevent collisions between aircraft and, on the maneuvering area, collisions between aircraft and obstructions. ATC also expedites and maintains the orderly flow of traffic.

b. FIS is to give advice and information useful for the safe and efficient conduct of flights.

c. ALRS is to notify appropriate organizations regarding aircraft in need of search and rescue aid, and assist such organizations as required.

1.2.3 Concept of ATMAS

The ATMAS mentioned in this document is mainly applied in ATC service, and offers assistance for ALRS and ATFM. It comprises a group of processing sub-systems dedicated to specific functions, which are integrated as one air traffic management system to provide functional capabilities to air traffic controllers in the Area Control Centers (ACC), Approach Control Unit, and Aerodrome Control towers. The ATMAS helps controllers keep conformance monitoring, hazard monitoring, and assuring safety separation to air traffic flow.

The ATMAS has a modular design and distributed architecture to ensure robustness under adverse operating conditions. The modularity enables modifications to the baseline product to be made with relative ease. The principle of distributed processing ensures the safe, uninterrupted provision of Air Traffic Services by controllers.

All processing and display sub-systems are interconnected via high-capacity redundant LANs. Computers providing common services (e.g., Flight Data Processing) may be duplicated, with each computer connected to each LAN providing a high degree of redundancy. Fail safe operation of the dual computer groups is achieved by multiple computation redundancy (parallel operation of the computer), or hot stand-by redundancy, to provide uninterrupted service to the controllers.

Typically, considering the safety and redundancy requirements, the ATMAS has two individual LANs, which are called working LANs, where the redundancy computers are connected. The working LANs keep sharing information and function as main and fallback modes. Air traffic control airspace with high-density traffic is recommended to use a third LAN, which is called service LAN. The latter’s primary function is system trace collection, handling of recording and playback, etc.

1.2.4 Challenges and Solutions

Considering the framework for global ATM roadmap requirements and the current world situation, ATMAS is facing the following challenges:

a. The challenge for States to implement technologies as prescribed in the GANP and ASBU timeframes particularly is innovative concepts such as 4D trajectory and seamless ATM across FIRs. The seamless ATM Plan requires the individual ATMAS sharing a common set of accurate information in a timely manner, which needs to interface with each other seamlessly and work interoperability.

b. Traditional ATMAS procurement processes deliver systems that are not COTS but a baseline of core function and subsequent accumulation of bespoke design for previous ANSP applications. As the system functions and features continue to develop, the system is getting more and more complex. These cause long software/application development and practically, in most cases, these functions/features are seldom used. Consequently, the system is getting hard to maintain and costly to deploy.

c. Increase scrutiny of costs for ANSPs due to various reasons, including airspace user scrutiny, public oversight into spending, or constrained national budgets due to local or regional economic events. Significantly, public health emergencies have a devastating impact on the economy and the aviation industry worldwide. It will not be surprising that the ICAO member states, including those in the APAC Region, must reappraise both their capital and operational expenses (CAPEX and OPEX) in the coming years, including the expenditure in the ATMAS.

To overcome the above challenges, it is important to come up with the ATMAS IGD that will provide the main functions and performances which is aimed at facilitating the implementation or provision of the robust, safe, efficient ATM automation systems. This will help the APAC region member states/CAAs/ANSPs to have an ATM automation system that shares common/core functions/performances while achieving seamless interoperability rather than investing more on CAPEX/OPEX to cope with future increase in air traffic. It is relatively more important to put focus on:

a. application of new/innovative technologies that would help make good business cases,

b. incorporating baseline/key optional features into their system design at an early stage, and

c. preparing for system completion affecting changes during low air traffic periods before full traffic recovery.

1.2.5 Outcomes and Endorsements

To ensure continuous and coherent development of the ATM automation systems harmonized with adjacent regions to enhance systems interoperability, and to keep abreast of the latest developments in ASBU and ATM automation systems, topics pertaining to ATMAS have been focusing and discussing in APAC Region since 2018.

The ICAO Asia Pacific Regional ATMAS Symposium (APAC RATMS) held in Nanjing, China, from 22 to 23 November 2018 successfully addressed Action Item 54/13 of 54th DGCA Conference on ATMAS where it also suggested for States/Administrations to consider establishment of a regional working group/task force under the ICAO CNS Sub-group of APANPIRG to deal with matters arisen from this symposium concerning ATM automation systems. The symposium agreed to formulate an action item for the 23rd meeting of CNS Sub-group in 2019 to review and consider whether such regional working group/task force is needed.

The SURICG/4 was held in Nanjing, China from 9 to 12 April 2019. The meeting reviewed and further discussed the outcomes of the ICAO APAC Regional ATMAS Symposium (APAC RATMS) and other SURICG/4 papers relevant to ATMAS, and endorsed the draft Decision of **"Draft Decision SURICG/4/5-Establishment of ATM Automation System Working Group (ATMAS/WG)"** for consideration by CNS SG.

The Twenty Third Meeting of the Communications, Navigation and Surveillance Sub-group (CNS SG/23) of Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG) held at the ICAO Regional Office, Bangkok, Thailand, from 2 to 6 September 2019 considered the report of SURICG/4 with some other CNS SG/23 working papers and noted that a briefing on the proposal on establishing a working group to deal with ATMAS issue was also provided to ATM SG/7 meeting. Several States/Administrations expressed their willingness to support the work of the Task Force, including China, Hong Kong China, India, Indonesia, Nepal, Singapore, Thailand, and the USA. Hence, the meeting adopted the **"Decision CNS SG/23/13 (SURICG/4/5) - Establishment of ATM Automation System Task Force (ATMAS/TF)"**.

APANPIRG/30 meeting that was held from 4-6 November 2019 at ICAO APAC Office, Bangkok, Thailand. The APANPIRG/30 meeting noted with appreciation the work done and achievements by the CNS SG and the contributory bodies reporting to APANPIRG through the

SG pertaining to ATMAS. The panel noted that CNS SG/23 meeting had adopted 9 Conclusions and 4 Decisions on technical and operational matters, including the **"Decision CNS SG/23/13 (SURICG/4/5) Establishment of the Asia/Pacific ATM Automation System Task Force (ATMAS/TF)"**.

1.3 Arrangement of ATMAS IGD

This ATMAS IGD consists of the following parts:

Section 1	Introduction
Section 2	Reference Documents
Section 3	System Functional Baseline
Section 4	System Design
Section 5	System Readiness
Section 6	System Transition
Section 7	System Maintenance

1.4 Document History and Management

The framework of this document was first introduced in the first Working Group Meeting of ATMAS Task Force (ATMAS TF/1) video conference, which was held in October 2020. The Meeting agreed to further develop based on the proposed framework into a complete document for approval as a regional guidance document. A working team consisting of volunteers from China, Hong Kong-China, India, Japan, Malaysia, Philippines, Singapore, Thailand, and Vietnam was established during the Meeting to contribute to document's content. In August 2021, the completed draft of this document was ready for circulation among States for review and comment.

This document aims to supplement SARPs, PANS and relevant provisions contained in ICAO documentation, and it will be regularly updated to reflect evolving conditions. To support the ICAO in making specific recommendations and developing guidance materials, such as minimum functional/performance requirements and additional/local requirements, which aim at facilitating the implementation or provision of robust, safe, efficient, and orderly ATM services by the use of existing and/or new procedures, facilities, and technologies concerning ATMAS.

1.5 Copies

Paper copies of this ATMAS IGD are not distributed. Controlled and endorsed copies can be found at the following website: http://www.icao.int/APAC/Pages/edocs.aspx.

Copy may be freely downloaded from the website or by sending an email of request to APANPIRG through the ICAO Asia and Pacific Regional Office.

1.6 Changes to ATMAS IGD

Whenever a user identifies a need for a change to this document, a Request for Change (RFC) Form (refer to Appendix A) should be completed and submitted to the ICAO Asia and Pacific Regional Office. This form may be photocopied as required, emailed, faxed, or emailed to ICAO Asia and Pacific Regional Office +66 (2) 537-8199 or APAC@icao.int. The Regional Office will collate RFCs for consideration by the ICAO Communications, Navigation, Surveillance (CNS) Sub-group of APANPIRG.

When an amendment has been agreed by a meeting of the ICAO CNS Sub-group of PANPIRG, then a new version of the ATMAS IGD will be prepared, with the changes marked by an "|" in the margin, and an endnote indicating the relevant RFC for the traceability of the change. If the change is in a table cell, the outside edges of the table will be highlighted, for example, as follows.

Final approval for publication of an amendment to the ATMAS IGD will be the responsibility of APANPIRG.

1.7 Editing Conventions

（Intentionally blank）

2. REFERENCE DOCUMENTS

Id	Name of the document	Edition	Date	Origin	Domain
1	Annex 2 - Rules of the Air	10th Edition	2005	ICAO	
2	Annex 12 - Search and Rescue	8th Edition,	July 2004	ICAO	
3	Annex 11 — Air Traffic Services	15th Edition	2018	ICAO	
4	Annex 17 - Security	10th Edition	2017	ICAO	
5	PANS-ATM, or Procedures for Navigation Services – Air Traffic Management (DOC 4444)	16th Edition (Amendment 9 dated 5/11/20)	2020	ICAO	
6	Global Air Navigation Plan (GANP) (Doc 9750)	6th Edition	2020	ICAO	
7	Global Air Traffic Management Operational Concept (Doc 9854)	First Edition	2005	ICAO	
8	Manual on Air Traffic Management System Requirements (Doc 9882)	First Edition	2008	ICAO	
9	Manual on Global Performance of the Air Navigation System (ICAO Doc 9883)	First edition	2009	ICAO	
10	Doc 10031 Guidance on Environmental Assessment of Proposed Air Traffic Management Operational Changes	First edition	2014	ICAO	
11	Restricted—Air Traffic Management Security Manual(Doc 9985)	First edition	2013	ICAO	
12	Air Traffic Services Planning Manual (Doc 9426)	4th Edition	2007	ICAO	
13	Manual on Implementation of a 300 m (1 000 ft) Vertical Separation Minimum Between FL 290 and FL 410 Inclusive (Doc 9574)	4th Edition	2013	ICAO	

14	Performance Based Navigation (PBN) Manual (Doc 9613)	4th Edition,	2013	ICAO	
15	Manual on Airspace Planning Methodology for the Determination of Separation Minima (Doc 9689)	2nd Edition	2007	ICAO	
16	Manual of Air Traffic Services Data Link Applications (Doc 9694)	5thEdition	2010	ICAO	
17	Manual on Flight and Flow — Information for a Collaborative Environment （FF-ICE）(Doc 9965)	First edition	2012	ICAO	
18	Manual on Simultaneous Operations or Parallel or Near-Parallel Instrument Runways (SOIR) (Doc 9643)	2nd Edition	2020	ICAO	
19	Pan Regional (NAT and APAC)Interface Control Document (ICD) for ATS Interfacility Data Communications (PAN AIDC AIDC)	Version 1.0	2014	ICAO PAN	
20	ICAO Asia/Pacific Regional ADS-B Implementation and Operations Guidance Document (AIGD)	Version 13.0	April 2021	ICAO APAC	
21	ICAO Asia/Pacific Regional Mode S DAPs Implementation and Operation Guidance Document	Edition 3.0	2021	ICAO APAC	

3. SYSTEM FUNCTIONAL BASELINE

The functional baseline, forming the core of the ATMAS, is broadly described as those involved with the processing and display of operational information that will be used in providing an alerting, flight information, and separation service to aircraft.

3.1 System Essential Functions

In order to provide controllers with the display of air situation, the ATMAS is suggested with the following essential functions.

a. Surveillance Data Processing Function (SDP). Chapter 3.1.1 introduces the essential surveillance data processing function. For the processing of enhanced surveillance data such as ADS-B, please refer to chapter 3.2.1.

b. Flight Data Processing Function.

c. Bypass Surveillance Data Processing Function.

d. Correlation of Surveillance and Flight Data function. Chapter 3.1.4 introduces the essential correlation function with mode 3/A code. The processing of using 24-bit address code etc., as the condition for correlation, please refer to chapter 3.2.2.

e. Safety Net Function. Chapter 3.1.5 introduces the essential Safety Net function. For the extended Safety Net function, such as Departure No Transgression Zone(DTZ), please refer to chapter 3.2.3.

f. Meteorological Information Processing Function.

g. Air-Ground Data Link Function (AGDL).

h. Variable System Parameter (VSP) Management Function.

i. ATS Inter-facility Data Communication Function.

j. Human Machine Interface Function (HMI).

k. Recording and Playback Function. Chapter 3.1.11 introduces the essential data recording and playback function. For the video recording and playback function, please refer to chapter 3.2.7.

l. System Monitoring and Controlling Function.

m. Software Version Management Function.

n. GNSS Time Synchronization.

3.1.1 Surveillance Data Processing Function

SDP is one core function of ATMAS. SDP should be able to integrate multi-sensor surveillance data and process the received data to generate a unique system track. System tracks contain accurate real-time positioning information, which correlates with flight plans and is displayed on HMI with specific track symbols.

Usually, SDP includes the following functions:

a. Access and process data from primary radar, secondary radar, primary and secondary combined radar, ADS-B, MLAT, and weather data from PSR radars.

b. Pre-process the surveillance data to monitor the data quality.

c. Process mono-sensor surveillance data and generate mono-sensor track.

d. Process multi-sensor surveillance data and generate continuous and smooth system tracks adopting advanced tracking filtering algorithms.

e. Manage the altitude tracking and perform conversion of Mode C derived data

f. according to QNH value.

g. Provide prompts in case of overload, filter received data, and discard extra data.

h. Process the special position identification pulse (SPI) and display using a unique indication.

i. Allow special area definition to improve system track accuracy.

3.1.1.1 Surveillance Data Pre-processing

The system is recommended to process standard radar formats, including ASTERIX format and related standards. It should automatically identify the form of surveillance data, then decompose and extract the data items according to the corresponding format specifications.

The system is encouraged to be able to monitor the received data quality and filter out the abnormal data to ensure the data fusion quality. The surveillance data quality check is suggested by considering the following factors:

a. CRC error.

b. Data frame error.

c. North messages lost.

d. Radar sector crossing messages lost.

e. Track lost.

f. Timestamp check.

3.1.1.2 Mono-sensor Data Processing

The system is recommended to perform syntactic and semantic checks on the received data against specifications, including the target attributes, identifier (SSR code, track number, address code, etc.), position, altitude, speed, time stamp, etc.

The system is suggested with time drift management to handle abnormal time stamping, and correct the timestamp by adding a time shift in received data.

The system handles target correlation for the purpose of generating a new track, or updating the existing, or deleting the dated, and then form a stable mono-sensor track in the end.

3.1.1.3 Multi-sensor Data Processing

The system fuses the accessed multi-sensor to generate a stable system track by associating the targets of multiple sensors, and forms a unique target identification mark. When the surveillance data are associated, the data and state attributes of sensor, including position, secondary code, altitude, speed, track characteristics, and other data, are considered.

The system associates the existing system track for updating or establishes a new track to ensure accuracy, continuity, and smoothing.The system track is provided to alert calculation, correlation process, and HMI display. In the track fusion process, the system records the quality of every surveillance sensor to estimate the quality of this sensor based on historical and real-time data. Abnormal data derived from some sensors should not impact system track quality.

3.1.1.4 Target Altitude Tracking and Processing

The system is suggested to provide altitude tracking by extrapolating the flight level according to the current mode C value and altitude change rate.

The system should support QNH area definition and correct Mode C values into barometric altitudes for all aircraft in a specific QNH area.

The system should discard abnormal altitude reported.

3.1.1.5 Special Pulse Identification Processing

When receiving SPI from radar track, the system is suggested to display a prompt on track identifier automatically.

3.1.1.6 Automatic Test Target Monitoring

The system is advised to be capable of monitoring the quality of radar via automatic Test Target Monitoring with fixed SSR Test Transponders.

3.1.1.7 Surveillance Data Overload Processing

The system should detect plots overload (i.e., the maximum number of plots per radar and per antenna revolution and the maximum number of plots per radar and per sector) to filter out excess plots.

The system is recommended to cope with surveillance data overloading processing as follows:

a. When the total number of targets processed by SDP reaches a certain threshold, the system will automatically generate a warning prompt.

b. When the total number of targets exceeds the load threshold, the system will give prompts to users and considers filtering or discarding the extra data.

3.1.1.8 Special Area Setting and Processing

The system is proposed to be capable of:

a. Defining areas of interest (AOI) for each sensor and discarding reports outside the AOIs.

b. Defining inhibition areas for each sensor and stoping track initialization but provide reports for exist track in the inhibition areas.

c. Defining distrust areas for each sensor, and discard reports in the areas.

3.1.1.9 Real-time Quality Control (RTQC) of Radar

Real-time quality control (RTQC) is used to monitor and control the quality of radar signals received by the system. It calculates the radar (sensor) correction factor and the fusion weight coefficient based on the results of monitoring and controlling. RTQC should manually and automatically compensate for the deviation in azimuth and distance of radars or sensors to improve the radar detection accuracy and provide the necessary fusion parameters for subsequent multi-radar tracking processing.

When the RTQC finds abnormal monitoring data, it gives a warning on the system monitor interface in real-time. When the quality of one or more data sources is abnormal or interrupted, the system will isolate it to ensure the system tracks in a normal work state. The system judges the availability of the data according to the confidence coefficient of source surveillance data.

3.1.1.10 System Tracks Output

d. The system should output the system tracks according to various specified radar formats (such as ASTERIXcat062, etc.).

e. The output system tracks can be adjusted within a reasonable range by modifying parameters, and its fastest update rate is the same as the track of ATMAS.

3.1.2 Flight Data Processing Function

Flight data processing (FDP) is one core function of the ATMAS. Data relevant to flight plan are received, stored, processed, and updated by FDP. FDP can also exchange data with other software modules.

Usually, FDP includes the following functions:

a. ATS messages processing, which processes ICAO, AIDC, OLDI, and other format messages.

b. Flight plan life cycle management to the flight plan.

c. 4D profile trajectory computation, including route analysis, profile calculation and time estimation, SID /STAR /runway automatic allocation.

d. SSR code management, including SSR code automatic assignment and manual SSR codes assignment by controllers;

e. Sector management and posting computation, post flight plans based on conditions, and provide electronic postings and paper flight strip printing at the designated position;

f. Flight plan data exchange with other external systems (such as Main/Fallback ATM automation systems, tower ATM automation systems, air traffic flow management systems, etc.). This part will be described in detail in section 5.7 of this document.

3.1.2.1 Flight Message Processing

The system should be capable of processing flight messages following ICAO PANS-ATM(Doc 4444) and AIDC and other related regulations, including FPL, CHG, CNL, DEP, ARR, DLA, CPL, EST, CDN, ACP, LAM.

The system is advised to perform semantic and syntactic checks on the received messages and create or update associated flight plans with correction. Messages that failed in semantic or syntactic checks are categorized and sent to the designated position for manual processing. Manually corrected messages will be processed again by the system.

The system is suggested to be designed with a messages manual transmission function and provide a default template for each type of message to be modified and confirmed by users.

The system is recommended to transmit messages according to the pre-defined conditions and addresses automatically. At least the following types can be sent: FPL, DEP, ARR, CHG, DLA, CPL.

3.1.2.2 Life Cycle Management

The system shall be able to manage the life cycle of flight plans. Flight plan states could be generally defined as INACTIVE, PREACTIVE, COORDINATED, ACTIVE, FINISHED, etc. Users can adjust the above states according to the operation requirement.

The evolution of the flight plan states could be triggered automatically based on time, message, correlation, etc., or by manual input.

Examples of the central state transition conditions and processing are as follows:

a. INACTIVE

When created, the flight plan state is INACTIVE.

Typically, all flight plans in INACTIVE state support manual modification or via ATS messages.

b. PREACTIVE

When the flight is approaching its execution and control airspace, the flight plan state will change to PREACTIVE.

At PREACTIVE state, the system is suggested to perform 4D trajectory and posting computation and send flight strips to relevant positions. The system could allocate SSR codes, departure runways, and SIDs for departure flights.

c. COORDINATED

When the flight is ready for control, the plan state will change to COORDINATED which can be triggered by manual operations or system events.

The flight plan in the COORDINATED state is qualified for correlation with system tracks.

d. ACTIVE

The flight plan state becomes ACTIVE when the flight is in the jurisdiction. Generally, the system calculates and updates 4D trajectory based on surveillance data, air-ground data, and manual commands. The flight plan in the ACTIVE state is qualified for correlation with system tracks.

e. FINISHED

When the flight plan is no longer used to assist in controlling the actual flight, the plan state becomes FINISHED.

At the FINISHED state, the system is suggested to:

- Release the SSR code.
- Stop the 4D trajectory calculation.
- Delete posting events and remove the electronic flight strip.
- Save the records for further analysis and statistics.

f. Other states

In addition to the above states, users can also define SUSPENDED, INHIBITED, and other states according to operation requirements. Under these states, FDP will stop updating the flight profile and suppress related alarms.

3.1.2.3 4D Profile Trajectory Calculation

It is recommended the system support 4D flight profile trajectory calculation. The profile calculation is continuous and generally divided into three stages: climb, level flight, and descent. The profile may start from the departure airport or the fixes before the FDRG entry, containing height and time information for each waypoint, and ends at the destination airport.

The profile calculation could refer to waypoint information, DEP/ARR airport, runway, requested altitude, cruise speed, aircraft performance parameter, GRIB, target position, real-time data input by controllers, etc.

The profile updates could be done at the change of flight attitude, passing waypoints, sector boundary points, system events, or controller inputs.

The system is proposed to automatically allocate departure runways and SIDs for departure flight plans and arrival runways and STARs for arrival flight plans. The system would provide the function of manual assignment, modification, and deletion to SID/STAR/runway.

3.1.2.4 SSR Code Management

Usually, the system is capable of manually and automatically assigning SSR codes.

The system is recommended to adopt specific SSR code group and allocation rules according to the type of flights (inbound and outbound).

The system is suggested to perform an SSR code retention check and use the SSR code in received messages (e.g., DEP messages) if the code is available. If not accessible, the system will allocate a new code from the free code list. In case of no free codes, the system could assign an SSR code from the given code list, and the earliest allocated code should have priority.

Generally, the system is not supporting special codes (such as 7700, 7600, 7500, etc.) assignment.

The SSR code will be released when the flight plan is finished.

The system is proposed to support manually modifying the flight plans' SSR. If the input code is already occupied, a prompt is suggested to be produced.

It is recommended that the system uses A1000 as Mode S conspicuity code. The flight plan with that code will use a 24-bit address or ACID to correlate with system tracks, and warnings/alerts should not be generated when SSR duplication occurs due to Mode S conspicuity code.

3.1.2.5 Sector Management and Posting Computation

Normally, the system can pre-configure the airspace into different sectors and enables the controllers to group or ungroup these sectors online.

The system is recommended to post the relevant electronic flight strip to the designated sector according to offline defined conditions. The electronic flight strip is suggested to display on the controlling sector and posted sector in specific colors.

The system is proposed to compute and insert posting events based on the waypoints or sectors in the flight plan. Posting conditions are tightly linked with the operational concept and control procedures, including waypoints, altitude range, ACID, airport, runway, flight rule, flight type, etc.

The system is advised to support the manual and automatic transfer of jurisdiction. The automatic transfer could be computed based on offline rules to get the timing and the target sector. The mechanical transfer conditions are similar to posting conditions.

3.1.3 Bypass Surveillance Data Processing Function

To further enhance resilience, bypass surveillance data processing（BSDP）could be implemented according to the operational need. BSDP is a redundancy module of SDP, which can independently receive, process and distribute surveillance data independently to SDP. When the SDPs fail, the system will switch to BSDP automatically. When the system switches to bypass mode, the HMI should clearly indicate if controller is working in BSDP mode.

BSDP is recommended to be capable of directly accessing various surveillance sources, using a different tracking algorithm with SDP.

BSDP should at least provide mono-sensor tracking function. Multiple-sensor data tracking function and alarm functions, such as Special Codes alert, Short Term Conflict Alert (STCA), Minimum Safe Altitude Warning (MSAW), Area Proximity Warning (APW), etc., could be considered as part of BSDP.

3.1.4 Correlation of Surveillance and Flight Data

The objective of the surveillance and flight plan correlation function is to establish an association between a surveillance track and a flight plan based on identifying codes and position checks. The way to develop association includes automatic and manual correlation.

3.1.4.1 Automatic correlation

Usually, the system performs an automatic correlation between the flight plan and the system track when pre-defined conditions are met, for example:

a. Specific flight plan status.

b. Identical SSR code.

c. Passing position and altitude check.

The flight plan in the system has two kinds of SSR codes:

a. ASSR (Assigned SSR code): currently assigned to the flight plan within the FIR.

b. PSSR (Previous SSR code): used for inbound flight, which was used in the previous FIR or the previous code used in the case of a code change within the FIR.

The position and altitude checks will improve the accuracy of correlation. The method of position and altitude checks are suggested as follows:

a. Whether the track position is in the route model. The route model is composed of airports, waypoints, and route corridors in the flight plan.

b. Whether the difference between the estimated flight plan position and the track position is within a certain range.

c. For take-off and landing system tracks, the altitude check is recommended to be performed.

3.1.4.2 Manual Correlation

The system is recommended to support manual correlation of a flight plan with a track by controllers, for example, using mode 3/A code as a criterion.

A warning message is suggested to be provided if the manual correlation is failed.

3.1.4.3 Cancel Correlation

The system is suggested to cancel correlation if the correlation conditions are no longer met, and automatically generate a warning prompt to designated position except Emergency Settings.

Under emergency settings, the system is advised to maintain the correlation when the SSR code is changed to 7500, 7600, and 7700.

3.1.4.4 Correlation Data Distribution

After correlation, the system is recommended to distribute correlation information to other modules and display correlated system tracks on the controller positions.

Usually, the system updates the flight profile according to the position and altitude information of the correlated surveillance track.

3.1.5 Safety Net Function

Safety Net Function serves to alert controllers of a potential, imminent or actual infringement of safety margins to prevent hazardous situations from developing into major incidents or even accidents. The aviation safety areas covered by Safety Net Function generally include:

a. Aircraft Separation.

b. Airspace Operation Requirement.

c. Conformance of Clearance.

d. Terrain Clearance.

e. Approach/Departure Path Conformance.

Alerts/warnings from Safety Net Function are generated based on different levels of severity of infringement and imminency with distinguishable visual and/or acoustic alarms with their prominence corresponding to the severity and imminency of the infringement.

During the planning stage, States/Administrations are encouraged to conduct a comprehensive study on the applicability of safety net features in ATMAS to their local environment considering system behavior, Human Machine Interface (HMI) design, and operational procedures. By design, the Safety Net Function in the ATMAS should be configurable with various parameters on activation/deactivation/acknowledgement of alarm adjustable by the users. Where applicable, references, especially on test strategy and system parameters, to successful cases of Safety Net implementation by other States/Administrations are suggested.

For actual implementation of Safety Net Function, a progressive approach is suggested with potential advantages as below:

a. Reducing risks in implementation and operation of one safety feature at a time as compared to deployment of all planned safety features in one go;

b. Reducing demand for resources and staff workload involved in the evaluation of the safety features; and

c. More time for air traffic controllers to evaluate the safety features and finetune the parameters before further implementation.

A post-implementation review is recommended, including the collection of feedback and suggestions from frontline air traffic controllers, effectiveness and performance of the safety features (such as user-friendliness, alert timeliness, nuisance alerts), data analysis to gauge improvement in safety figures with a view to continuously fine-tuning of safety net parameters to reduce nuisance alerts.

3.1.5.1 Types and Priority

The system provides safety net to controllers with visual and/or acoustic indications, integrating surveillance data, flight plan data, and other operational data using different algorithms and rules.

The safety net includes Emergency, STCA, MSAW, APW, APMW, etc.

It is recommended that the system is capable of setting the priority of alerts. The priority of warning is higher than its corresponding pre-warning. The emergency should have the highest priority, including Unlawful interference (7500), radio communication failure (7600), emergency (7700), etc.

3.1.5.2 Emergency

Once the Emergency codes were received, the system is suggested to process it and display the Emergency on the concerned positions.

The emergency codes include:

a. 7500 (Unlawful Interference).

b. 7600 (Radio communication failure).

c. 7700 (Emergency).

Normally, the Emergency is displayed until the received Mode 3/A code is different from the emergency code.

3.1.5.3 Short Term Conflict Alert

Short Term Conflict Alert (STCA) is an important safety net feature of ATMAS as collision avoidance tool, or to provide a separation alert for a potential or actual infringement of separation minima between aircraft. STCA can work between targets associated with an FPL and unknown targets without an FPL.

The STCA function in ATMAS generates visual and/or acoustic alerts to controllers in air situation display if any aircraft is predicted to or is violating a pre-defined conflict or separation minimum in the STCA settings of the ATMAS. Controllers would need to resolve the conflict immediately once the alert has been generated.

Surveillance, flight plan, and environmental data are required for generating STCA in ATMAS. The following list of information could be considered to include in the STCA processing:

a. Aircraft position

b. Pressure altitude

c. Cleared flight level

d. Flight rule

e. RVSM status

f. Concerned controller jurisdiction

g. Separation standards of STCA areas

h. Look-ahead time

The Flight plan is not obligatory. Flight plan data, i.e., cleared flight level, flight rule, and RVSM status of the aircraft, could help improve the relevancy of alert generation so as to reduce cases of nuisance alerts. In addition, the implementation of STCA inhibition could be considered based on a definition of inhibition zones, SSR code groups, callsign, or other conditions applicable to the local operating environment and needs.

The STCA processing cycle is recommended to be at a frequency not less than once per track update of ATMAS. States/Administrations could also consider implementing STCA with two stages of alerts based on the situation of predicted and actual infringements, i.e., Predicted Conflict Alert (PCA) and Conflict Alert (CA).

For complex airspaces with different separation standards for respective sectors, the design of ATMAS is recommended to allow the configuration of multiple STCA volumes. Users could apply specific STCA parameters for a given STCA volume according to operational needs.

The performance of STCA is highly dependent on the optimization of the conflict detection algorithm and adapted parameters for the local environment. States/Administrations are suggested to work closely with system manufacturers to adapt the STCA detection according to the local environment. For successful implementation, regular review with controllers on the performance is necessary.

3.1.5.4 Minimum Safe Altitude Warning

Minimum Safe Altitude Warning (MSAW) is intended to assist controllers with alerts of the potential risk of an aircraft infringing a defined minimum safe altitude over a concerned region.

The MSAW function monitors the position and altitude of an aircraft against defined MSAW regions and minimum safe altitudes. The MSAW region can be defined by height or polygon. When the altitude of an aircraft is found or predicted to be lower than the applicable minimum safe altitude within defined the MSAW region, a visual and/or acoustic warning would be generated to alert controllers to take necessary actions to resolve the infringement.

For reference, examples of surveillance, flight plan, and environmental data are required for the MSAW functional module to generate alerts are:

a. Aircraft position.

b. Pressure altitude.

c. Cleared flight level.

d. Flight rule.

e. Concerned controller jurisdiction.

f. Terrain and obstacle model.

g. Look-ahead time.

To minimize nuisance alerts, flight rules and cleared flight levels in flight plan data can help improve the relevancy of MSAW alert generation. In addition, States/Administrations could consider implementing MSAW alert inhibition which suppresses MSAW alerts based on defined inhibition zones (such as final approach zones), SSR code groups, callsign, or other conditions applicable to the local operational environment.

The accuracy of MSAW alert is related to MSAW terrain/obstacle definition, look-ahead time setting, and inhibition strategy adopted for flights intentionally flying close to terrains/obstacles. Appropriate settings of the above are necessary for providing a reliable MSAW detection that controllers can rely on. Any unoptimized parameters would likely result in nuisance alerts or insufficient time for controllers to respond to the alert. It is important to perform tuning of MSAW parameters based on controllers' feedback for successful MSAW implementation.

3.1.5.5 Area Proximity Warning

Area Proximity Warning (APW) is a safety net for alerting controllers of any potential or actual unauthorized penetration of aircraft into Special Use Airspaces (SUA) including:

a. Danger airspace.

b. Prohibited airspace.

c. Restricted airspace.

d. Temporarily restricted airspace.

Each SUA volume could be defined in ATMAS as an area (e.g., circle, polygon, etc.) with upper and lower bounds on altitudes. The warning activation/deactivation of each SUA could be triggered automatically according to an online-defined schedule or by the manual action of controllers. The system should provide APW inhibition function based on flight rules, SSR code groups, callsign, and other conditions applicable to the local environment and operational needs.

3.1.5.6 Approach Path Monitoring Warning

The Approach Path Monitoring Warning (APMW) monitors the aircraft's vertical and lateral deviation from the final approach profile in ATMAS, and generates visual and/or acoustic alerts when an aircraft exceeds or is predicted to exceed the defined tolerance of deviation. The system should allow multiple groups of glide path monitoring parameters to be defined.

An APM zone would generally be defined in ATMAS for performing APMW processing on flights. Examples of parameters on the definition of APM zone are:

a. Runway name and direction.

b. Touchdown point on the runway.

c. Horizontal angular extend from the touchdown point.

d. Vertical angular extend from the touchdown point.

e. Distance from the touchdown point.

f. Glide slope elevation.

g. APMW inhibition zone.

Surveillance, flight plan, and environmental data are required for generating APMW. The APMW prompt will be given on the HMI when the alarm conditions are met.

To minimize nuisance alerts, checking flight rules could help improve the relevancy of warning generation. In addition, an aircraft flying close to terrains/obstacles during the final approach which could easily trigger MSAW alert due to nearby terrains/obstacles. States/Administrations could consider suppressing MSAW alert generation in ATMAS within the APM zone or via the definition of inhibition zones if an aircraft's descent profile is already under the monitoring by APMW.

The performance of APMW is highly related to adapted APMW parameters for the local environment, look-ahead time setting and inhibition strategy adopted for flights that intentionally deviated from the optimal final approach path. Regular review of the performance is crucial for the tuning of APMW parameters based on controllers' feedback to increase its effectiveness.

3.1.6 Meteorological Information Processing Function

Generally, the system is capable of receiving, processing, and displaying meteorological information, including GRIB, QNH, and weather data derived from mono-radar. The meteorological information should be applied in surveillance data and flight data processing.

The system could process GRIB messages from the meteorological information system, which contains upper wind and temperature for accurate calculation and estimation of flight plan profiles.

The system is recommended to automatically extract and process QNH data from METAR and SPECI messages, as well as manual input.

The system is recommended to be capable of receiving and processing mono-radar derived weather data, and displaying it on the controller positions. From experience, the categorization of weather intensity level could be classified as no less than three levels. The parameters of display level and priority could be defined as required.

3.1.7 Air-Ground Data Link Function

The AGDL function mainly processes the information based on the data link communication, including ADS-C (Automatic Dependent Surveillance-Contract), CPDLC (Controller-Pilot Data Link Communication), and DCL (Departure Clearance), etc. States/Administrations could implement the Air-Ground Data Link Function according to the operational needs.

3.1.7.1 ADS-C Data Processing

The ADS-C data processing is recommended as follows:

a. The system automatically determines whether the aircraft enters the ADS-C area according to route information.

b. The ADS-C connection could be initiated by pilots or controllers.

c. The system receives and processes ADS-C messages, including periodic contract, event contract, emergency, current location, etc.

d. The system updates and manages ADS-C tracks with received ADS-C messages.

3.1.7.2 CPDLC Data Processing

From experience, the system is suggested to provide the following functions for CPDLC data processing:

a. Display CPDLC position report and flight data.

b. Display a CPDLC dialogue window.

c. Determine whether the aircraft enters the CPDLC area according to route information.

d. Allow initiating a CPDLC connection automatically or manually by the pilot or the controller.

e. Receive and process CPDLC downlink messages, send CPDLC uplink messages, and manage the message status.

f. Allow to search CPDLC historical messages and display the messages in chronological order.

g. Provide prompts to controllers in the following cases: correct message transmission and reception, manual operation, and successful logon.

3.1.7.3 DCL Processing

The system is recommended to provide the following DCL functions:

a. Receive, process, and send DCL messages (ARINC 623, EUROCAE ED-85A, etc.).

b. Identify and process the RCD message and automatically send error messages to controllers suggesting voice-clearance in case of invalid RCD message.

c. Correlate the RCD message with a specific flight plan according to the callsign, departure airport, landing airport, and automatically reply with an FSM message.

d. Automatically send CLD messages according to the correlated FDR and manual input data and perform synthetic and semantic checks.

e. Check the compliance between the CDA and CLD message.

f. Be capable of displaying RCD information, including the callsign, SSR code, CLD processing identification, and enable the edition and transmission of CLD messages.

3.1.8 System Parameter Management Function

For the convenience of system maintenance, the system is proposed to be capable of managing the variable system parameters through a user/ops orientated adaptation interface used by trained adaptors.

3.1.8.1 Types of System Parameters

The system is recommended to be able to adapt system functional parameters for all functionality.

That parameters adaptation is highly preferential to software-code based system management, e.g., pre-set files.

Those parameters are designed to accommodate future performance loads to avoid errors or limitations brought on by inflexible value limits.

That parameters adaptation is orientated towards use by ATS operational orientated staff. Variables, their units of use, and values range should reflect the operational application.

Generally, the types of system parameters include the following:

a. Basic parameters: airspace, sectors, positions, routes, QNH areas, etc.

b. Surveillance data parameters: surveillance source parameters, fusion parameters, etc.

c. Flight data parameters: message processing and transmission rules, SSR code allocation rules, FDR parameters, etc.

d. System interface parameters: interface configuration parameters.

e. HMI parameters: sectorization parameters, electronic and paper flight strips formats, CFL popup values, system maps, etc.

f. Alert parameters: warning and inhibition area definition, warning condition parameters, etc.

g. Other maintenance parameters: recording parameters, warning messages, error messages, etc.

3.1.8.2 System Parameter Management

The system is recommended to support a graphical user interface tool, such as Database Management System (DBMS) to establish, delete, modify, display release, and validate the online/offline system parameters.

The DBMS tool is suggested to support accuracy check, provide error prompts and references according to parameters format, character length, and mold to ensure accuracy of parameters, and limit illegal input of the parameters. The system has the fallback function. If a step of parameters setting goes wrong, you can go back to the previous step.

3.1.8.3 System Parameter Activation

In order to balance the efficiency and safety, by experience, the system is suggested to support the following two ways to let the system parameters go into effect:

a. Online generate: for parameters allowed to be configured, selected, and generated online, without restarting the system.

b. Offline generate: for parameters to be generated after restarting the entire system or specific system modules.

3.1.9 ATS Inter-facility Data Communication Function

The system is recommended to incorporate an AIDC application that supports the ATS-related information exchanges within the ATMAS of adjacent Control Units and Flight Information Regions adopted in the Asia-Pacific region.

The AIDC function of the system should conform to the standards in the prevailing version of the following documents:

a. Pan Regional (NAT and APAC) PAN AIDC ICD; and

b. Procedure for Air Navigation Services-Air Traffic Management (PANS-ATM) (ICAO Doc4444).

3.1.9.1 AIDC message transmission and processing

The system should support the core AIDC messages recommended in Asia/Pacific Regional ICD, such as ABI, CPL, EST, MAC, CDN, ACP, REJ, TOC, AOC, EMG, MIS, LAM, and LRM.

The system should be configurable in supporting variations in AIDC processing and messages dependent on the mutual agreements with each adjacent Control Unit or FIR.

Commonly, the system is recommended to transmit AIDC messages automatically,and be capable of processing received AIDC messages automatically.

The system is suggested to transmit ABI, EST, PAC, and other messages automatically according to the AIDC handover conditions and the status of the flight plan.

The system is proposed to transmit TOC and EST messages manually through the HMI in specific cases. The flight data operation position (FDOP) is capable of processing erroneous and irrelevant messages manually.

For received messages that failed syntactic and semantic checks, the system should send such messages to a message queue to process by controllers manually.

The system is expected to alert controllers of any unsuccessful transmission of AIDC messages due to communication fault, rejection by the receiving adjacent Control Units or FIRs, or failure to receive an expected application response from the receiving Control Unit within a time threshold.

3.1.9.2 AIDC Handover

The system should be able to trigger AIDC handover automatically, depending on configured AIDC handover parameters, which may include handover points, height, time, adjacent Control Unit, etc.

The system could allow controllers to initiate AIDC handover manually.

3.1.9.3 AIDC Coordination Process

Generally, the AIDC handover is mainly fulfilled by exchanging a variety of messages. The AIDC procedure is composed of three phases forming a standard AIDC process:

a. Notification Phase;

b. Coordination Phase; and

c. Transfer of Control Phase.

The standard AIDC procedure could be simplified according to the handover agreement between adjacent Control Units. For example, taking advantage of several indispensable messages regarding EST/PAC, ACP, TOC, AOC, and LAM, the handover could be simplified into two phases coordination and handover. The procedure is shown in the figure below:

AIDC phase	ATS Control Unit A	Direction	ATS Control Unit B
Coordination	Send EST/PAC N minutes before the handover point	→	
		←	Automatically Reply with LAM
		←	Automatically Reply with ACP
	Automatically Reply with LAM	→	
Transfer of Control	Send TOC automatically/manully before the handover point	→	
		←	Automatically Reply with LAM
		←	Automatically/manually reply with AOC
	Automatically Reply with LAM	→	

Figure 3.1.9-1 Simplified AIDC procedure

The system could update the flight state of a flight as it transits through the AIDC coordination phases.

After completing a coordination process, the system could automatically update the concerned flight plan with the cleared flight profile.

The system is expected to alert controllers when coordination with an adjacent Control Unit or FIR is not completed within certain time thresholds before Estimated Time over Boundary RP, Estimated Time of Departure, etc.

3.1.10 Human Machine Interface Function

HMI (Human Machine Interface), as an important part of the ATMAS, is the medium for interaction and information exchange between the system and controllers. Operational users can monitor air traffic situations and modify flight plans and other relevant information through tphysical peripherals and/or onscreen control interfaces. Technicians can monitor the status of the ATMAS and perform technical maintenance operations as well. HMI design of ATMAS should consider the day-to-day operation of air traffic controllers to provide a user-friendly interface for controllers to perform their duties effectively and efficiently. In general, the design should facilitate safe, efficient, and sustainable control of air traffic based on the following principles:

a. Accurate presentation of air traffic data

b. Timely presentation of air traffic data

c. Automatic data validity checking including operator input

d. Input options automatically limited to valid data selections

e. Allow a variety of user-friendly input methods (e.g., keyboard, number pads, mouse, etc.) for data entry by controllers

For friendly use,, the HMI function is recommended to include at least as follows:

a. Providing graphical interfaces and functions for different positions, such as supervisor position, controller position, flight data operator position, etc.

b. Providing multiple position modes (e.g., Normal, Degraded, Bypass, and Mono) if required.

c. Providing variable user modes (e.g., Operational, Free, Shadow, and Replay) if required.

d. Providing a complete set of HMI configuration, including track display, HMI layout, menu setting, color management, mouse/keyboard functional definitions, map management, etc.

e. Providing the operation interfaces for flight plan modification and control/management of onscreen information.

f. Providing warnings related to HMI.

3.1.10.1 Controller Position

The controller position provides controllers with relevant information required for air traffic control, helping the controller be fully aware of the situation and manage the aircraft in the responsible area. The specific functions are suggested as follows:

a. Display system tracks, multi-radar tracks, multi-ADSB tracks (if available), multi-WAM tracks (if available), flight plan tracks, and bypass tracks.

b. Enable interactive flight operations such as aircraft handover and acceptance, manual correlation, level assignment, and coordination status.

c. Allow screen operations such as zoom in, zoom out, off-center, measurement, window movement, label rotation, etc.

d. Manage map display.

e. Display and edit Flight plans.

f. Post and display electronic flight strips/flight data list.

g. Display system information.

h. Personalize position parameters and display.

i. Other relevant information required for operations.

3.1.10.2 Supervisor Position

The supervisor position typically has the same display and operation interface as the controller position. In addition, the system is advised to provide other functions on the supervisor position, such as online operation parameters settings and management, SSR code management, sector management, automatic handover setting, position alert management temporary/global map setting, etc.

3.1.10.3 Flight Data Operator Position

The flight data operator position is capable of displaying relevant flight plans in a flight list containing all the flight information fields, and enabling the online flight plan editing function and AFTN message display, query, error correction, and sending function.

3.1.10.4 Technical Management Position

The technical management position provides a graphic interface enabling efficient system maintenance and software management. The specific functions of the position are generally as follows:

a. Technical parameters management.

b. Operational parameters management.

c. Software configuration and management.

d. User Management.

e. Map generator.

3.1.10.5 Position Mode Switch

The system could be designed to provide controller positions with various user modes to cater to different operational needs. Below is an example of different user modes.

States/Administrations could define their own set of position modes according to the operational need.

a. Operational mode

The position in operational mode is allocated with sector and provides ATC service.

b. Free mode

The position in free mode is sector-free and functionally limited, such as read-only access to flight data.

c. Shadow mode

The position in shadow mode provides real-time monitoring of the operational position of specific sectors and the functionally limited, such as read-only access to flight data.

d. Replay mode

The system only provides playback function in replay mode and cannot be used for ATC service.

3.1.10.6 Track Display

The graphical representation of a track usually includes a track symbol located at the current position of the aircraft, a label, a label leader, a selectable velocity vector, and a selectable number of track history dots, etc.

The system should be able to display the accurate position of the track, generated and updated according to surveillance source.

From experience, the system can customize of the display of information in different layout types to show information on the label in different levels of detail depending on he operational needs.

The system is suggested to support label action such as CFL modification, handover request and acceptance, runway modification, STAR allocation, etc.

3.1.10.7 Map Display

The system is recommended to be capable of the offline definition of the system maps, the online creation of the local maps by individual controller position, and the online creation of the Global Map, temporary Restricted / Danger Area maps, etc. by the supervisor position.

The online created local map, global map, and temporary restricted / danger area maps could be saved and restored automatically during system restart.

Note: Controllers should use the online creation of maps with caution to avoid safety impact.

3.1.10.8 Flight Plan Window

The flight plan window is suggested to support displaying and modifying of the flight plan data fields such as SSR code, ACID, flight rule, aircraft type, wake category, departure airport, destination airport, requested flight level, route, field 18 data.

The flight plan window is recommended to enable at least the following flight plan functions: creation, deletion, modification, flight strip printing, etc.

3.1.10.9 Electronic Flight Strip Function (if applicable)

Electronic Flight Strip Function could be implemented as a part of HMI function, from which controllers can access to do handover, acceptance, filtering, and sorting function. The electronic flight strips can be sorted and displayed by flight plan state, route fixes, time information, etc.

3.1.10.10 System Information Display

It is recommended to provide in the HMI system information, including device failure, operational data, feedback of operation, system status information, etc., for controllers' awareness of system status.

3.1.10.11 Tracks Quick Search

It is recommended that the system has a quick search function to search a track with complete or partial search criteria of the callsign, SSR code, departure/destination airport, or other information. The matching track will be highlighted to the controllers.

3.1.10.12 Track/Label Filtering

It is recommended that the system provides a track and/or label filtering function.

The system could filter tracks based on upper/lower limitation of level or SSR code, and search the track label by part or entire of ACID.

Enabling and disabling the flight plan track display could also be achieved via the HMI.

3.1.10.13 Personalized Position Parameters Setting

The system is recommended to provide flexible configurations, including label layout, HMI colors, mouse and keyboard functions, color configurations of all elements, menus, and windows according to operational demand.

3.1.10.14 SSR Code Duplication Warning

When detecting multiple aircraft with the same SSR code in a certain area, the system is suggested to provide an SSR Code Duplication warning to the controller.

3.1.10.15 AIDC Coordination Failure Warning

On failure of AIDC coordination, the system is advised to provide visual indications to controllers on track labels and electronic flight strips.

3.1.10.16 SPI Indication

The system provides visual indications to controllers at the reception of SPI information transmitted by the aircraft.

3.1.11 Recording and Playback Function

The Recording and Playback function enables the recording of operational data of ATMAS. It allows synchronized playback of the air traffic situation, controller-pilot communication, and controller actions in the air situation display for incident analysis and investigation. The recording and playback could be implemented as part of ATMAS or via an external recording system. The design should aim at reconstructing the actual scenario as accurately as possible.

3.1.11.1 Recording Function

The Recording Function for ATMAS should maintain a continuous recording on all controller working positions. The following data and display could be considered to be recorded by the system:

a. Screen data of controller working positions, including an identical picture of windows, temporary maps, and any alert /warning, etc.

b. Surveillance data, including SDP track output, radar data, ADS-B data, etc.

c. Controller input actions on keyboard or mouse.

d. Messages of external interfaces such as AIDC messages, meteorological messages such as GRIB, AFTN, ICAO messages (including flight plan data), ADEXP messages, data links such as PDC, CPDLC, ADS-C.

e. System data such as system event data, system performance data, system log, etc.

The recording of data and display is suggested to be synchronized with a deviation of less than 1 second or an acceptable tolerance according to the local operational needs. The deviation is suggested to be as minimal as possible to allow the best reconstruction of the recorded scenario during playback.

The Recording Function should ensure no loss of data at all times during the operation of ATMAS, and the recording process should not render any degradation to the performance of other functions of ATMAS. Recorded data should be retained for at least 31 days or a duration which satisfies local regulatory requirements. Some States may require a longer recording period for other purposes e.g., requests for data from other organisations. Periods of 90 or 120 days may be more applicable for such needs. Appropriate warnings are needed for notifying maintenance personnel when storage capacity drops below a certain threshold so that appropriate action could be taken to resolve the situation.

3.1.11.2 Playback Function

The ATMAS or external recording system should allow the replay of recorded and archived data onto designated or idle controller working positions. In general, a playback session should be able to start up within a short period of time and allow continuous replay of recorded data for a considerable duration according to operational needs. The system shall support synchronized playback of voice data.

The following two modes of playback are suggested for implementation in ATMAS to cater to different investigation scenarios:

a. Passive Playback

The system replays what was on the screen of controller position with recorded and archived data at the period of recording without interaction

b. Interactive Playback

The system replays the air situation display of the controller' working position at the period of recording. Controller tools, such as change of display range, range, and bearing line, separation probe, quick look, altitude filtering, map selection, etc., are allowed to be used interactively during playback.

For both of the above playback modes, the system should allow synchronized playback of voice data in order to provide a complete picture of events for investigation purpose. To facilitate the playback, the following controls are recommended to be included in the playback function of ATMAS or external recording system:

a. Start / Pause (Resume) / Stop of a playback session.

b. Selection of different playback speeds at least real-time speed and a range of playback speeds faster than normal recording speed.

c. Allow to select a start time for playback in terms of minute.

d. Selection of playback mode.

The system is suggested to be capable of performing multiple playback sessions simultaneously to allow the playback of the same or different scenarios using different controller working positions. For the same playback session, synchronized replay of recording multiple controller working positions could be considered as part of the playback function to facilitate the investigation of events involving multiple control sectors.

The screen dump function is recommended to capture the screens during playback and store them as files for subsequent printing and exporting. The facility should be provided for exporting the screen dump file to external media using a common image format that could be viewed on computers using non-proprietary software readily available in the market.

3.1.11.3 Data Archiving

Data Archiving function is needed in ATMAS or external recording system for transferring recording data onto removable media for the backup or impounding purpose. The archiving process could be initiated in the system via manual action or configured automatic process based on criteria, e.g., periodic archiving process at a defined time interval or when remaining storage dropped below a certain threshold.

In general, the archiving process should not interfere with normal recording and playback processes in the system as well as other system functions. Appropriate warnings should be given whenever there is an error, or the archiving media is full during the archiving process.

3.1.12 System Monitoring and Control Function

The system is recommended to provide the monitoring and controlling function, and the failure of the monitoring and controlling function should not affect the operation of other modules.

3.1.12.1 Monitoring Function

The system is suggested to monitor in real-time the operational status of each module and display the significant events. Alerts could be raised in levels according to severity, and log files are generated accordingly. The system should be able to search, print, and export logs by time. Usually, the system monitoring function mainly includes:

a. Interface status monitoring.

b. Hardware operation status monitoring.

c. Software operation status monitoring.

d. Network equipment operation status monitoring.

e. Database operation status monitoring.

f. System capacity and resource usage monitoring.

g. Important system events monitoring.

3.1.12.2 Control Function

In general, the system controlling function mainly includes the operations of start, stop, restart, and switch as follows:

a. Start and stop the entire system.

b. Start and stop single surveillance source.

c. Start and stop a single server.

d. Start and stop network.

e. Switch between redundant equipment and networks

f. Start and stop software modules.

3.1.13 GNSS Time Synchronization

The system is suggested to be able to access an accurate time source, synchronize external GNSS signals, and calibrate internal system time based on the NTP (Network Time Protocol), so that the system time is consistent with the UTC.

The system is capable of receiving multiple external clock sources and switching among them automatically or manually.

If all the external clock signals are interrupted or lost, the system is proposed to synchronize with internal time correspondingly.

Unified time within the system is recommended to be shown on the HMI and provided for surveillance data processing, flight data processing, monitoring and controlling, recording and playback, etc.

3.2 System Optional Function

3.2.1 Extended Surveillance Data Processing

Except for PSR and mode A/C radar data, the extended surveillance data include Mode S radar data, ADS-B data, WAM, and other surveillance data, which contain more target information, such as DAP parameters and accuracy, etc.

The system is encouraged to be able to process the extended surveillance data to provide higher quality tracks and supplementary data.

The systems should be able to receive, process and display data from all the connected sources in an integrated manner. When extended surveillance data is connected, in addition to the essential surveillance data processing requirements (see 3.1.1), the following additional requirements is suggested to be met.

The system can filter anomalous data according to the sensor type. Anomalous data filtering can be carried out during pre-processing, mono-sensor data processing, and multi-sensor data processing. Some suggested anomalous data filtering is as follows:

a. The system should check the integrity of mandatory data items in the ADS-B message. And only ADS-B messages containing all mandatory data items will be processed. Refer to ICAO APAC's *GUIDANCE MATERIAL ON GENERATION, PROCESSING & SHARING of ASTERIX CATEGORY 21 ADS-B MESSAGES* for definitions of ADS-B mandatory data items.

b. The system should check the quality indicators of ADS-B data and position accuracy of WAM data to ensure that only the data meeting the operational requirements is used for track tracking and fusion.

c. Downlink aircraft parameters rely on airborne equipment besides surveillance system, and their data quality is affected by more factors. It is recommended that the system should perform the validity and consistency check of downlink aircraft parameters.

d. Due to the anomalous Mode S SSR DAPs caused by BDS SWAP, it is recommended that the system performs additional verification for Mode S SSR DAPs, for example, cross-verification of SSR DAPs from different radar stations.

The system should be able to use the ICAO 24bit aircraft address and aircraft identification for track tracking and correlation.

The system should be able to process the extra emergencies beyond those indicated by codes 7500, 7600, and 7700, including lifeguard/medical, minimum fuel, and downed aircraft.

Note: DO-260 systems only transmit EMG and don't transmit a MODE A code. DO-260A systems broadcast Mode A information using a test message field. DO-260B systems can transmit the MODE A code. While emergency status can be transmitted by all version of ADS-B transponder. Considering aircraft equipped with DO-260/DO-260A ADS-B transponder in airspace covered only by ADS-B, ATMAS should be able to identify the aircraft's emergency status based on the emergency status of the ADS-B data only.

Mode S radar, ADS-B, and WAM systems can detect aircraft on the ground. The system should be able to process ground/air flags to filter unnecessary ground targets.

The system should be able to process Mode S conspicuity code. Mode S conspicuity code is a standard and non-discrete Mode 3/A code to tell the ATMAS that this is a Mode S equipped aircraft. ATMAS should not use Mode S conspicuity code to identify the aircraft, correlate the flight plans. Instead, the ATMAS should make of the Mode S interrogated information, such as aircraft identification or ICAO 24bit aircraft address, to identify the aircraft and correlate the flight plan. Asia Pacific region adopts "1000" as Mode S Conspicuity Code.

3.2.2 Extended Correlation

On the basis of the original automatic correlation conditions, the system could further perform correlation for a surveillance track and a flight plan based on the aircraft's 24-bit address or Aircraft Identification (ACID) provided by the aircraft downlink parameters.

The system is recommended to give prompts on the correlated track label when SSR codes, aircraft 24-bit address, or ACID of the flight plan mismatch the ones of the surveillance track.

3.2.3 Extended Alert, Warning, and Advisory Function

In addition to the Safety Net Functions stated in paragraph 4.1.5, States/Administrations could consider implementing the following extended set of alert, warning, and advisory functions in ATMAS according to the local environment and operational needs. These optional functions aim at enhancing operational efficiency and possibly reducing controller workload.

3.2.3.1 Departure No Transgression Zone (DTZ)

The Departure No Transgression Zone (DTZ) function informs the controller if a track is predicted to infringe a Departure No Transgression Zone area within a predefined time interval, or has already infringed a Departure No Transgression Zone area. The DTZ function also may suppress improper STCA generate between two normal flights in DMA(Departure Monitoring Area).

The DTZ is an offline defined volume capturing the departure path of aircraft taking off between two extended runway center lines which aircraft is not allowed to penetrate. It shall be possible to define DTZ area off-line by specifying associated DMA (Departure Monitoring Area).

When a track is predicted to infringe an DTZ area within a predefined time interval, or has already infringed an DTZ area, the system shall provide DTZ warning.

a. The system shall generate DTZ warning for a track predicted to infringe an active DTZ area within a predefined time interval.

b. Visual and acoustic signals shall be provided on concerned controller positions on DTZ warning is raised. The system shall enable operators to acknowledge the raised warning to cancel the acoustic alarm.

c. The system shall be allowed to define multiple DTZ areas and activate or de-activate online.

d. The system shall have STCA filtering function within an active Departure Monitoring Area.

3.2.3.2 No Transgression Zone Alert

In the context of parallel approaches, No Transgression Zone (NTZ) is generally defined as the corridor of airspace between two extended runway centerlines that aircraft are not allowed to penetrate. The purpose of the NTZ alert is to warn controllers of a predicted or actual unauthorized penetration of NTZ by aircraft during the final approach. An appropriate look-ahead of the predicted NTZ alert is important to allow enough time for controllers to respond to the situation.

When a track is predicted to infringe an NTZ area within a predefined time interval or has already infringed an NTZ area, the system shall provide an NTZ warning.

e. The NTZ warning function includes two parts: NTZ pre-warning and NTZ warning.

f. The system shall generate a pre-NTZ warning for a track predicted to infringe an active NTZ area within a predefined time interval.

g. The system shall generate an NTZ warning for a track having infringed an active NTZ area.

h. Visual and acoustic alerts shall be provided on concerned controller positions on which pre-NTZ or NTZ warning is raised. The system shall enable operators to acknowledge the raised warning to cancel the acoustic alert. .

i. The system shall be allowed to define multiple NTZ areas and activate or de-activate online.

3.2.3.3 Medium Term Conflict Detection Advisory

Medium Term Conflict Detection (MTCD) is designed as a safety advisory tool that provides warnings to controllers for potential conflict for "aircraft-to aircraft" or "aircraft-to-airspace" encounters up to a looking ahead time. The aim of MTCD is to proactively provide possible conflict in advance during sector planning to reduce tactical workload.

States/Administration should consider the following factors to determine the applicability of MTCD to their local environment:

a. Suitability of local airspace structure to cater for long look-ahead time.

b. Local air traffic control procedures.

c. Whether airspace is under Free Route Operation.

d. CNS capability to support application.

MTCD advisory could be considered implemented in the following situation:

Potential or risk conflict detected based on current track trajectory and trial clearance/probe. While a controller inputs a clearance, the MTCD will be calculated, and conflict information, if any, will be provided to the controller and prompt for a confirmation to proceed or abort. If a confirmation to proceed is received, an MTCD warning would be generated to concerned controllers with the jurisdiction where conflict may occur.

The MTCD function shall generate visual and/or acoustic alerts to controllers in air situation display if any pair of aircraft is violating within a look-ahead time, which is a pre-defined separation minimum in the MTCD settings. If more than one type of conflict is implemented, different visual presentations are recommended for each type of conflict to avoid confusion of alerts. In addition, MTCD inhibition could also be implemented based on airspace, flight rule, SSR code groups, ACID, or other conditions applicable to the local environment and operational needs.

3.2.3.4 Route Adherence Monitoring

Route Adherence Monitoring (RAM) monitors if an aircraft (i.e., surveillance track) is following the planned route, as stated in the associate flight plan.

When an aircraft is detected to have deviated from the ATMAS trajectory by more than a defined tolerance, a visual/or acoustic warning shall be generated to alert controllers to take action on the situation.

In the case of the RAM caused by an incorrect Flight route, the warning may be suppressed after the controller amends the flight plan route to reflect the actual flight path by a user-friendly route modification interface (e.g., Graphical Re-route function).

The RAM warning can be acknowledged manually.

The RAM route model could be defined by the width of the corridor and the radius of the waypoint. It is recommended that the system is designed to allow the definition of different route model parameters for specific route segments.

3.2.3.5 Cleared Level Adherence Monitoring

Cleared Level Adherence Monitoring (CLAM) monitors the conformance of the Actual Flight Level (AFL) of an aircraft to the Cleared Flight Level (CFL) issued by the air traffic controller and provides warnings if the deviation between the two levels (i.e., Level Bust) was found after the aircraft has been level-off. To reduce nuisance alerts, the system could allow an adaptable tolerance on the deviation of AFL from CFL.

States/Administrations can consider including the use of Mode S DAPs, Selected Altitude, in the CLAM detection logic. Selected Altitude is the altitude inputted by the pilot at the aircraft cockpit based on the clearance from controllers. The checking of Selected Altitude with CFL in the CLAM logic could allow early detection of potential Level Bust and alert controller in advance.

3.2.3.6 Similar Callsign Advisory

Similar Callsign Advisory (SCA) provides advisory to alert controllers when an aircraft carries a similar callsign with another one in the same jurisdiction controlled by a controller. According to the operational environment and local needs, SCA checking rules could be pre-defined or pre-programmed at the design stage of ATMAS implementation. Adaptable SCA checking rules or look-up tables are preferred to allow modification of similar callsign checking process based on the latest requirement and feedback from controllers.

3.2.3.7 Reduce Vertical Separation Minimum Warning

Reduce Vertical Separation Minimum (RVSM) Warning provides alerts to controllers when a non-RVSM approved/compliant aircraft is within or is predicted to enter RVSM airspace.

To provide the warning to controllers, the volume of RVSM airspace would need to be defined in the ATMAS, and the Field 10 of ICAO flight plan would be checked to see if the aircraft is RVSM-approved. Visual indication would be generated if the aircraft did not match the airspace requirement on RVSM.

3.2.3.8 Position Report Monitoring

The ATMAS trajectory needs to update for every point inside the route model when the aircraft overflow this point. Position report permits a more precise calculation of the Estimated Time of Overflight (ETO) of subsequent points along the planned route.

The Position Report shall also include intent information from Surveillance reports for use in trajectory estimation.

To make the maintenance staff aware of the inconsistency in position reports, Position Report Monitoring (PMON) monitors ATO/ETO and provides warnings to controllers when:

a. Actual Time Over (ATO) and/or Estimated Time Over (ETO) of the next report point differs from that calculated by the flight trajectory by more than a defined time interval

b. The ETO of the respective waypoint differs by more than a defined time interval

c. No position report is received for a defined time interval after the ETO missed the position report

3.2.3.9 Last Known Position Display

Last Known Position Display occurs when correlated tracks, uncorrelated, or ADS-C tracks with critical alerts are lost.

The last known position of the track is displayed with a special track symbol to the dedicated position.

3.2.3.10 SSR Inconsistency Warning

For correlated flight plan tracks, when the Mode 3/A code in the surveillance data is inconsistent with the SSR code in the flight plan, the system is suggested to raise ASSR Inconsistency Warning.

NOTE: 24-Bit Code Mismatch Warning and Callsign Mismatch Warning, please refer to chapter 3.2.4.2.

3.2.3.11 PBN Capability Indication

The PBN function shall provide PBN indicator and/or PBN route mismatch indication for controllers in order to indicate whether the aircraft match the RNAV/RNP Route or Arrival.

When the PBN indicator is presented in the flight plan message, the system is suggested to determine the PBN capability of the aircraft and inform controllers of the PBN capability.

It is proposed that the system could define different priorities of PBN capability display for each logical position.

The PBN function shall provide PBN route mismatch indication to the controllers:

a. When PBN route is mismatch between offline defined and PBN of flight plan message.

b. It shall be raised at offline define time prior to the route segments.

c. It shall be able to offline turn on or off.

3.2.3.12 CFL Predicted Detection Advisory

In order to support controller assignment of CFL and further reduce tactical work load, CFL Predicted Detection (CPD) could be implemented as a Controller advisory tool.

With the similar calculation method used in MTCD, CPD uses a shorter look ahead time to pre-calculate all possible vertical trajectories based on adjacent flight levels and identify potential conflicts. When controllers open a clearance list, the results of CPD detection will highlight available CFLs for assignment and the conflict risk with each. Controllers can then assign an appropriate CFL in accordance with the overall tactical situation while aware of any additional action that the highlighted conflict may require.

3.2.3.13 Downlink Aircraft Parameters Related Warnings

Please refer to section 3.2.4.2 for Downlink Aircraft Parameters related warnings.

3.2.4 Downlink Aircraft Parameter Processing and Display

It is recommended that the system have the capability to process and display aircraft downlink aircraft parameters (DAPs) from Mode S radars, ADS-B and/or WAM to help controllers have a more integrated view of the aircraft's flight status in the air.

3.2.4.1 DAPs in Consistency Checks

The system is capable of making use of DAPs for report consistency checks, altitude and position tracking. The data in DAPs include the magnetic heading, true airspeed, selected altitude, barometric vertical rate, geometric vertical rate, roll angle, track angle rate, track angle, and ground speed, etc.

3.2.4.2 DAPs Related Warnings

DAPs Related Warnings generally include:

a. 24-Bit Code Mismatch Warning

For the correlated track, the system can provide an ICAO 24-bit code mismatch warning and present to the responsible controller when the downlink 24-bit code does not match the CODE in field 18 of the FPL message.

b. Callsign Mismatch Warning

For the correlated track, the system can provide a callsign mismatch warning and present it to the responsible controller when the downlink callsign does not match the callsign in field 7a of the FPL message.

c. Predicted Level Mismatch Warning

The system is suggested to continuously monitor the consistency of Selected Altitude from the airborne equipment and the Cleared Flight Level from the controller. A predicted level mismatch warning will present to the responsible controller if the difference is greater than the pre-defined threshold.

d. QNH Mismatch Warning

The intention of such an alert is to highlight to controllers when there is a mismatch between a flight crew set QNH and that the QNH applicable to the airspace that the aircraft is operating in. This alerting uses DAPs provided QNH to compare against the ATMAS QNH value.

Like any alerting, QNH alerting can produce spurious alerts that can result in over or under reaction by controllers. States considering any display of QHN mismatch on the ATMAS HMI should consider:

- Risk/benefit-based implementation and assessment of alerting accuracy
- Limiting the application to areas of specific concern such as arrival or departure procedures that are affected by terrain or traffic density.
- Consideration of mitigations for when aircraft QNH and system QNH may be different but acceptable in application e.g., aircraft transiting from an Area QNH to and Aerodrome QNH for arrival.
- Alternatives to on screen alerting – such as summary daily reporting, that can be used to identify trends and areas of higher occurrence and appropriate operational or technical action.

e. Resolution Advisory (RA) alert indication

The system may provide a RA alert indication and present on the track label to the responsible controller when a RA report is received via the airborne ACAS system.

Note: The display of ACAS Resolution Advisory Report in ATM automation system can be turned on or turned off by user, and it is not recommended by IFATCA. The user is suggested to do the relevant safety evaluation before applying this function.

3.2.4.3 DAPs Display

The system is suggested to provide a downlink data window, which is used to display the downlink aircraft information. Displayable information is recommended to include: SSR code, Target aircraft address, Target aircraft identification, Magnetic heading, True airspeed, Selected altitude, Final state selected altitude, Barometric vertical rate, Geometric vertical rate, Roll angle, Geometric vertical rate, Track angle rate, Track angle, Ground speed, Velocity uncertainty, Position uncertainty, Indicated airspeed, Mach number, Barometric pressure setting, etc.

The information in the DAP Window can be configured per logical positions, such as the airborne downlink data to display and the unit of data items, etc.

3.2.5 Arrival Manager Function

The purpose of Arrival Manager (AMAN) is an advisory tool to optimize the flight landing sequence with suggested arrival interval and reduce flight holding time in the air, thus minimizing delay and providing control actions and advisories. These are achieved by considering factors such as airport runway configuration, runway rate, weather conditions, stand arrangements, etc.

The essential functions of AMAN include flight sequencing, spacing, and delay advice.

a. Flight sequencing and spacing function

   According to the calculated four-dimensional trajectory, AMAN calculation takes into account the metering point or runway spacing and performs a sorting calculation to obtain the target landing time (TLDT) and the arrival sequence. The tool recalculates the TLDT, when it obtains a new estimated landing time (ELDT), or when ATC reissues a request to revise the metering point or runway spacing.

b. Delay advice function

   The delay advice generated by AMAN includes re-route, holding pattern, point merge system (PMS), and delay time indication. The system gives different delay advice according to the time of the delay.

AMAN may interact with ATFM or CDM system to follow a strategic plan to balance capacity and demand within different volumes of airspace and airport environments. There are many types of ATFM measures. Their lifetime typically spans the pre-tactical and tactical phases of the ATFM timeline. Fix balancing, Re-routing (mandatory or alternative), Level capping scenarios, and Collaborative trajectory options are included in the lateral aspect. For details and more information, please refer to DOC 9971.

3.2.6 Departure Manager Function

The basic function of DMAN shall include stakeholders to file Target Off-Block Time (TOBT) to a particular flight and ATC to calculate Target Take-Off Time (TTOT) which in turn issues a Target Startup Approval Time (TSAT). DMAN should also take in Calculated Take-Off Time (CTOT) from Flow Managers to apply ground delay programs.

The purpose of Departure Manager (DMAN) is to allow the operator to plan flights and share the planning decisions with other operators enabling Airport Collaboration Decision Making (A-CDM) to optimize departure sequence. This reduces fuel wastage by reducing taxing and waiting time on taxiways.

a. Filing TOBT

   When operators and stakeholder to file a TOBT, it enables ATC to know when the aircraft will be ready for pushback. This enable better predictability of flight readiness

b. Calculating TTOT and TSAT

   With a known TOBT, DMAN will calculate a take off time for this flight. If take off time is free of conflict, TSAT will be TOBT. If take off time is occupied by another flight, DMAN will find the next available take off time base on system set departure interval and wake constraint, forming the TTOT. TTOT will be back calculated by deducting taxing time to runway and pushback time deriving a TSAT. In this case, TSAT is not the same as TOBT thus a delay advice in gate is issued.

c. Taking CTOT into consideration

d. If ground delay program is needed, Flow Managers will issue a specific CTOT to a flight. This will then replace TTOT of the flight and DMAN will back calculate by deducting taxing time to runway and pushback time deriving a TSAT. This CTOT shall be within system configured constraint and other non CTOT flights to be sequenced around it.

DMAN can be enhanced by introducing Surface Manager (SMAN) which will feed taxing time to DMAN base on ground sensors rather than a fix system configured table.

3.2.7 System Log Management

For the convenience of anomalies investigation, the system is recommended to be able to collect and manage operational logs and error messages. The operational logs include personnel commands, hardware logs, software logs, external interface logs, etc. The error messages consist of software and hardware error messages, etc.

The system is suggested to be capable to:

a. Record operational logs and error messages.

b. Display necessary logs on the dedicated positions.

c. Store logs on the disk and classifies by dependency. The user is allowed to sort logs by given conditions.

d. Backup logs automatically or manually, and the backup logs are readable.

e. Store logs on the disk for at least 31 days.

3.2.8 Enhancement Recording and Playback Function

Considering the convenience to user, the system is recommended to extend the capability to integrally record the screenshots of the HMI by way of frames and replay the recording onto designated positions and mobile devices in the form of video.

3.2.8.1 Video Recording Function

The video record refers to the continuous footage derived from the controller's screen as exactly the same as shown. The video recording data is recommended to output as common video formats.

The system is suggested to support the storage of video recording data over a period of time, such as 31 days. By reducing disk occupancy and transferring the data for the method, the system should not be impacted by storage overload.

3.2.8.2 Video Playback Function

It is recommended that the replay of the video record data could be performed on any designated controller position, and the video replay should be synchronized with the Audio.

The system is expected to be able to control the replay, including the selection of replay mode, retrieval replay, change replay speed, start, pause, forward, stop, etc.

3.2.9 Enhanced Wake Turbulence Separation and Pairwise Separation Tools

Amendment 9 of the PANS-ATM (Doc 4444) introduces a new enhanced wake turbulence separation scheme with an alternative set of wake turbulence groups and associated wake turbulence separation minima for approach and departure phases of flights. The new scheme is based on the studies performed by Federal Aviation Administration (FAA) and European Organization for the Safety of Air Navigation (EUROCONTROL) on the wake generation and wake resistance characteristics of different aircraft types, which allows a reduction in wake turbulence separation between some aircraft pairs depending on the leading and the following aircraft type, as well as increases in wake turbulence separation for the smaller and more vulnerable aircraft type.

The ICAO Flight Plan is not required to be updated with the new wake turbulence groups, while air traffic controllers will have to consider seven wake turbulence groups instead of four categories when applying the new wake turbulence separation minima. States/Administrations are recommended to implement Pairwise Separation Tools function in ATMAS to assist air traffic controllers in the delivery of intended aircraft separation under the new scheme without memorizing all the separation pairs.

3.2.9.1 Wake Turbulence Groups and Airspace

The harmonized ICAO wake turbulence group categorizes aircraft into seven groups, Groups A to G, based on maximum certified take-off mass and wing span:

For the implementation of enhanced wake turbulence separation scheme, States/Administrations have the flexibility to determine the scope of applicability to their airspaces. Also, States/Administrations can consider introducing the reduced minima in total, or in part as the first step, or a combination of these with fewer groups, or updating the local minima based on a partial set of enhanced wake turbulence separation minima, whichever will provide the most benefit given the local traffic mixture.

To facilitate the transition from legacy to new scheme by air traffic controllers, the design of ATMAS should allow the flexibility to adapt the mapping of wake turbulence groups (A to G) to a custom set of abbreviations according to the local operational environment to minimize the impact to air traffic controllers in handling extra wake turbulence groups under the new scheme.

States/Administrations would need to define the specific volume of airspace that operates using ICAO enhanced wake turbulence separation, whilst other airspaces should continue to operate using legacy ICAO wake turbulence categories. For the implementation, the design of ATMAS should allow the use of both wake turbulence categories and groups in the system so that the appropriate wake turbulence categories/groups could be applied based on airspaces, controlling sectors, or controller’s roles in accordance to operational needs.

3.2.9.2 Human Machine Interface of Wake Turbulence Groups

The abbreviation of wake turbulence categories/groups is normally displayed in the track labels of an aircraft in the HMI of ATMAS. Since the enhanced separation would only be implemented in the designated volume of airspace, the ATMAS should be configurable to display the appropriate wake turbulence categories/groups to air traffic controllers in accordance with the applied wake turbulence scheme of that airspace. The ATMAS could determine the appropriate scheme by referring to the location of the aircraft and/or roles of the controllers.

In addition, States/Administrations can consider implementing electronic cue cards on the pair-wise aircraft separation under wake turbulence groups in ATMAS to assist controllers in identifying the required separation for aircraft pairs during operation.

3.2.9.3 AMAN Optimization

With the implementation of ICAO enhanced wake turbulence separation, runway capacity is expected to increase in most cases due to a general reduction of wake turbulence separation in popular aircraft pairs of traffic mix. To benefit from the increase in runway capacity, the AMAN would need to be optimized to provide plans with arrival rate matching the runway capacity. The optimization could involve a change in the AMAN logic on handling extra wake turbulence groups or fine-tuning of system parameters to increase the arrival rate of the landing sequence generated by AMAN to match with the theoretical runway capacity as far as possible.

3.2.9.4 Pairwise Separation Tools

To assist air traffic controllers in handling air traffic under enhanced wake turbulence separation and improve air traffic controllers' consistency in delivering the traffic according to the intended runway capacity, Pairwise Separation Tools are recommended to be implemented. There are several examples of such tools in use, the following tool, namely Approach Spacing Tool (AST), provides an example of the function and application of such tools. The AST could project and present the required spacing graphically between aircraft pairs along the approach sequence and provide advisories, in the form of graphical indicators on the Air Situation Display, to indicate the optimal positions of aircraft along the final approach path.

The AST could be operated in either Distance-based Separation (DBS) or Time-based Separation (TBS). Time-based Spacing could be helpful in safely managing the traffic without reduction in capacity when aircraft ground speed is generally reduced on the final approach due to strong and consistent headwinds. States/Administrations should assess separation standards by considering the performance/accuracy/reliability of local wind prediction, time-to-fly forecast, and other relevant ATC support tools.

<u>Projection of Spacing</u>

> During the computation of spacing guidance, the AST should consider all the required separation criteria for a given aircraft pair, including wake turbulence separation minima, minimum radar separation, and dependent parallel approach separation. Then the tool would apply the most stringent criteria to ensure that none of the required separations is infringed.

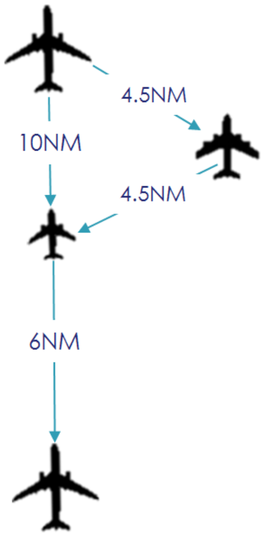


Figure 3.2.8-1 Minimum Separation

Apart from the required minimum separation, the AST would also consider other operational situations or parameters which could affect the optimal spacings between aircraft such as runway occupancy times, specific minimum separation defined for a runway, extra gap required between specific landing aircraft, etc. Together with the operational mode on the aircraft spacing and runway mode, the AST would consider all the above factors and provide spacing guidance in the form of graphical cues illustrated in the subsequent paragraphs.

<u>AST Guidance Cues</u>

Provision of visual guidance on the computed spacing, in the form of graphical indicators on the Air Situation Display, is recommended as part of the AST function. The purpose of visual guidance is to support air traffic controllers in delivering the traffic according to the intended capacity as far as practicable. Two guidance cues are recommended to be implemented by the AST:

a. Final Target Distance (FTD)

b. Initial/Intermediate Target Distance (ITD)

Final Target Distance (FTD) is the appropriate position for the following aircraft behind a leading aircraft at the required minimum spacing applied at the runway threshold. The follower shall always be behind its respective FTD indicator along the final approach path.

Initial Target Distance (ITD) is the optimal distance for the following aircraft to be positioned behind a leading aircraft with the consideration of the required minimum spacing and the deceleration compression buffer. The ITD should be calculated based on the estimated 3D trajectory, the estimated speed profile, environment data (including wind, temperature, etc.), and the target FTD.

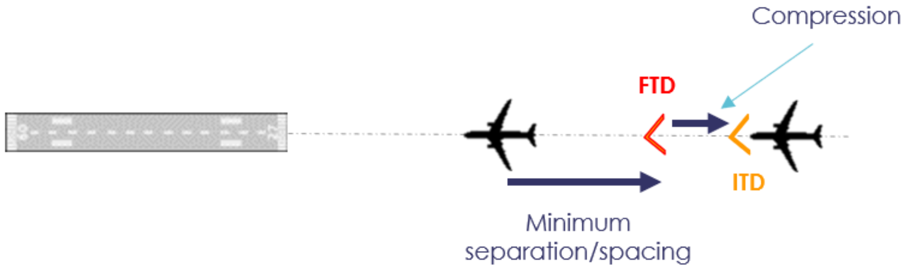
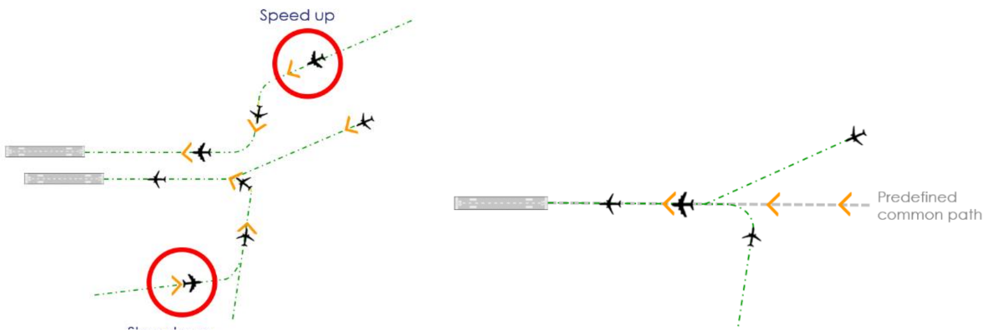


Figure 3.2.8-2 FTD and ITD Guidance

FTD and ITD guidance should be updated at every track update of ATMAS. Depending on the actual operational environment, the position of the FTD and ITD guidance cues could be chosen to implement in AST along:

a. Planned trajectory of the flight.

b. Predefined common path.



(a) Planned trajectory of the flight (b) Predefined common path

Figure 3.2.8-3: Guidance Cues

Final Approach Sequence Management

The planned Final Approach sequence is crucial in the generation of AST Guidance Cues by providing necessary information to the AST in determining the required wake turbulence separation between aircraft. Therefore, an accurately planned sequence is important for smooth AST operation.

If State/Administration has implemented Arrival Manager (AMAN) in its operation, its arrival sequence data would be the best candidate for processing by the AST. If AMAN is not available, an arrival sequence based on the flight trajectories from ATMAS would be an alternate option for AST processing.

Monitoring Aids in Approach Spacing Tool

To ensure the appropriate spacing between arriving aircraft can be delivered, the following monitoring aids could be implemented for aircraft under management by AST for detecting catch-up scenarios, infringement of aircraft spacing, arrival sequence mismatch, speed non-conformance, etc.

3.2.10 Operational Data Synchronization

In order to provide continuous ATM service in case of the ATMAS suffers from technical problems, system failures, or other critical anomalies, some ATM centers are configured with two types of ATM automation systems, which work in main and backup mode.

The Operational Data Synchronization Function serves for both master and backup ATM automation systems deployed in the same ATM center. This function enables the system to synchronize operational data to the backup system when in master mode. This function also synchronizes the system when in backup mode with operational data from other master systems.

3.2.10.1 System Main/Fallback Mode

The system provided with the operation data synchronization function shall have two working modes at least: main and fallback mode. These two working modes can be switched manually.

In the main mode, all of the system functions operate normally and output synchronization data in real-time.

In the fallback mode, the system receives and processes the synchronization data in real-time. System functions run as usual, apart from the transmission of messages to external systems.

3.2.10.2 Synchronous Data

Data synchronous data between the main and fallback systems is recommended to include basic flight data and operational setting data as follows. Users can adjust the data to be synchronized based on the operation needs:

a. Basic flight data comprises flight plan information, allocated runway, SID/STAR, etc.

b. Operational setting data includes sector allocation, airport runway status, position settings, online area creation or modification, etc.

3.2.10.3 Synchronization Trigger

Data synchronization is recommended to carry out periodically at a pre-defined time interval. In addition to the periodic data synchronization, the synchronization could be triggered by pre-defined events, for examples:

a. Each item in the flight plan information changed.

b. Each flight plan state changed

c. Each operational setting changed.

3.2.11 Statistics and Analysis Function

Statistics and analysis function could be implemented for generating reports on the surveillance data, flight plans, alarm information, and traffic flow data.

Flight data that can be extracted from the ATMAS database at a minimum would have the following correlated data fields: aircraft ID[1], number of aircraft movements in the airspace sector and controlled airspace[2], flight rule[3], flight type[4], number of danger area infringements, number of rejected & accepted uplink messages, number of rejected & accepted downlink messages, number of uplink & downlink delivery timeouts, number of received and transmitted messages, number of AIDC messages[5] (transmitted, received, rejected, and accepted) and the total number of flights.

Presentation of correlated data fields would be in the form as shown in Appendix B: **Table 3.2.10-1A for Flight Specific Flight Data and Table 3.2.10-1B for Collective Flight Data,** where these are organized according to the date and/or time (in hour resolution[6]) of interest. The date and/or time window selection will allow flexibility in the period of data of interest. Hence, the correlated data will not be limited to fixed time periods, e.g., daily, weekly, or monthly. Nonetheless, a fixed time period can be the default setting and, in any case, the selected time period that defines the scope/coverage of the data that are being presented in the interface will always be visible to the user.

The data fields for **Collective Flight Data** will refer to the specified time periods. For example, data for the Total No. of Flights will be presented for the Day if the selected Time Period is set to Day; the Total No. of Flights will be shown in each sector for the Airspace Sector; and so on. Furthermore, the Total No. of Flights data need not be equal to the Total No. of Flights in the Airspace Sector when the Total No. of Flights

[1]ICAO 2012 strictly enforces that this figure should be letters and numbers only, devoid of dashes, spaces, or other punctuation.

[2]sorted into ARR, DEP, Overflight, and Domestic Flights

[3] "I" for IFR, "V" for VFR, "Y" for when the flight will be initially IFR followed by one or more subsequent flight rules changes, and "Z" for VFR first with any number of subsequent changes.

[4] "S" for Scheduled Air Service, "N" for Non-scheduled Air Transport Operation, "G" for General Aviation, "M" for Military, and "X" for everything else

[5] applicable to flights involving the exchange of AIDC messages with adjacent FIR/ATS Unit

[6] the selection of time period will allow up to values in hour, e.g., 19 March 2021 0900-1000 UTC

in each Airspace Sector is summed together for the reason that the flight may have traversed more than one Airspace Sector. The same principle is applied in the presentation of other correlated data fields.

Correctness and accuracy of the information in the presented data should be verified prior to deployment of the ATMAS into live operation. This can be arranged as one of the test cases for each data field that the vendor must be able to comply verifying its performance.

Similarly, surveillance data correlated with flight data records can be retrieved from the ATMAS. These data are grouped into Flight Specific Surveillance Data.

Flight Specific Surveillance Data should be able to provide information on the type of surveillance track that is/are correlated to the flight. For instance, in a single flight data record, there is information if Secondary, Mode S, Multilateration and ADS-B tracks are correlated to the flight. This applies to an ATMAS interfaced with multiple surveillance technologies. For more than one source of the same type of surveillance technology, information about the source of that correlated track data should be provided, e.g., ADS-B Source: 2 (ADS-B track data taken from the second ADS-B sensor defined in the system). Furthermore, information about the surveillance track quality should also be provided if coasting, normal, low or high. This track information shall be based on the time stamped track at the time of track distribution. The time stamp shall be the reference of the ATMAS for generating the Flight Specific Surveillance Data after selecting the time period of interest. Appendix B **Table 3.2.10-2** illustrates the presentation of **Flight Specific Surveillance Data**.

Considering the number of surveillance tracks generated as system tracks for the ATMAS from a single source alone for one target, it will be quite irrelevant to gather **Collective Surveillance Data. Flight Specific Surveillance Data** would be more useful for the analysis of information generated by the ATMAS.

Data records should be retained for at least 31 days to allow for accident/incident investigation processes. These records should be made available on request to the relevant State safety authority. Where data is sought from an adjacent State, the usual State to State channels should be used. These recordings shall be in a form that permits a replay of the situation and identification of the messages that were received by the ATS system[7].

The data can be used for pre- and post-analysis of Air Traffic Management situation. Peri-analysis process will allow the ATC Supervisor to make the necessary adjustment(s) in the operations, while post-analysis can provide guidance in improving the operational processes and activities complementary to the technical aspect of the operations.

[7] The excerpts from Chapter 7.7.1 of the ADS-B IMPLEMENTATION AND OPERATIONS GUIDANCE DOCUMENT, Edition 8.0 – September 2015 is hereby adopted for all surveillance data sources.

4. SYSTEM DESIGN

4.1 System Architecture

In general, ATMAS should be equipped with adequate redundancy to ensure full availability for all critical, essential, and routine operational functions for air traffic control. Its system architecture should allow extra redundancy to be deployed whenever considered necessary. The architecture of ATMAS should follow the design and implementation principles below:

a. The ATMAS software should adopt modular design and distributed architecture to ensure robustness under adverse operating conditions. For the key function modules, such as FDP and SDP, they should be at least deployed on dual redundant servers in hot standby configuration to ensure a safe and uninterrupted service of ATMAS.

b. To minimize the number of single point failures due to hardware or software, multiple system redundancy and distributed system architecture are recommended.

c. System elements running simultaneously on multiple servers/computers should communicate over redundant networks and the failure of any element should not affect the operation of other system elements.

d. The network of ATMAS should be built on redundant network elements. Each mainstream operational data should be transmitted over independent links and networks. Failure of any network element would not affect the delivery of the main data stream within ATMAS.

e. For large-scale ATMAS designed for handling large traffic volumes, it is recommended to separate the transmission of different types of system data into dedicated networks. For example,

   - Operational Network: for handling the exchange of operational data, including surveillance data, flight plans, etc., between all controller working positions and operational servers.
   - Maintenance Network: for the transmission control & monitoring data, maintenance-related data, system log, replay data as well as distribution of new software and adaptation updates to system elements.
   - Direct Surveillance Access Network: for direct distribution of surveillance data from surveillance sources to controller working

positions as the backup to the system track output of Surveillance Data Processor (SDP) of ATMAS.

- Data Synchronization Network: for synchronizing data between redundant systems of ATMAS.

f. High reliability through redundancy such that at least two identical system elements of the same function operate concurrently and the failure of either one should not affect the satisfactory operation of its counterpart and the system service.

g. Fault tolerant such that the system could continue its service, rather than failed completely, when some elements of the system failed.

h. With fail safe capability such that the system operation should switch over to the fallback system elements after failure or abnormal termination of operational system elements.

i. Apart from having redundant elements within ATMAS, it is encouraged to implement a separate set of ATMAS as the fallback system to main operational system for maintaining air traffic services in case of catastrophic events happen in the main system.

j. For ATMAS managing busy airspaces with high traffic volume, the main and fallback systems are recommended to be provided by different manufacturers to avoid common software faults to both systems.

k. The main and fallback systems are suggested to be physically located at different sites to prevent any single-site accident affecting the operation of ATMAS.

l. External interfaces of the system (such as radar, AFTN, etc.) shall be redundantly configured and the system support automatic/manual switch to the redundant interface channels in case of partial failure.

4.2 Position Roles and Types

Based on functionalities, positions of ATMAS can be categorized into the different types, e.g.

a. Controller Working Position.

b. Flight Data Operator Position.

c. Flow Management Position.

d. Technical Maintenance Position.

e. Data Management Position.

f. Search and Rescue Position.

States/Administrations is suggested to review their operational needs during the design stage of ATMAS in order to adopt the suitable set of positions for their operational environment.

Working positions can be further categorized based on the user roles. For example, in ATC Center, controller working positions are categorized into roles of Supervisors, Executive Controller, Planning Controller, and Assistants under Enroute, Terminal, and Approach Control Streams. In ATC Tower, controller working positions are categorized into roles of Supervisor, Air / Ground Controls, Clearance Delivery, and Assistant.

Access to different system functions by users would be controlled based on the assigned roles. Controllers would be assigned with controlling roles for flights under their jurisdiction, while maintenance engineers would be granted monitoring and control permission on system components of ATMAS. All the roles and permissions should be offline adaptable in the system database by authorized personnel. Once a role has been assigned to an individual, that person can access the data and functions based on the assigned permission.

States/Administrations could consider strategically deploying extra controller working positions as spare in ATC Center and Tower. If a controller working position fails for some reason, controllers can quickly move to a spare controller working position and continue the ATC operation. The design of ATMAS should allow the restoration of air traffic situation display, flight data, electronic flight strips, display settings, and preferences after controllers move to another position to continue their works.

The type and number of positions shall be deployed on each site according to the operational requirement. For the functions of each position, please refer to section 3.1.10.

4.3 Main and Fallback System Configuration

States/Administrations are encouraged to implement ATMAS in Main and Fallback configuration as the baseline in order to be capable of providing uninterrupted ATC service for their airspace. The Main and Fallback configuration can be achieved by two sets of ATMAS or redundant processors of the same system. The Fallback system should possess comparable system scale, configuration, and software functions with the Main system. In addition, the Main-Fallback data synchronization mechanism should be implemented to ensure the readiness of Fallback system for taking up the role as operational system for air traffic control in case of failures in Main system.

For ATMAS managing busy airspaces with high traffic volume, States/Administrations are encouraged to set up the Main and Fallback ATMAS with the same functionalities, capabilities, and capacities but in separated systems in order to enhance robustness and continuity in providing safe, efficient, and orderly ATC services. In busy airspaces, ATMAS failure could be a catastrophic event and cause disruption to air traffic. The Main and Fallback systems with data synchronization mechanism should allow the switch over between Main and Fallback systems seamlessly when needed. In addition, since the system switch over due to unexpected failure could be a rare event, States/Administrations are suggested to perform the switch over between Main and Fallback systems regularly to get air traffic controllers and engineers familiar with the process.

To further enhance resilience and mitigate risks of complete ATMAS failure, Main and Fallback systems are recommended to be provided by different manufacturers to avoid common software faults encountered in both systems simultaneously. If Main and Fallback systems with the same functionalities, capabilities, and capacities were supplied by the same manufacturer, a full-fledged Ultimate Fallback system from a different manufacturer would need to be implemented such that the Ultimate Fallback system could take up the operation as last resort in case of common software faults in Main and Fallback systems. The Ultimate Fallback should be designed to have the same level of functionalities, capabilities, and handling capacity as Main and Fallback systems in order to sustain possible prolonged control of the airspace.

For the case of (1) Main and Fallback systems from the same manufacturer or (2) redundant processors of the same system, but without the deployment of Ultimate Fallback system, States/Administrations should conduct safety risk assessment on the overall system architecture to ensure that the risks of having common software faults in both Main and Fallback systems simultaneously have been mitigated to an acceptable level.

Real-time data synchronization function shall be implemented between the main and fallback systems to ensure the data consistency and smooth switch when technical failure. The operational data synchronization function can refer to section 3.2.9.

4.4 System Operation Mode

4.4.1 Normal and Degraded Modes

The ATMAS should be capable of operating in normal and degraded modes. Under the normal mode of operation, all the system elements of ATMAS are running normally with full redundancy. Whenever there is any key system function (such as FDP or SDP) fails, the ATMAS should maintain its service and automatically change to a degraded mode of operation. The degraded mode should allow controllers to maintain the provision of air traffic control service using limited system functionalities for a short period of time while the system issues are being fixed by maintenance staff or switching over to the Fallback system is still underway.

Under FDP failure, the ATMAS would be unable to process new incoming flight plans and existing flight data records in the system. Silent coordination across controller working positions may be unavailable as well. To mitigate the impact, controller working position should keep a local copy of system flight plan data at individual workstations so that flight plan association to the surveillance tracks could be maintained using local flight plan copy upon FDP failure. In this case, controllers could continue to identify tracks under their jurisdiction in their air situation display and maintain the control of traffic.

For SDP failure, the processed multi-surveillance track data from SDP would be unavailable in ATMAS. The system should maintain the display of air traffic situation to the controllers by automatically switching to direct surveillance access mode in which individual sources of surveillance data are directly fed to the controller working positions without the need for an SDP. In this case, controllers can continue the air traffic control operation using directly fed surveillance data while the SDP issue is being investigated and fixed by the maintenance team.

In case of other failures, the system should display impacted functions and operate smoothly in the absence of degraded functions. When the failed function recovers, controllers are allowed to manually upgrade to the normal mode on the position.

4.4.2 Main and Fallback Modes

For the case with Main and Fallback systems in place, the system should be capable of configuring between Main and Fallback modes. In the Main operation mode, the system would be responsible for processing AFTN messages, assigning SSR codes, responding to controllers' input, communicating with external systems, and synchronizing data to the Fallback system. In the Fallback operation mode, the system would not process carry out the above processing but would receive synchronization data from the Main system and keep the system database up-to-date for operation switchover at any time. Since the Main-Fallback switchover involves the coordination across different controlling streams and technical maintenance team, it is suggested that user should manually switch the Main/Fallback modes at the dedicated position of ATMAS for centralized coordination on the switchover.

Regarding the HMI design, the operational modes should be shown at the controller working positions and technical maintenance positions with prominent indications in case of any degradation of system functionalities. For cases with Main and Fallback systems in operation, the ATMAS should clearly indicate the current mode of operation, Main or Fallback, in its HMI to ensure that controllers are working at the correct system.

4.5 Capacity and Performance

4.5.1 System Capacity

Normally, system capacity is used to describe the maximum processing capabilities, which is determined by the air traffic flow, operation requirements and system architecture, etc. It is suggested to include the following items at least:

a. System area.

b. Maximum number of sectors.

c. Maximum number of positions.

d. Maximum number of tracks displayed/correlated/under-controlled.

e. Maximum number of flight plans existing in the system.

f. Maximum number of flight plans activated simultaneously.

g. Maximum number of surveillance sensor inputs.

h. Maximum number of adjacent centers with AIDC protocol.

4.5.2 Response Time

Response time is used to measure the speed, stability and resource usage of hardware and software in the system, the following recommended criteria are listed by experience, States/Administrations are encouraged to consider during the system planning stage.

a. The duration to start up a single node should be not more than 5 minutes.

b. The duration to cold start up whole system should be not more than 30 minutes.

c. MTBF of surveillance data processing should be not less than 100,000 hours.

d. MTBF of a single workstation should be not less than 10,000 hours.

e. Maximum deviation of clock synchronization should be not more than 100 milliseconds.

4.5.3 Performance of Surveillance Data Processing

Performance of surveillance data processing is used to measure the accuracy and ability of the system surveillance data processing, the following suggested values would be considered for system planning.

Adhering to the RSUR-5NMSEP_ER_Tier- A in the RSUR manual as attached in Appendix C, recommended surveillance performance requirements for 5 NM horizontal separation are mainly as follows:

a. The surveillance Data Update Interval (DAT_{UI}) should be less than or equal to 5 seconds.

b. The Probability of Update (PoU) of horizontal position and pressure altitude should be greater than or equal to 97%.

c. The Horizontal Position RMS error (HPERMS) should be less than or equal to 230 m or the Horizontal position error distribution at 95% (HPE95%) should be less than or equal to 400 m.

d. The Pressure Altitude INTegrity (PAINT) and Mode A code Identity. (IDINT) should be less than 0.1%.

e. The Pressure Altitude INTegrity (PAINT).should be less than 0.1%.

f. Maximum Data Age of a parameter of Horizontal Position (HPMDA) should equal to 15s and Maximum Data Age of a parameter of Mode A code Identity. (IDMDA) should equal to 30s.

Adhering to the RSUR-3NMSEP_TMA_Tier- A in the RSUR manual as attached in

Appendix C, recommended surveillance performance requirements for 3 NM horizontal separation are mainly as follows:

a. The surveillance Data Update Interval (DAT_{UI}) should be less than or equal to 5 seconds.

b. The Probability of Update (PoU) of horizontal position and pressure altitude should be greater than or equal to 97%.

c. The Horizontal Position RMS error (HPERMS) should be less than or equal to 150 m or the Horizontal position error distribution at 95% (HPE95%) should be less than or equal to 260 m.

d. The Pressure Altitude INTegrity (PAINT) and Mode A code Identity. (IDINT) should be less than 0.1%.

e. The Pressure Altitude INTegrity (PAINT).should be less than 0.1%.

f. Maximum Data Age of a parameter of Horizontal Position (HPMDA) should equal to 15s and Maximum Data Age of a parameter of Mode A code Identity. (IDMDA) should equal to 30s.

4.5.4 Capacity of Recording and Playback

Generally, the capacity of recording and playback refers to the storage time of data in the system, and the following proposed values would be used as information during system design.

a. The minimum period for recording data archived in the system should be not less than 31 days.

b. The minimum period for system traces should be not less than 31 days.

c. The minimum period for raw surveillance data archived in the system should be not less than 7 days.

4.6 External Interfaces

External interfaces are used to communicate with other systems, including receiving and transmitting messages.

The selection, configuration, and design of external interfaces can be determined by environmental conditions, operational requirements, and long-term schemes.

States/Administrations can determine the external interface of the ATMAS. In general, ATMAS includes the following external interfaces:

a. Surveillance data interface

   - Radar interface

The system is recommended to manage dual inputs from individual radar with serial or Ethernet interface and be able to receive and process the plots/tracks in a standard format, including ASTERIX.

- ADS-B interface

  The system is suggested to manage dual inputs from individual ADS-B with serial interface or Ethernet and be able to receive and process ADS-B data in a standard ASTERIX CAT021format.

- WAM interface

  The system is recommended to manage dual inputs from WAM data processing center with Ethernet, and be able to receive and process WAM data in a standard format, including ASTERIX CAT020from Ethernet.

b. ICAO message interface

The system should be able to receive and transmit the ICAO messages automatically in IA5 or ITA2 format with the asynchronous serial interface.

c. AIDC Interface

The system should be able to exchange the AIDC messages compliant with the standard AIDC protocol on the AFTN line and/or dedicated line.

d. Meteorological interface

- QNH interface

  The system should be able to process the QNH data from the AWOS system with an asynchronous serial interface.

- GRIB interface

  The system should be able to receive and process the GRIB message from Ethernet.

e. Data synchronization and exchange interface

- System track interface

  The system should be able to receive and transmit the system tracks with serial interface and Ethernet in ASTERIX CAT 062.

- Flight data exchange interface

  The system should be able to receive and transmit flight data with serial interface and Ethernet in the message format agreed.

- Audio playback interface

The system is recommended to be able to provide the interface to synchronize the playback activities with the audio in an agreed data format through a serial interface or Ethernet, which can keep the playback of audio and situation awareness synchronization in time.

f. GNSS time interface

The system should be able to receive the GNSS time from the time reference system with Ethernet NTP protocol or serial interface.

g. CPDLC interface

The system is suggested to enable communication with external CPDLC equipment in compliance with the FANS1/A, ATN B1 data formats through Ethernet or serial interface.

4.7 Systems Interoperability

The system interoperability function enables ATMAS to exchange messages with other external systems to implement information sharing, and it is recommended to include the followings：

a. Data synchronization with fallback ATMAS

Please refer to Chapter 3.2.10.

b. Messages exchange with Tower systems

The system is recommended to be able to exchange messages with the integrated tower system, A-SMGCS, and tower electronic flight strip system. The followings are the major exchanging messages:

- flight plan message

  Providing synchronization information of flight plan messages between ATM system and tower system, including flight plans creation, modification, deletion, cancellation and flight plan life evolution, etc.

- SSR assignment message

  Providing synchronization information of SSR allocation and release between ATM system and tower system.

- Runway operational state

  Providing synchronization information of runway operational states between ATM system and tower system, including DEP, ARR CLOSE, and additional information such as inspection and construction temporarily, etc.

4.8 Cyber Threats and Mitigation

4.8.1 General Description

With the extensive deployment and closer interconnection of Commercial-Off-The-Shelf (COTS) Information and Communications Technology (ICT) Systems which is built on common standards rather than on the conventional proprietary equipment, Air Navigation Service Providers (ANSPs) have been facing increasing challenges in protecting their critical infrastructure and manage potential risks arising from cyber security threats.

To address the growing concerns on cyber security threats, ICAO has extended its SARPs with Annex 17 on Security, with the supplement as in ICAO Doc 8973 "Aviation Security Manual" which sets out the aviation security requirements, including cyber security in ATMAS. In addition, ICAO published Doc 9985 "ATM Security Manual" setting out the principles and guidelines for protecting ATC system infrastructure from cyber attacks. States/Administrations are encouraged to pursue the appropriate level of compliance to the cyber security control requirements as stated in the ICAO documents and make collaborative efforts to effectively address cyber security threats. ICAO and other international organizations have been promoting the importance of cyber security in ATC systems via their website, such as ICAO's Thematic Website on Cyber security (www.icao.int/cybersecurity) and CANSO's website on Standard of Excellence in Cyber security.

4.8.2 Cyber Security Management

States/Administrations are encouraged to develop cyber security management, which adopts a proactive and systematic approach for protecting the increasing digitization of ATS against cyber threats, through the establishment of Cyber Security Manual, Cyber Security Handbook and User Account Management Policy. The above-mentioned documents should be developed in accordance with relevant provisions in ICAO Annex 17 and Doc 9985 to provide protection of the safety-critical ATMAS against cyber threats and interference. Key elements of enhanced controls on cyber security are as follows for reference:

a. <u>Cyber Security Policy</u>

   States/Administrations should establish their own Cyber Security Policy to mitigate cyber threat. Dedicated committee or working group on cyber security with regular meetings is encouraged to set up for reviewing policies and steering the implementation of cyber security control measures throughout the whole life cycle of ATMAS.

b. <u>Network Infrastructure Protection</u>

   Interoperation among ATMAS and other ATS systems for information exchange is inevitable. Proactive protection of the backbone data network of ATMAS is essential to ensure its operation. Multi-tier defence-in-depth scheme for external TCP/IP unicast communication to other systems, comprising network equipment, firewalls, Network Intrusion Detection (NIDS) or Network Prevention System (NIPS), is suggested to strengthen the protection of the network ATMAS against cyber threats from external connections. To further strengthen the above-mentioned scheme, data diode could be utilized to leverage on unidirectional communication for the dissemination of data from ATMAS to other systems.

During the project implementation stage of ATMAS, Virtual Private Network (VPN) is often suggested by the system manufacturer to allow their personnel to assist in the installation and configuration of the system remotely. Since the system is not yet in operational use and is isolated from other operational ATC systems, an external VPN connection to ATMAS is considered acceptable in general for facilitating the project implementation. States/Administrations should assess the cyber security risks involved in remote VPN access during the integration of data interfaces to other ATC systems and ensure that all the security risks have been mitigated to an acceptable level.

After the ATMAS is put into operational use, external VPN access by the system manufacturer is, in general, not recommended. If there are operational needs to keep the VPN access by system manufacturer, States/Administrations should assess the cyber security risks and safety risks involved and implemented all the necessary measures to mitigate the risks to an acceptable level.

c. User Account Management

To protect the ATMAS from the cyber security risk of access control, States/Administrations should establish a systematic and traceable process for the administration of user accounts applicable to authorized access to ATMAS.

d. System Development Life Cycle

To achieve the viability and sustainability of cyber security protection, the protection from cyber threats in mind throughout the system life cycle of the development of ATMAS is indispensable. States/Administrations could formulate a project procedures handbook, which includes cyber security requirements, to safeguard against cyber threats from an early concept and design stage of a project. Besides, Independent Network Security Risk Assessment (INSA) for ATMAS is encouraged to conduct at a different stage of the project cycle to assess the adequacy of the cyber security measures applied to the system development.

e. Removable Media Control

Removable media provides a common route for importing malicious content into an information system. To mitigate the potential risk posed by the use of removable devices or media in ATMAS, States/Administrations should consider refining their workflow to strengthen the security control, such that a removable media should be scanned for malicious content by the machine prior to uploading data to ATMAS.

f. Software Security Patch Management

Patching vulnerabilities for ATMAS is a key challenge maintaining the balance between security and performance. States/Administrations could set up a scheme to work closely with system manufacturers to evaluate system patches when considered appropriate.

g. Physical Security Measures

While cyber security measures are in place for dealing with cyber threats, States/Administrations should implement physical security measures to physically protect the infrastructure of ATMAS from physical threats. The physical security provision includes facility management, security guards, CCTV surveillance, access control, physical lock, USB blocker, etc., from perimeter security down to console/rack level.

h. Response to Cyber Security Incidents

States/Administrations are encouraged to collaborate with the relevant local authority responsible for the investigation and prevention of cyber crime closely. A direct reporting mechanism is recommended to establish in order to seek swift assistance from the local authority for handling cyber security incidents. States/Administration is encouraged to seek relevant authority for an independent assessment of cyber security measures implemented on ATMAS. Periodic drill exercises should be arranged to upkeep staff awareness and the robustness of the reporting mechanism

4.8.3 Suggested Cyber Security Devices Configuration

ATMAS (security command, control and dispatch systems) is identified critical cyber ICT systems software and hardware used in their ATM system infrastructure in DOC9985. Physical protection of such systems should begin at the design stage or as early as practicable to ensure that they are as robust as possible against cyber-attacks. This may be achieved using a multi-layered approach. Among them, cyber security devices is suggested to strengthen the protection of the network ATMAS against cyber threats from external connections.

Cyber security devices is suggested to be designed as a part of the ATMAS, and be implemented together with the system. The balance between security and economy cost should be considered to avoid excessive defense. The cyber security devices should be compatible with the ATMAS, as well as its scalability to accommodate upgrades and developments.

ANSPs can select corresponding devices in considering of the system scale, investment budget, and the requirements of national cyber-security policies. The security devices can be selected in the cyber security construction and upgrade of ATMAS, including, but not limited to:

a. Firewall

The firewall is suggested to be implemented as the preferred device at the border network of the ATMAS to isolate the system from the external network environment and block intrusions. By deploying security configurations on the firewall, unauthorized access can be controlled and the internal network address of the ATMAS can be hidden. The firewall with intrusion detection/prevention (IDS/IPS) module and anti-virus (AV) module can be selected to strengthen the protection of ATMAS network against cyber threats.

b. Audit System

Audit systems can be used to achieve these functions: monitoring database access and operations; collecting and storing logs from servers, terminals, and switches. When a cyber security incident occurs, the records provided by the audit systems can be used for investigation.

c. Operation and Maintenace management system（Jumper）

The operation and maintenance (O&M) management system can be used to help operators conveniently authorize and manage accounts. It works as a jumper for administrators to access the internal network of the ATMAS to prevent security risks introduced by removable media.

d. Traffic Monitoring and Analysis System

The traffic monitoring and analysis system works as a higher-level security device to monitor and analyze the real-time network traffic data of the ATMAS, and provides alarms when detecting abnormal network behaviors. It assists administrators in discovering and handling cyber security incidents.

e. Endpoint Detection and Response（EDR）

EDR protection has been widely applied as a common network security technology. EDR devices monitor and protect servers and terminals as endpoints, thereby improving the security and reliability of the computing environment. Due to the consumption of system resources involved in the use of EDR devices, it is essential to conduct sufficient compatibility verification and evaluation before implementation. It needs to be confirmed that additional load will not be brought to cause a decrease in the performance or blocking of functionality of the ATMAS.

5. System Readiness

Generally, a brand new or expanded ATMAS deployment includes the following stages: Planning, Requirement definition, Bidding, Implementation, Transition. Relevant activities in different phases refer to System Deployment Checklist as attached in Appendix D.

After completion of system deployment, before transition, it is necessary to prepare the system readiness. Based on appropriate assessment, Site Acceptance and Fight Inspection can be important parts of the system readiness.

5.1 Site Acceptance

Site Acceptance is an essential validation step for a brand new or expanded ATMAS to guarantee operational safely and ensure any contractual obligations.

After completing system deployment, it is recommended to form a site acceptance working group jointly with the vendor to:

Confirm the scope of the Site Acceptance Test (SAT), test and safety plans, acceptance criteria, and agreed process for issue resolution during or post SAT i.e., the creation of a SAT Plan.

Conduct testing and verification of those items identified for SAT validation ensuring that the ATMAS meets the associated requirements of the bidding documents and the contract and any post contract changes or safety related requirements.

It is recommended that the relevant site acceptance indicators be clearly stated in the contract terms or SAT plan.

SAT areas for consideration include the following testing contents:

a. Performance testing – including identified load, integrity, reliability, and timeliness requirements.,

b. Interface testing – including data handling requirements, integrity, and associated system functionality.

c. ATMAS functionality that requires SAT integration to be conducted effectively including testing and verifying of system functions and external interfaces

d. Abnormal data processing – including erroneous input data or processing output that relates to SAT configuration

e. Stability testing, it is recommended to conduct stability testing for an agreed period that ensures all business as usually processes and expected system load conditions are incorporated. Stability testing should include a process for cessation, diagnosis, continuation, or re-set when issues are encountered during the stability period.

f. <u>Regression testing commensurate for the size of issue identified during the SAT or agreed plan for post-SAT resolution for any items that are required to be resolved before go-live but do not require a re-set of the SAT.</u>

It is recommended to record the problems discovered during the testing, and objectively and truthfully record the original data. If necessary, video, image and other recording methods can be used. Again, the parties of the site acceptance working group shall agree to the recording media and method of issues recording to ensure effective resolution.

After completing the testing, the site testing report is recommended to be compiled. The content of the report is suggested to include:

- The agreed criteria that were used for SAT validation
- Summary of test cases conducted, results and explanatory notations – this may include the testing time, testing personnel, testing item and testing conclusions,
- Issues identified during SAT and their course of resolution and status (Resolved/outstanding)
- Overall results and pass fail of the SAT against those criteria
- Any accompanying videos, images, and other content recorded during the testing that are required support the test report conclusions.
- Any other artifact documents that are used to support results or are used instead of testing during the SAT to verify SAT aspects.

5.2 Flight Inspection

Testing and validation of the main functions and technical indicators of an ATMAS is a critical part system implementation, Particularly for surveillance, identification, and safety net functions, States should carry out test regimes. This may include flight inspections.

Alternative methods may include:

- Targets of opportunity
- Recorded data
- Emulation system output

Flight inspection is strongly recommended for brand new, relocation, or updated major modules of ATMAS. With reference to Asia Pacific Flight Inspection Guidance Material 3.0 and considerable experience from common practices existing in Member States, this section describes general in relevant activities.

5.2.1 Planning of Flight Inspection

5.2.1.1 Responsibilities of Stakeholders

The stakeholders related to ATMAS Flight Inspection mainly comprise Flight Inspection Service Provider (FISP), Air Traffic Controller and Ground Maintenance Personnel. The main responsibilities of stakeholders describe as following for reference:

a. FISP

FISP is responsible for furnishing the Flight Inspection aircraft with the required airborne equipment, arranging the flight and crew to perform the inspection task, recording the airborne recorded data during the Flight Inspection, and providing the data to maintenance personnel and manufacturer for the purpose of analysis and evaluation.

b. ANSP - Air Traffic Controller

The air traffic controller is responsible for handling the inspection aircraft. Meanwhile, the controller takes charge of working closely with the Flight Inspection pilot, timely adjusting the flight route according to the actual situation, completing all inspection subjects according to the Flight Inspection programme on the condition of keeping the impact to normal traffic to a minimum.

c. ANSP - Ground Maintenance Personnel

Ground maintenance personnel are responsible for preparing for Flight Inspection in advance, observing and recording system performance during Flight Inspection in real time, analyzing the recording data and evaluating system major functions and technical indicators. Specific responsibilities include:

- Compile a complete Flight Inspection programme together with FISP and controllers, and discuss key contents such as flight check time, route and subjects.
- Ensure the system is operational and in a condition suitable for Flight Inspection, including system function and configuration, before the Flight Inspection.
- Maintain and adjust the system to solve issues encountered during the Flight Inspection
- Record data in the ATMAS for later analysis and evaluation according to the Flight Inspection programme, and maintain close cooperation with the controllers.
- Complete the data record analysis and Flight Inspection report after Flight Inspection.

5.2.1.2 Communication of Stakeholders

The smooth conduct of Flight Inspection requires concerted efforts from all stakeholders. All parties involved shall clarify their responsibilities and fully communicate with each other. Main exchanges with stakeholders are listed as follows for reference.

a. Flight Inspection programme

The reasonableness of the Flight Inspection programme is the basis of Flight Inspection implementation. It shall be formulated by all stakeholders through consultation. The programme typically includes flight inspection time, aircraft type, task area, planning route, flight altitude, inspection subject, contingency plan, etc.

- Flight Inspection time

For busy airports, there is a trend to advance the Flight Inspection time to dawn or even earlier to avoid rush hours. For small and medium-sized airports, Flight Inspection time can be determined by joint coordination with the control unit.

- Flight Inspection aircraft equipment

The aircraft is supposed to be fully equipped for all the Flight Inspection subjects, such as GPS mode, mode S transponder, etc.

- Flight Inspection subject

Flight Inspection subjects shall be set in advance according to airspace conditions and flight routes. These subjects shall be able to verify all the main functions and technical indicators of the system through actual aircraft, analog signals or system parameters configuration, while not affecting the normal operation of air traffic control.

- Contingency plan

The contingency plan includes backup Flight Inspection date(s) due to unexpected ad-hoc event such as inclement weather or technical fault, could also be discussed with key stakeholders.

b. Kick-off meeting

Before the commencement of Flight Inspection, a kick-off meeting involving all key stakeholders is recommended to ensure that all are familiar with their roles and responsibilities in supporting the Flight Inspection as well as each issue required special attention. This also allows all stakeholders to exchange comments about the programme and arrangement, taking the flight profiles sequence for instance, and helps to spot early issues which would potentially hinder normal ATC operations and Flight Inspection.

c. Closing meeting

After the completion of the Flight Inspection, a closing meeting involving all stakeholders would share the results and resulting actions of the Flight Inspection, as well as to help all to strive for continuous improvements on the overall Flight Inspection arrangement, with parties sharing their views and suggestions

5.2.1.3 Implementation Preparation

Before the implementation of Flight Inspection, the following preparations shall be made:

a. Weather Condition Acquiring

The wind direction of the airport and meteorological conditions of the flight route on the day of Flight Inspection from the meteorological department shall be obtained in advance to ensure the implementation of Flight Inspection.

b. System Preparation

The setting of parameters in ATMAS, such as warning area and arguments, radar parameters, indication map, shall be completed before the commencement of Flight Inspection. Besides, the radar simulation script (relate to the STCA function verification) shall be prepared.

5.2.2 Conducting of Flight Inspection

Flight Inspection is usually carried out in accordance with the Flight Inspection programme. During the inspection, it is essential to document all records and maintain communication with all stakeholders.

During the inspection, ground maintenance personnel shall maintain and adjust the system according to the programme, keep communication with all parties, and record the system performance of each Flight Inspection subject in the prepared record form.

5.2.2.1 Flight Inspection Subjects and Categories

Usually, the Flight Inspection subjects are suggested to categorize into three types.

a. The first type is the surveillance coverage and the processing precision in ATMAS. This type of subject mainly checks whether the target trajectory in the ATMAS properly generates and disappears, whether the track information displayed matches the actual flight information from the crew, and whether the system track is continuously smoothing without loss, and also validates multi-radar tracking and accuracy for maneuvering and circular flight.

b. The second type is the functional verification of ATMAS, regarding whether the key functions of the system are normal, mainly including the correct coupling to the flight plan, QNH altitude level changing display, DAPs data application, RVSM function, the customized function validation, etc.

c. The third type is the warning function inspection of ATMAS. This part mainly checks whether the system warning can be correctly produced and disappeared under various settings. Those may at least include STCA, MSAW, DAIW, CLAM, RAM, Emergency codes (such as 7700, 7600, 7500), etc.

In order to verify the availability of the ATM automation system, 20 Flight Inspection subjects are listed by experience as follows. The subjects cover all the types above, and can be selected by states according to site requirements.

No.	Subject	Scheme
1	Takeoff and Landing	A. Take off: Observe the appearance of the target and correlate with the flight plan; B. Landing: Observe the disappearance of the target.
2	special code （7500 7600 7700 SPI）	During the flight, the aircraft turns on a special code to observe the system alarm.
3	CA	Observe the CA alarms between the inspection aircraft and the simulated target at different altitudes, such as in the same direction, at different altitudes in opposite direction, at different altitudes in lateral crossing, at the same altitude in lateral approach, at the same altitude in pursuit, at the same altitude in the same direction in approach.
4	RVSM	Verify that the system has the ability to identify the target with the RVSM function and the CA function of the target in RVSM airspace.
5	MSAW	Observe the MSAW in the system when an aircraft is approaching the MSAW warning area
6	DAIW	Observe the DAIW in the system when an aircraft is approaching the DAIW warning area
7	Radar data processing accuracy	Verify the accuracy, continuity and stability of radar data processing of various flight paths by linear, circular and S-shaped flight modes. Check on-boarding aircraft profile data at designated position.
8	Multi-radar processing	Observe the continuity of the system track in the multiple radar overlapping area
9	Correlation	Verify whether the flight plan correlation with the system track in time and the correlation after changing the SSR code of the aircraft.
10	QNH processing	Check the system display when the aircraft crosses TA and TL, under TA, outside the QNH area, and level flying through several different QNH areas.
11	CLAM	Observe whether the CLAM alarm is displayed normally according to the parameters set by the system.
12	RAM	Observe the RAM alarm after the aircraft is not following the planned route.
13	Primary radar signal processing	Observe the appearance of primary radar targets and the marks of primary and secondary radar signals, when the aircraft takes off, as well as disappearance as the plane lands.
14	S-mode radar and ADS-B data processing	Observe the continuity of the system track in the area of S-mode radar coverage and ADS-B coverage.

15	NTZ	Observe whether the NTZ alarm is displayed normally according to the parameters set by the system.
16	DTZ	Observe whether the DTZ alarm is displayed normally according to the parameters set by the system.
17	APM	Observe whether the APM alarm is displayed normally according to the parameters set by the system.
18	accent/decent rate	Observe the system display rise/fall rate and record the actual rise/fall rate of the inspection aircraft.
19	PLM	Observe whether the PLM alarm is displayed normally according to the parameters set by the system.
20	Correlation mismatch alarms	Observe whether the system mismatch alarm is displayed normally when the flight track 24bit and callsign are inconsistent with the flight plan.

5.2.2.2 Implementation Suggestions

Generally, there are some suggestions for Flight Inspection implementation.

a. Flight Inspection time is recommended to choose in the low air traffic flow period for safety.

b. All participating parties, flight crew, air traffic controllers, and engineers shall be familiar with the responsibilities and Flight Inspection programme, carry out the work as assigned and collaborate in teamwork.

c. Ground maintenance personnel can set the analog signal script in advance to conduct the verification of STCA between the analog signal and inspection aircraft. Prepare the start time of the analog signal script in advance to ensure the success of STCA verification.

d. The virtual alarm area or obstacle height can be set to verify warning generation and disappearance, when the inspection aircraft enters into and steps out of the system warning area.

e. Usually, during Flight Inspection, ground maintenance personnel are responsible to record the ATMAS behaviors in the prepared record form, for all inspection types. This recording information will be used to analyze after the Flight Inspection.

5.2.3 Reporting of Flight Inspection

5.2.3.1 Flight Inspection Records

The inspection data used for analysis is derived from:

a. Flight Inspection aircraft data: data recorded by the airborne GPS module of the inspection aircraft and data output by the airborne aviation equipment;

b. Ground data: data recorded inside the ATMAS and the information recorded by ground maintenance personnel. The ground maintenance personnel can record the information of corresponding subjects in each flight stage and complete the relevant data recording through the ATMAS playback function.

5.2.3.2 Flight Inspection Analysis

Generally, after completion of Flight Inspection, engineers in charge of obtaining airborne recorded location data work together with the ATMAS manufacturer in carrying out data analysis as follows:

a. Complete the comparison and analysis of radar position accuracy, focusing on whether airborne equipment records location data and system track location data are consistent. Form a position accuracy analysis report based on system track data to ensure that the system meets the operating conditions.

b. Aggregates the recorded data in conjunction with the system playback to verify that the parameters of the system configuration match the relevant validation features and ensure that system functions achieve the prospective purpose.

c. Finish the Flight Inspection summary report according to the above data analysis.

5.2.3.3 Flight Inspection Report

The Flight Inspection report of the ATMAS is recommended to cover the time, route, subject, data record and conclusion of the Flight Inspection. The report matters whether the ATMAS is satisfied with and authorized on formal commission.

6. System Transition

There are several scenarios in which ATMAS transition normally happens, ranging from minor to major changes, including:

a. Major software and/or hardware upgrade, including operating system upgrade and important modules upgrade such as SDP or FDP to provide new or enhanced functionalities. These cases may influence the system stability, so it is recommended to take a transition to guarantee the operation safely.

b. Overall system upgrade with new software and hardware equipment.

For a more complex transition that involves multiple stakeholders and equipment, change management, safety risk management, transition plan, rehearsal, and post-transition support are the key elements to ensure a smooth system transition.

6.1 Phases of System Transition

There are mainly four transition phases: transition preparation, transition rehearsal, system transition and post-transition operation.

a. Transition preparation: the necessary preparation for transition in this phase, transition scheme, safety assessment, equipment preparation, staff training, an manual update shall be completed.

b. Transition rehearsal: The main objective of this phase is to build confidence in the new changes and flag any possible issues before the actual transition. It can be achieved by running an online test of the new system during off-peak hours or in the backup system in parallel with the operational system. During the online test, the new system could be connected with external interfaces and systems progressively. The operational users and engineering staff will test the main functions and interfaces, and record necessary optimization to the system as well as the rehearsal procedure. The frequency and duration of rehearsal shall be adjusted according to the complexity of the system transition.

c. System transition: In this phase, the new system will be put into operation. If the transition is complex with software and hardware upgrade, shadow operation is suggested, and the shadow operational period could last 1 or 2 weeks or even longer where appropriate. And according to the result of the shadow operation, the time point to start the transition shall be determined. If the transition fails, a decision on whether to repeat or roll back needs to be made.

d. Observing operation: In this phase, the new system operates on line, and an observation period of one month or more is suggested, depending on the complexity of the changes.

6.2 Transition Preparation

6.2.1 Transition Scheme

A complete transition scheme is necessary for a successful transition. Depending on the scale of the transition, the transition scheme is suggested to contain the followings:

a. The preliminary work to be finished, including:

- Review of acceptance testing results and equipment preparation.
- Review of the adequacy of change management and safety risk management.

- Review of training, including the competence of operational and engineering staff.
- Review of the change in ATC Procedures and update the operation manual.
- Other relevant work required.

b. Transition steps, procedures, and key points.

c. Checklist: used to check the system transition operation and verify system functions and performance during transition rehearsal and system transition.

d. Decision mechanism: transition institution shall be established to determine on the transitional key point.

e. Contingency plan: used to cope with the emergency situations and include the decision mechanism about roll back or transition delay, roll back plan, and the emergency support team.

6.2.2 Scheme Evaluation

The scheme evaluation is necessary and proposed to include scheme feasibility, scheme completeness, scheme presumption, equipment and staff preparation, the stability of the new system, and the solutions to bugs discovered during the on-site test. According to all these elements, some improved suggestions should be raised to make the scheme more perfect. After the evaluation, recheck should be made to ensure the implementation of the suggestions.

6.2.3 System Deployment

To ensure the system rehearsal and transition smoothly, the technical staff should validate the new software version on the test platform to ensure the new version can work well. And then, the system maintenance department should deploy the new software and hardware in advance. Making sure all the new software and hardware deployed in the system will shorten the time of transition sufficiently.

6.2.4 Table Pre-rehearsal

Table-top exercise refers to the process in which the participants use maps, sand tables, flow charts, and other auxiliary means to interactively discuss and deduce the transition steps and emergency decision-making in the transition scheme.

Table-top exercise is recommended to ensure the feasibility of system switch steps, the smoothness of cooperation, the completeness of checklist, and the rationality of time arrangement.

6.2.5 Other Preparations

The operational and engineering manual should be updated, including system information, technical manual, notification process, and emergency plan.

Before the rehearsal, thesystem maintenance department should train staff about the transition scheme and the updated manual to help them understand the system transition, collaboration matters among departments and system new functions.

6.3 System Rehearsal/Pre-Transition Verification

The transition scheme, including the detailed transition procedure and steps, should be made familiar to the team through training activities prior to the system transition. Depending on the complexity, several system rehearsals are suggested to be performed during the off-peak hours. The purpose of the system rehearsal is to verify the transition procedure as well as to validate the functionality, reliability, and stability of the new system in a real operational environment.

6.3.1 System Switch Steps Validation

The transition procedures are recommended to be validated according to the overall transition rehearsal scheme. The procedure to be validated includes at least the following: system switching steps, operating contents, transition team, and reasonability allocation, notification and reporting process. A checklist is suggested to be developed and optimized according to the result of each rehearsal. The optimization should be verified at the next rehearsal.

During the rehearsal, the time spent on each step is advised to be verified and be used as a reference to support the decision making during the formal transition.

6.3.2 System Functions and External Interfaces Validation

The system functions and external interfaces are suggested to be tested and to ensure that they are functional as intended during the rehearsal. To ensure a smooth transition, the problems identified during the transition should be recorded in detail and corrected with the support of the SP.

6.4 System Transition

At the end of the above preparation activities, the transition management organization is suggested to decide to approve the date and time of the formal transition, based on the transition scheme evaluation report, the transition preparation status, and the result of the transition rehearsals.

For major system replacement or overall system upgrade transition, the shadow period is recommended to put the new system into operation during an off-peak time, to verify the system performance in a real operational environment, and to allow staff to gain familiarity and confidence in operating the new system. The duration of the shadow period is determined by controllers. 1~2 weeks shadow period is suggested to make every shift familiar with the new system. Appropriate rostering of staff is required such that all staff will be given the opportunity to gain experience in operating the new system.

Finally, the transition is recommended to be performed based on the pre-defined procedure at the pre-defined transition time. The new system should be put into operational use after the verification of the functioning of the system is confirmed following its transition.

However, suppose there are blocking or critical issues, such as ssues affecting safe operation occurring during the transition. In that case, decisions should be made according to the decision making strategy defined in the transition scheme, which may result in rollback or delay of the transition.

6.5 Post-Transition Operation

The post-transition operation phase is suggested as the run-in period of the system, which preferably requirs additional staffing from the MSP as well as SP to resolve teething issues. The issues identified during this phase should be timely analyzed, corrected, and reviewed. In addition, the maintenance experience of the new changes will be accumulated.

The duration of the post-transition operation phase is recommended to be one month or longer. A formal assessment is suggested to be performed at the end of this phase. The assessment is proposed to include:

a. Issues reported during the observation period.

b. The cause analysis and possibly the avoidance and corrective methods of the issues.

c. Recommendations for future operation, matters-needs-attention, etc.

The system will enter the stable operation phase after the observation period.

7. System Maintenance

The ATMAS goes to the system maintenance phase after being put into operation. System maintenance is necessary for the entire service life of the system. Critical functions and equipment should normally work even as the environment changes through planned and organized maintenance. The purpose of system maintenance is to guarantee stable and continuous operation and to improve the performance of the system.

7.1 System Maintenance Participants

To handle the maintenance of complex and safety-critical ATMAS, robust and systematic maintenance management, and practice should be set up with close cooperation among system suppliers, Maintenance Service Provider (MSP), and the Air Navigation Service Provider (ANSP) to ensure the operation of the system.

Under the maintenance framework for ATMAS, the system supplier, MSP, and ANSP form a close coordination trio in operating and supporting the maintenance framework.

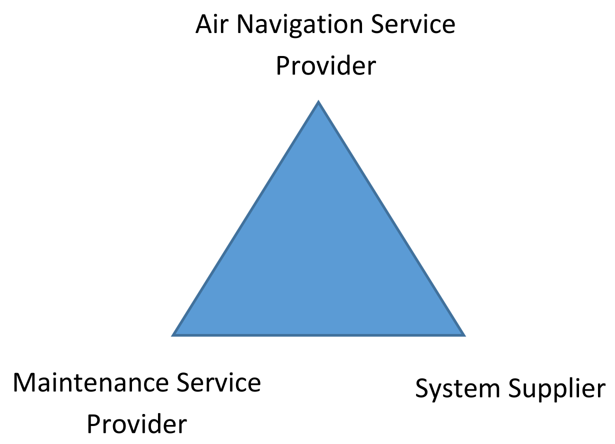


Figure7.1-1: Trio for Maintenance Framework

7.1.1 System Supplier

The design of system plays a critical role in the ease of maintenance during the operation stage of the system. Before system commissioning, the system supplier, as the entity with the most comprehensive know-how on the system, should provide sufficient maintenance documentation and training to ANSP and MSP, including complete information for proper installation, setup, use, operation, support, and maintenance of the system.

The system supplier should provide documentation to the ANSP and MSP for aiding the use, application, and maintenance of the system and individual equipment, which should include:

a. Operation handbooks and user manuals for operating procedures and system functionalities for use by controllers, supervisors, assistants, and support specialists.

b. Technical literature for the full technical description of configuration and operation in the system as well as full details of each system component, block diagrams with data flow, mechanic and wiring schematic diagrams, as-built drawings, etc.

c. Service and maintenance manuals, including system setup, optimization and parameterization, preventive maintenance procedures (system checking and rebooting, calibration, cleaning, housekeeping, etc.) with recommended frequencies, and troubleshooting procedures in hardware and software (recommended solution and flow chart to identified issues, handling of alarms and error messages, etc.).

All documentation should be reviewed and endorsed by the relevant authority prior to use.

The system supplier should prepare training plans and training course materials for ANSP and MSP for review with sufficient time prior to critical milestones, such as commencement of design review, factory/site acceptance tests, and ATC operational train-the-trainer course. ANSP, in coordination with MSP, should set out the required training topics, which should be specific to different user groups, in the system contract.

Subject to actual needs, after ANSP and MSP have built up their own training capability, on-site maintenance review and assessment on MSP should be conducted by the system supplier after commissioning on a regular basis, with more frequent training/assessments during the start-up and run-in period after commissioning.

As ATMAS is a complex system, it is unavoidable that unexpected technical issues might emerge, especially teething issues during the early stage of operation. As such, the system supplier should be required to respond to requests from ANSP or MSP to provide timely assistance in dealing with and rectifying all faults or deficiencies in software and hardware within pre-defined response time according to the criticality of such faults or deficiencies as specified in the contract. Repeated faults should be handled and investigated with high priority by the system supplier to identify the root cause and implement corrective measures.

Since technology is changing rapidly, some system components might become obsolete and become difficult to source in the market. The system supplier should provide a list of obsolete equipment and its replacement models on a regular basis, and the replacement model should be evaluated on-site for its compatibility prior to use as a spare for operation.

The performance of the system supplier has to be regularly reviewed in suitable forums, such as performance review meetings in conjunction with ANSP and MSP representatives.

The system supplier could consider forming user groups to allow sharing of users' experiences and gather feedbacks. The system supplier should facilitate regular hosting of user group meetings.

7.1.2 Maintenance Service Provider

The engagement of an MSP to perform frontline maintenance under the supervision of ANSP is a practical solution in leveraging skill sets and the latest technology available in private sector in order to facilitate the provision of reliable services with cost benefit.

Under the regime of compliance to all applicable ordinances and regulations, Safety Management System and Air Traffic Safety Electronics Personnel (ATSEP), the maintenance services provided by MSP should include watch-keeping of equipment, preventive/corrective maintenance, system/equipment minor modification/ replacement works, staff training, and procurement of spares and test equipment/ tools. Support services such as record-keeping on maintenance activities, preparation of statistics and reports and inventory control, etc., could be provided as part of the package from MSP.

MSP needs to perform maintenance according to the system supplier's established procedures at recommended intervals, including health checks on the system, servers, equipment and workstations, critical data backup, and log capture/review for hardware, software, user management, and other activities, system parameters and user preference checks and backup, regular clean-up, and reboots of hardware including servers and workstations, etc. Proactive system housekeeping procedures adopting industry best practices with the recommendation from system supplier and expertise from MSP, together with close monitoring of system healthiness/system resources and housekeeping of servers/workstations on a regular basis to upkeep the system performance, should be in place.

There could be cases that due to the local specific environment/operational status of the ATMAS, it would require extra steps or more frequent maintenance, e.g., more frequent clean-up/reboot of servers and workstations, on top of recommended maintenance procedures by system supplier.MSP, who looks after the system day-by-day and is familiar with local environment, would contribute their expertise in adapting the maintenance procedures to fit into the local needs after consulting the system supplier.

In addition, like any critical system running on a round-the-clock basis, ATMAS has no exception that it might encounter system fault where immediate attention from MSP is required. For example, a server breakdown after a software bug is hit with no or little pre-alerts. It is important that MSP has geared up with a full deck of operational instructions for their watch-keeping staff to handle all sorts of foreseeable system scenarios with proper initial and refresher training/drills on such scenarios.

The build-up of know-how and experience for MSP in dealing with urgent scenarios is crucial to smooth operations of the ATMAS.

Similar to system suppliers, the service level of performance of MSP has to be constantly monitored to meet the target levels set out in the contract and regularly reviewed in suitable forums, such as operations & maintenance review meetings in conjunction with ANSP representatives to ensure maintenance provisions could meet the service needs.

7.1.3 Air Navigation Service Provider

As the party to govern maintenance service performance by MSP and system supplier through various means discussed above, ANSP has to ensure the necessary support and resources to be provided to MSP and system supplier for fulfilling or even exceeding. The baseline maintenance requirements are set out in the contracts with these parties. Payment deduction might be incorporated into the contract to handle cases where performance does not meet requirements, but it might bear impacts on maintaining a good relationship with MSP or system supplier.

ANSP has to ensure the services provided by MSP and system suppliers are in compliance with ICAO standards and international best practices. ANSP is encouraged to share experience and best practices gained from ICAO and international meetings/ symposia/ seminars, as well as overseas facts-finding visits, with MSP and/or system suppliers with a view to enhancing the maintenance regime.

To allow ATC professionals to perform their work safely and satisfactorily, it is highly desirable for ANSP’s engineering professionals to understand the operational needs such that the ATMAS could fully support their work. As such, constant communications with ATC professionals in addressing their needs via suitable steering forums and communication channels would be critical to the smooth operations of ATMAS. Following the system commissioning, a technical team comprising ANSP engineering professionals, system supplier, and MSP, could be established with ATC professionals to oversee system performance and deployment of new software builds and system data updates to ensure smooth operation of the ATMAS.

7.2 Resources Requirement

Necessary resources are mandatory for system maintenance, and the main considerations are as follows:

7.2.1 Staffing

MSP should ensure sufficient staff is employed to form a maintenance team and provide 24-hour operation and maintenance.

Before stepping into the system maintenance phase, MSP and ANSP should ensure the personnel is fully trained by the SP or certified trainers. This ensures that the personnel involved in the maintenance work grasp knowledge and skills related to the system. It is also recommended to arrange on-site training by SP for MSP and ANSP after system installation. Before the training, the training plans and training course materials should be fully reviewed by ANSP/ MSP in accordance with contract requirements and define training topics for different users.

Before the system is put into operation, MSP and ANSP are recommended to send personnel to work in different phases for technical reserves in advance and enhance their comprehension and familiarity with the system, which will be conducive to the subsequent maintenance work:

a. System design phase

   MSP and ANSP are recommended to send personnel to participate in the design of the system to track the project development progress in SP factory, check the rationality and applicability of the design of each functional module of the system and put forward suggestions, and review technical documentation at the milestone, including the consistency of requirements, product design, handbooks, and acceptance test book.

b. Factory acceptance test phase

   MSP and ANSP shall send personnel to participate in factory acceptance test in accordance with the contract requirement. MSP and ANSP personnel shall review the acceptance test books provided by SP in advance. The acceptance test shall be executed according to the approved test book in the test environment, such as platform, signal, instrument, etc., prepared by SP, and the result shall be recorded in the report.

c. Installation phase

   After the work of on-site equipment installation starts, MSP should send personnel to participate in the whole process of hardware installation, software debugging, on-site acceptance tests, flight inspection, etc. At this stage, personnel should be well familiar with important information such as equipment installation location, cabling, signal routing, position layout, label , signs, etc. They also need to learn software debugging and testing methods, and master the knowledge of system's functions and performance during on-site testing and flight inspection.

Besides above all, MSP and ANSP should set up their own maintenance personnel training systems, maintenance personnel access mechanism, and regular assessment of personnel skills to ensure that qualified personnel can perform the operation, maintenance, and management of the system.

7.2.2 Documents

Before the start of the system maintenance phase, MSP and ANSP should make sure necessary documents are in place to run the system. The documents should include at least the following:

a. System Design Specification: a set of technical documentation including system architecture, interface control documents, function module principle, etc.

b. Operational manual: an instruction manual that describes the function, performance, and user interface of the system software in detail so that the maintenance can understand how to use the operate the system.

c. Maintenance Manual: the service and maintenance manual includes system installation, parameters setting, maintenance suggestions, as well as troubleshooting procedures in hardware and software (it is recommended to provide a flow chart to locate and solve the problems and a method to identify the alarm and error, etc.)

d. User guides documentation: detailed description and operation guide of HMI for controllers, FIO, Flow.

e. Installation documentation: including details of each component of the system, cabinet layout, figure with data flow, mechanical and wiring schematic diagram, as-built drawing, etc.

f. Training documentation: including training materials or documents related to factory and on-site training.

g. Testing documentation: including achievement of acceptance criteria and identification of outstanding issues

h. Emergency response process documentation: in the event of sudden equipment failure, effective countermeasures can be taken in time to minimize the impact of equipment failure on air traffic control operations.

Besides, MSP and ANSP should work out their working procedures, maintenance plans, and contingency plan for unning the system.

All documents should be reviewed and approved before application which should be updated continuously to keep the accuracy according to the changes in system behavior during the long-term operation.

7.2.3 Maintenance Tools

MSP and ANSP are recommended to be equipped with instruments and maintenance tools required for system maintenance, for example, a simulator used to simulate track and message for system test, a software management tool for installation, rollback, and backup operation to software patch and release. Training for maintenance personnel shall cover the use of instruments, maintenance tools, and simulators by MSP and SP.

7.2.4 Spare parts

Sufficient hardware spare parts shall be reserved for the ATMAS, including servers, workstations, monitors, network equipment, etc. The percentage of spare parts is related to the scale of the system. The mechanism of spare parts management should be set up, including periodically testing and checking the reserve status to make sure that the spare parts are sufficient and available.

Since it is very common that computer hardware will be updated frequently, ANSP/MSP should review the list of hardware and confirm with the SP a list of obsolete hardware and replacement solutions regularly. The replacement hardware should be reserved as spare parts after finishing the site compatibility assessment.

If conditions allow, ATMAS Test and Validate System (TVS) is recommended to be deployed for supporting new software testing, system parameter adjustment, personnel training, etc.

7.3 Maintenance Content

System maintenance is recommended to include the following at least:

7.3.1 Periodic maintenance

Periodic maintenance including daily, weekly and monthly, etc. Which maintenance matters should be worked out according to the real operational requirements. It is recommended to cover the followings:

a. Check the running status of the system software, dual nodes redundancy.

b. Check the running status and health of the system hardware, including network load and the usage of resources such as CPU, memory, and disk of servers, workstations, and network devices. Please refer to section 4.5.2 for the inspection standards.

c. Check the validation of external data, including surveillance data, AFTN, AIDC, meteorological data, GNSS, and the status of data interaction with the external system, if any.

d. Check the integrity of the recorded data to prevent the data lost.

e. Check the status of basic function on bypass server.

f. Perform active/standby switch between the redundant servers to ensure both servers can operate normally.

g. Backup critical files and data periodically, including the system configuration parameters, database, log, etc.

h. Manually clean and reboot the server and workstation regularly.

i. Check the physical system operating environment regularly, including temperature, humidity, equipment grounding, electromagnetic environment, etc.

j. Switch the backup system to operational mode regularly to achieve a balanced use for both main and backup systems.

7.3.2 Troubleshooting

MSP should promptly execute troubleshooting, correct system errors, and ensure that the system work normally by replacing components, updating software or parameter configuration, and other methods.

SP should respond in time to the requirements of MSP or ANSP after a failure occurs and assist MSP in handling and correcting the failure within the predetermined response time according to the severity.

MSP needs to record all the system problems in different kinds and problem-solving processes, and collect necessary system logs for analysis.

When a problem is judged as a software defect, MSP needs to register and track the problem. It is recommended to use a fixed PCRs form to register the system software problems, including supplier name, site location, software version number, failure time, failure content description, user investigation of relevant logs, the severity of the problem, etc.

After being confirmed by ANSP, MSP sends the PCRs to SP in time for problem analysis and software repair.

According to the information in PCRs, SP establishes the problem database, checks software code, locates and repairs software defects, and provides problem analysis reports.

The software defect repair plan is discussed by SP, MSP, and ANSP, and they jointly determine the delivery and implementation schedule of the software patch.

7.3.3 Software Version and Requirement Management

After the software is approved in site acceptance and put into operation, the software version and requirement management are managed by SP, MSP, and ANSP together throughout the service life of the system.

7.3.3.1 Baselines Establishment

Usually, SP will select a stable ATMAS software version defined as a Baseline, before SP develops a set of ATMAS based on the requirement of customers. The Baselines are defined for further software life cycle process activity and allow reference to, control of, and traceability between configuration items.

Baselines establishment is recommended to consider the factors as follows:

a. Baseline should be established for each set of ATMAS.

b. ATMAS Baseline is a stable software version that has been approved.

c. Once a Baseline is established, it should be protected from change.

d. In the service life of the system, the Baseline should have the check code and check method of the corresponding program to ensure the traceability consistency, and uniqueness of the program.

After the baseline version of the automation system is established, the customization of the automation system functions need to be fully discussed, researched, and agreed upon by SP, MSP, and ANSP. Then the SP carries out systematic research and development, and finally delivers the system software to users after passing factory acceptance and site acceptance.

7.3.3.2 System Requirement Management and Software Upgrade

The system function requirements usually come from the change of ATC procedures, the application of new technologies, etc., and the new functions are put into operation through software version upgrades.

ANSP may formulate a standard software requirements library according to operational needs, regularly maintain and update the requirements library, and guide the upgrading of software versions and the construction of new systems.

MSP is responsible for recording function requirements, analyzing and evaluating the description and scheme of the requirements, and submitting them to SP for development after being verified by ANSP.

SP completes the system software change and delivers it to MSP after passing the self-test, attaching the analysis of the impact scope of the software change.

MSP need to carry out functional improvement test and system stability test for software change. After ensuring that there is no defect, MSP shall jointly agree with ANSP on the effective time of software upgrade and implement the upgrade.

During the implementation of the software upgrade, MSP is recommended to backup the operating software. If there is any problem in the upgrading, MSP need to roll back the software to the previous version in time.

Note: If SP is responsible for the maintenance of system software throughout the service life of the system, the specific software maintenance contents may be defined in the contract which is agreed upon by all related parties.

Appendix A

ATMAS IGD Request for Change Form

RFC Nr:	

1. SUBJECT:				
2. REASON FOR CHANGE:				
3. DESCRIPTION OF PROPOSAL: [expand / attach additional pages if necessary]				
4. REFERENCE(S):				
5. PERSON INITIATING:			**DATE:**	
ORGANISATION:				
TEL/FA/X/E-MAIL:				
6. CONSULTATION	**RESPONSE DUE BY DATE:**			
Organization	**Name**	**Agree/Disagree**	**Date**	
7. ACTION REQUIRE :				
8. AIGD EDITOR		**DATE REC'D :**		
9. FEEDBACK PASSED		**DATE :**		

Appendix B

Table 3.2.10-1A Flight Specific Flight Data

Aircraft ID	Traversed Sector/s	Controlled Airspace	Flight Rule	Flight Type	No. of Danger Area Infringements	No. of Uplink Messages		No. of Downlink Messages		No. of Delivery Timeouts	
						Rejected	Accepted	Rejected	Accepted	Uplink	Downlink

[Selected Time Period]

Aircraft ID	No. of AIDC Messages		No. of AIDC Messages	
	Rejected	Accepted	Transmitted	Received

Table 3.2.10-1B Collective Flight Data

Day/Week/Month	Total No. of Flights	Airspace Sector				No. of Danger Area Infringements	No. of Uplink Messages		No. of Downlink Messages		No. of Delivery Timeouts	
		N	W	E	S		Rejected	Accepted	Rejected	Accepted	Uplink	Downlink

Day/Week/Month	Controlled Airspace				Flight Rule				Flight Type				
	ARR	DEP	OVF	DOM	I	V	Y	Z	S	N	G	M	X

Table 3.2.10-2 Flight Specific Surveillance Data

[Selected Time Period]

Aircraft ID	Surveillance Track Type				Source of Surveillance Track				Quality of Surveillance Track			
	Secondary	Mode S	Multilat	ADS-B	Secondary	Mode S	Multilat	ADS-B	Secondary	Mode S	Multilat	ADS-B
	0	0	x	0	1	2	-	2	Coast	Normal	-	High

Appendix C

Performance of Surveillance Data Processing in RSUR

RSUR Specifications define technical performance requirements of ATS surveillance systems used in support of a particular ATS application in a given airspace.

The RSUR-5NMSEP_ER_Tier-C specification are applicable to the delivery of surveillance data at the output of a surveillance system that is used to support 5 NM Separation service in en-route environment as described in PANS ATM (Doc 4444) section 8.7.3 in a Tier C environment.

Table 3-1: RSUR_5NMSEP_ER_TIER-C

	RSUR specification 5NM-SEP_ER_TIER-C							
	Coherence		Integrity			Time		Reliability
DATA	Update Interval UI	Probability of Update	Core Error	Tail error	Integrity	Age	Delay	
2D Horizontal Position (HP)	**DAT**$_{UI}$ ≤12s	**PoU** ≥97%	**HPE**$_{RMS}$ <825m or **HPE**$_{95\%}$ <1430m	**RNBE**$_{LB}$= 2714m **RNBE**$_{UP}$= 3644m	**HP**$_{INT}$	**HP**$_{MDA}$ = 36.3s	-	-
Pressure Altitude (PA)			-	-	**PA**$_{INT}$ <0.1%	**PA**$_{MDA}$= **30s**	-	-
Mode A code Identity (ID)			-	-	**ID**$_{INT}$ <0.1%	-	**ID**$_{MUD}$ = **48s**	-
Flight Status (emergency, SPI = FS)	-	-	-	-	-	-	**FS**$_{MUD}$ = 24.2s	-
Time of applicability	With HP	-	-	-	-	-	-	-
Service	In defined OCV **HP**$_{RTD}$ <0.3s		**FGT**$_{DEN}$< 0.1% **SRV**$_{INT}$ <10^{-5} per report					**SRV**$_{CNT}$ = 0.999 /hour

The RSUR-5NMSEP_ER_Tier-B specification are applicable to the delivery of surveillance data at the output of a surveillance system that is used to support 5 NM Separation service as described in PANS ATM in en-route airspace (ICAO Doc4444) section 8.7.3 in a Tier B environment .

Table 3-2: RSUR-5NM SEP TIER B

	RSUR specification 5NM-SEP_ER_TIER-B							
	Coherence		Integrity			Time		Reliability
DATA	Update Interval UI	Probability of Update	Core Error	Tail error	Integrity	Age	Delay	
2D Horizontal Position (HP)	**DAT_{UI}** ≤8s	**PoU** ≥97%	**HPE_{RMS}** <540m or **$HPE_{95\%}$** <940m	**$RNBE_{LB}$=** 1776m **$RNBE_{UP}$=** 2384m	**HP_{INT}**	**HP_{MDA}** = 24s	-	-
Pressure Altitude (PA)			-	-	**PA_{INT}** <0.1%	**PA_{MDA}= 30s**	-	-
Mode A code Identity (ID)			-	-	**ID_{INT}** <0.1%	-	**ID_{MUD}** = 32s	-
Flight Status (emergency status, SPI = FS)	-	-	-	-	-	-	**FS_{MUD}** = 16s	-
Time of applicability	With HP	-	-	-	-	-	-	-
Horizontal Velocity			VEL_{RMS} =					
Vertical rate								
Flight status ground/airborne							**FS_{MUD}** = 16s	
Aircraft Identification							**ID_{MUD}** = 32s	
ACAS capability					CAP_{INT} <10^{-5}			
ADS-B version number					CAP_{INT} <10^{-5}			
Service	In defined OCV **HP_{RTD}** <0.3s		**FGT_{DEN}**< 0.005% **SRV_{INT}** <10^{-5} per report					**SRV_{CNT}** = 0.9999 /hour

The RSUR-5NMSEP_ER_Tier- A specification are applicable to the delivery of surveillance data at the output of a surveillance system that is used to support 5 NM Separation service as described in PANS ATM (ICAO Doc4444) in en-route airspace section 8.7.3 in a Tier A environment.

Table 3-3: RSUR_5NMSEP_ER_TIER-A

	RSUR specification 5NM-SEP_ER_TIER-A							
	Coherence		Integrity			Time		Reliability
DATA	Update Interval UI	Probability of Update	Core Error	Tail error	Integrity	Age	Delay	
2D Horizontal Position (HP)	**DAT_{UI}** $\leq 5s$	**PoU** $\geq 97\%$	**HPE_{RMS}** $<230m$ or **$HPE_{95\%}$** $<400m$	**$RNBE_{LB}$**= 1262m **$RNBE_{UP}$**= 1695m	**HP_{INT}**	**HP_{MDA}** = 15s	-	-
Pressure Altitude (PA)			-	-	**PA_{INT}** $<0.1\%$	**PA_{MDA}= 30s**	-	-
Mode A code Identity (ID)			-	-	**ID_{INT}** $<0.1\%$	-	**ID_{MUD}** = 32s	-
Flight Status (emergency status, SPI = FS)	-	-	-	-	-	-	**FS_{MUD}** = 10s	-
Time of applicability	With HP	-	-	-	-	-	-	-
Horizontal Velocity			HVE_{RMS} < ?					
Vertical rate			VRE_{RMS} < ?					
Flight status ground/airborne							**FS_{MUD}** = 10s	
Aircraft Identification							**ID_{MUD}** = 32s	
ACAS capability					CAP_{INT} $<10^{-5}$			
ADS-B version number					CAP_{INT} $<10^{-5}$			
ADS-B in capability					CAP_{INT} $<10^{-5}$			
Data-link capability					CAP_{INT} $<10^{-5}$			
Resolution Advisory status						X_{MDA} $<DAT_{UI}$ +2s		
Barometric pressure setting						X_{MDA} $<DAT_{UI}$ +2s		
Expanded State vector (2.3.3.5)						X_{MDA} $<DAT_{UI}$ +2s		
Service	In defined OCV **HP_{RTD}** $<0.3s$		**FGT_{DEN}**$< 0.005\%$ **SRV_{INT}** $<10^{-5}$ per report					**SRV_{CNT}** = 0.99999/h

The RSUR-5NMSEP_ER_Tier-C specification are applicable to the delivery of surveillance data at the output of a surveillance system that is used to support 3 NM separation service in TMA environment as described in PANS ATM (Doc 4444) section 8.7.3 in a Tier C environment.

Table 3-4: RSUR_3NMSEP_TMA_TIER-C

	RSUR specification 3NM-SEP_TMA_TIER-C							
	Coherence		Integrity			Time		Reliability
DATA	Update Interval UI	Probability of Update	Core Error	Tail error	Integrity	Age	Delay	
2D Horizontal Position (HP)	**DAT_{UI}** $\leq$5s	**PoU** $\geq$97%	**HPE_{RMS}** <450m or **$HPE_{95\%}$** <780m	**$RNBE_{LB}$=** 1478m **$RNBE_{UP}$=** 1985m	**HP_{INT}**	**HP_{MDA}** = 15s	-	-
Pressure Altitude (PA)			-	-	**PA_{INT}** <0.1%	**PA_{MDA}= 30s**	-	-
Mode A code Identity (ID)			-	-	**ID_{INT}** <0.1%	-	**ID_{MUD} = 20s**	-
Flight Status (emergency, SPI = FS)	-	-	-	-	-	-	**FS_{MUD}** = 15s	-
Time of applicability	With HP	-	-	-	-	-	-	-
Service	In defined OCV **HP_{RTD}** <0.3s		**FGT_{DEN}**<0.1% **SRV_{INT}** <10^{-5} per report					**SRV_{CNT} =** 0.999 /hour

The RSUR Specification defines the performance of ATS surveillance systems used in the provision of Terminal Control Area TMA (see definition in PANS-ATM) (Doc4444) in Terminal Area section 8.7.3 in a Tier B environment.

Table 3-5: RSUR 3NMSEP_TMA_TIER-B

	RSUR specification 5NM-SEP_TMA_TIER-B							
	Coherence		Integrity			Time		Reliability
DATA	Update Interval UI	Probability of Update	Core Error	Tail error	Integrity	Age	Delay	
2D Horizontal Position (HP)	**DAT_{UI}** $\leq$5s	**PoU** $\geq$**97%**	**HPE_{RMS}** <300m or **$HPE_{95\%}$** <520m (556m ADS-B)	**$RNBE_{LB}$=** 987m **$RNBE_{UP}$=** 1326m	**HP_{INT}**	**HP_{MDA}** = 15s	-	-
Pressure Altitude (PA)			-	-	**PA_{INT}** <0.1%	**PA_{MDA}= 30s**	-	-
Mode A code Identity (ID)			-	-	**ID_{INT}** <0.1%	-	**ID_{MUD}** = 20s	-
Flight Status (emergency status, SPI = FS)	-	-	-	-	-	-	**FS_{MUD}** = 15s	-
Time of applicability	With HP	-	-	-	-	-	-	-
Horizontal Velocity (VEL)			VEL_{RMS} =					
Vertical rate (VR)								
Flight status ground/airborne							**FS_{MUD}** = 15s	
Aircraft Identification							**ID_{MUD}** = 20s	
ACAS capability					CAP_{INT} <10^{-5}			
ADS-B version number					CAP_{INT} <10^{-5}			
Service	In defined OCV **HP_{RTD}** <0.3s		**FGT_{DEN}**< 0.004% **SRV_{INT}** <10^{-5} per report					**SRV_{CNT}** = 0.9999 /hour

The RSUR Specification defines the performance of ATS surveillance systems used in the provision of Terminal Control Area TMA (see definition in PANS-ATM) (Doc4444) in Terminal Area section 8.7.3 in a Tier A environment.

Table 3-6: RSUR 3NM-SEP_TMA_TIER-A

	RSUR specification 5NM-SEP_TMA_TIER-A							
	Coherence		**Integrity**			**Time**		**Reliability**
DATA	Update Interval UI	Probability of Update	Core Error	Tail error	Integrity	Age	Delay	
2D Horizontal Position (HP)	**DAT_{UI}** $\leq$5s	**PoU** $\geq$**97%**	**HPE_{RMS}** <150m or **$HPE_{95\%}$** <260m	**$RNBE_{LB}$=** 1736m **$RNBE_{UP}$=** 988m	**HP_{INT}**	**HP_{MDA}** = 15s	-	-
Pressure Altitude (PA)			-	-	**PA_{INT}** <0.1%	**PA_{MDA}= 30s**	-	-
Mode A code Identity (ID)			-	-	**ID_{INT}** <0.1%	-	**ID_{MUD}** = 20s	-
Flight Status (emergency status, SPI = FS)	-	-	-	-	-	-	**FS_{MUD}** = 10s	-
Time of applicability	With HP	-	-	-	-	-	-	-
Horizontal Velocity			HVE_{RMS} < ?					
Vertical rate			VRE_{RMS} < ?					
Flight status ground/airborne							**FS_{MUD}** = 10s	
Aircraft Identification							**ID_{MUD}** = 20s	
ACAS capability					CAP_{INT} <10^{-5}			
ADS-B version number					CAP_{INT} <10^{-5}			
ADS-B in capability					CAP_{INT} <10^{-5}			
Data-link capability					CAP_{INT} <10^{-5}			
Resolution Advisory status						X_{MDA} <DAT_{UI} +2s		
Barometric pressure setting						X_{MDA} <DAT_{UI} +2s		
Expanded State vector (2.3.3.5)						X_{MDA} <DAT_{UI} +2s		
Service	In defined OCV **HP_{RTD}** <0.3s		**FGT_{DEN}**< 0.005% **SRV_{INT}** <10^{-5} per report					**SRV_{CNT}** = 0.99999/h

Appendix D

CHECK LIST FOR ATMAS PROJECT MANAGEMENT

Phases	No.	Activities	Detail Activities	Check ☒	Check ☑
PRE-CONTRACT PHASE:					
Planning	1	**Definition of Scope of Work**	System Architecture		
			Level of redundancy required		
			Level of recording requirement		
			Mode of communications with external Stake holders		
			Power distribution requirement		
	2	**Project Cost Estimation**	Quoted price from Prospective suppliers		
			Latest version of Hardware & peripheral equipment (Monitors, Flight Strip Printers, Printers etc.)		
			Defining the level of Operational Maintenance support that is required during Operationalization		
	3	**Project Time-Line**	Defining all the activities and its duration		
			Defining parallel activities		
			The time of Site-readiness, availability of external systems like ASMGCS, AMSS/AMHS,Met system		
			The time of thorough software test in real environment undertake by the QA team, MP, and ANSP,and before putting the system into operation.		
			The time that Suppliers take to resolve the software issues designed as per customer requirement		
			Sufficient manpower available for testing the ATM Automation system during shadow mode of operation		
Requirement definition	4	**System requirement**	System requirement in terms of Controller		
			System requirement in terms of Technician		

			New technology			
Bidding	5	**Tender Evaluation and selection of bidder based on Quality cum Cost Based Selection (QCBS) criterion**	Quality assurance level requirement	Quality of Test in accordance with ISO-9001-20XX specifications		
				DO-278A/ED-109A assurance level		
				Valid CMMI Level xx		
				Dedicated Quality Assurance Program (QAP) manager who should be responsible for Quality of documentation		
				QAP Manager shall not be same person as the Program Manger		
			Qualified Technical proposal	finalized the Technical and Operational requirements of the system		
				evaluate and conduct Technical discussion on methodology of fulfillment of critical requirements		
				understand in depth the strategy to achieve the functional requirements		
			Qualified project team	Supplier should depute his manpower to complete the system software develop, system test, system document preparation, system database creation, system transition, and etc.		
POST CONTRACT PHASE :						
Implementation	6	**Project Monitoring Group**	There are different groups involved like ATSEPs, ATCOs, External system suppliers, Decision making Officers (Management), Safety officer and Regulatory authorities etc.			
			Dedicated Project Monitoring group (PMG) drawn from all the concerned stakeholders			
			The PMG will be responsible for monitoring various activates, Time lines, scheduling activities etc.			
			The PMG will be responsible for keeping a running record of the progress of implementation,with external stake holders and reporting the progress to Higher Management. a record of various decisions, coordination			
	7	**System Evaluation, HMI**	System requirement review (SRR)	Review the system requirement based on the bidding document		
			System Design Review (SDR)	Any gap in understanding the System requirement by		

		customization & prototype testing		supplier shall be mutually agreed and properly recorded		
			Factory Acceptance Test (FAT)	FAT procedures shall be well examined		
				FAT duration shall be realistic		
				Supplier shall resolve the System anomalies observed during FAT		
	8	**External Interface Integration & Installation Phase**	Dust free environment, Air conditioning system in place, Power supply source is in place,			
			Availability of External systems ASMGCS, AMSS, MET etc.			
			Surveillance data to be integrated is available & ATC Consoles are available			
			ICD Details of ASMGCS and ATMAS should be shared well in advance			
			Rationality of AIDC ICD version should be ensured and defined in scope of work.			
			Radar & MET radar data protocol should also be defined			
	9	**Database Creation Phase**	Supplier should prepare the Database Creation incoperate with controllers and technican			
			Database Creation should be completed in time before starting site testing phase			
	10	**Site Acceptance**	Quality Assurance Audit			
			Site Acceptance Test			
			System Reliability & Stability Test (SRST),			
			System Anomalies resolution			
	11	**Training**	Training to ATSEPS and ATCOs is normally provided before Factory Acceptance test as well as after installation of the System			
			Supplier provides the training to Trainers who will further provide the training to other Officers.			
	12	**Flight Inspection**	Planning	Identification of Stakeholders, form the Flight Inspection programme, and prepare the system and other conditions		
			Conducting	All stakeholders need to cooperate and record data following the Flight Inspection programme		
			Reporting	Analysis and report the recorded data, and form the conclusion of the Flight Inspection		

Transition	13	**Transition Preparation**	Transition Scheme		
			Scheme Evaluation		
			System Deployment		
			Table Pre-rehearsal		
			Other Preparations (Technical manual, notification process, emergency plan, etc.)		
	14	**System Rehearsal/Pre-Transition Verification**	System Switch Steps Validation		
			System Functions and External Interfaces Validation		
	15	**System Transition**	The shadow period is recommended to put the new system into operation during an off-peak time		
			performed based on the pre-defined procedure at the pre-defined transition time		
	16	**Post-Transition Operation**	Issues reported during the observation period.		
			The cause analysis and possibly the avoidance and corrective methods of the issues.		
			Recommendations for future operation, matters-needs-attention, etc.		

REFERENCE

Field	Title of Field	Description / *Instances*	Remark
1	Issue reference	*AIDC-ISSUE-1*	AIDC-ISSUE-n
2	Reporting State/ATSU	*Indonesia/Ujung Pandang ACC*	-
3	Pairing FIR1/FIR2	*UjungPandang/Brisbane*	-
4	Date of Reported	*2015-12-03*	-
5	Date of Occurence	*2015-10-10*	-
6	Fault Category	a. Communication Link, or	a. faults related to AIDC communication link (eg AFTN, direct connection, etc)
		b. ATM System, or	b. faults caused by ATMS software issues
		c. AIDC Message, or	c. faults related to AIDC messages headers, content, syntax, etc
		d. Airspace Design/Procedures, or	d. faults attributed to airspace configuration (eg: common shared boundary points on different ATS routes, etc)/ ATC procedures
		e. Others.	e. others
7	Description of Fault	Brief summary of fault in not more than 20 words	-
8	Frequency	a. Frequent, or	a. At least 1 reported case every 24 hours
		b. Occasionally, or	b. At least 1 reported case between 1 to 7 days
		c. Rare.	c. At least 1 reported case beyond 7 days
9	Priority (assessed by TF or RO)	High	-
		Medium	
		Low	
10	ATSU/ Vendor	*Ujung Pandang ACC / THALES*	-
11	Actions Taken/Updated Date	*It was a system's bug and the software has been upgraded/ 21Dec2015*	Sub information is separated by delimiter slash (/)
12	Status (Open/Closed)	*Closed*	-

AIDC ISSUES FORM - ATMAS TF/5 (2024)

Issue reference	Reporting State/ATSU	Pairing FIR1/FIR2	Date of Reported	Date of Occurrence	Fault Category	Description of Fault	Frequency	Priority (assessed by TF or RO)	ATSU/ Vendor	Actions Taken/ Updated Date	
AIDC-ISSUE-1	Australia / Brisbane ACC Australia / Melbourne ACC	Brisbane / Melbourne	2016-01-02	-	b. ATM System, or	Limited AIDC V3 compliance (partial compliance on block levels only, no weather deviations or other optional formats) Now support offsets and weather deviations as well as block levels in all messages	Frequent	Low	Brisbane ACC & Melbourne ACC/ THALES	Software limitation / 02Jan2016 Corrected mid 2023	**CLOSED**
AIDC-ISSUE-2	Australia / Brisbane ACC Australia / Melbourne ACC	Brisbane / Melbourne	2016-01-02	-	b. ATM System, or	LRM may contain incorrect field number	Occasionally	Low	Brisbane ACC & Melbourne ACC/ THALES	Software limitation / 02Jan2016	**OPEN**
AIDC-ISSUE-3	Australia / Brisbane ACC Australia / Melbourne ACC	Brisbane / Melbourne	2016-01-02	-	b. ATM System, or	Limited CDN capability. Limited ability to transmit CDN messages, and cannot always correctly process received CDN messages	Occasionally	Low	Brisbane ACC & Melbourne ACC/ THALES	Software limitation / 02Jan2016 Corrected mid 2023	**CLOSED**
AIDC-ISSUE-4	Australia / Brisbane ACC Australia / Melbourne ACC	Brisbane / Melbourne	2016-01-02	-	b. ATM System, or	Unable to process a received CPL message	Occasionally	Low	Brisbane ACC & Melbourne ACC/ THALES	Software limitation / 02Jan2016 Corrected mid 2023	**CLOSED**
AIDC-ISSUE-5	Australia / Brisbane ACC Australia / Melbourne ACC	Brisbane / Melbourne	2016-01-02	-	b. ATM System, or	Only a limited number of characters (250) in Field 18 are supported.	Occasionally	Low	Brisbane ACC & Melbourne ACC / THALES	Software limitation / 02Jan2016	**OPEN**
AIDC-ISSUE-6	Australia / Brisbane ACC Australia / Melbourne ACC	Brisbane / Melbourne	2016-01-02	-	b. ATM System, or	No support for AIDC messages developed in AIDC V2 and onwards (e.g. FAN, FCN, ADS, TRU etc.).	Frequent	Low	Brisbane ACC & Melbourne ACC / THALES	Software limitation / 02Jan2016	**OPEN**
AIDC-ISSUE-7	India / Delhi ACC	Delhi / Lahore	2020-07-01	-	b. ATM System, or	Messages from Lahore to Delhi like ABI were rejected by Delhi system due to Error Message 61 (CRC Error). No AIDC messages being received from Lahore as per latest observation.	Frequent	High	Delhi ACC / INDRA	Error is perhaps because Lahore System is generating extra spaces. Lahore should start the AIDC coordination with Delhi. There should be joint observation and exercise conducted to assess the status.	**OPEN**
AIDC-ISSUE-8	India / Delhi ACC	Delhi / Karachi	2020-07-01	-	b. ATM System, or	Messages from Karachi to Delhi like ABI were rejected by Delhi system due to Error Message 61 (CRC Error). Karachi has done changes through OEM. The problem still persists with majority of error message 61 and 57 as per latest observation.	Frequent	High	Delhi ACC / INDRA	Karachi is no longer a pairing FIR with Delhi after FIR reorganization in Pakistan.	**CLOSED**

AIDC ISSUES FORM - ATMAS TF/5 (2024)

Issue reference	Reporting State/ATSU	Pairing FIR1/FIR2	Date of Reported	Date of Occurrence	Fault Category	Description of Fault	Frequency	Priority (assessed by TF or RO)	ATSU/ Vendor	Actions Taken/ Updated Date	
AIDC-ISSUE-9	India / Delhi ACC	Delhi / Varanasi	2020-01-07	-	a. Communication Link, or	Two test trials were conducted with good results.Trial operations are going on. AFTN latency issues observed at times. TOC and AOC msg not successfully handled by INDRA ATM system at Delhi..Hardware and software issues with ATC automation system at Varanasi. Issues with Flightplan also observed.	Occasionally	Low	Delhi ACC / INDRA Varanasi ACC / INDRA	No Latency Issues. TOC and AOC issues resolved	CLOSED
AIDC-ISSUE-10	India / Delhi ACC	Delhi / Nagpur	2020-07-01	-	a. Communication Link, or	Observational trials conducted in March 2020. AFTN latency issues observed at times. TOC and AOC message not successfully handled by INDRA ATM system at Delhi. Hardware and software issues with ATC automation system at Nagpur. Issues of missing FPL also observed.	Occasionally	Low	Delhi ACC / INDRA Nagpur ACC / INDRA	No Latency Issues. TOC and AOC issues resolved	CLOSED
AIDC-ISSUE-11	India / Delhi ACC	Delhi / Ahmedabad	2020-07-01	-	a. Communication Link, or	New LOA signed. Coordination between Ahmedabad and Delhi happening mainly through AIDC. AFTN latency issues observed at times. TOC and AOC messages not successfully handled by INDRA ATM system at Delhi. For some flights AIDC messages not generated. Hardware and software issues with ATC automation system at Ahmedabad.	Occasionally	Low	Delhi ACC / INDRA Ahmedabad ACC / INDRA	No Latency Issues. TOC and AOC issues resolved	CLOSED
AIDC-ISSUE-12	India / Ahmedabad ACC	Ahmedabad / Nagpur	-	-	a. Communication Link, or	AFTN latency issues observed at times. AFTN (AMSS) to be upgraded to support unimpeded AIDC message handling.	Occasionally	High	Ahmedabad ACC / INDRA		CLOSED

AIDC ISSUES FORM - ATMAS TF/5 (2024)

Issue reference	Reporting State/ATSU	Pairing FIR1/FIR2	Date of Reported	Date of Occurrence	Fault Category	Description of Fault	Frequency	Priority (assessed by TF or RO)	ATSU/ Vendor	Actions Taken/ Updated Date	
AIDC-ISSUE-13	India / Ahmedabad ACC	Ahmedabad / Karachi	2014-06-04 to 2023-05-02	-	c. AIDC Message, or	ABI messages exchanged between two system and messages were rejected due route error and mismatch in coordination timing. Modification in airways was required for Ahmedabad and Karachi DBM. On 12 June 2014 required modification were made in airways (like imaginary points) for effectively acceptance of AIDC messages. ABI messages of some of the aircrafts were not correlated with FPL available in ATS automation system. Karachi has done changes through OEM. Re-testing is in progress. Message transaction rate is 100% for all AIDC messeges from Karachi to Ahmedabad. Message transaction from Ahmedabad to Karachi is unsuccessful. All messages are rejected from Karachi Automation System with unknown error no. 57. **Following undesirable AIDC messages are being received from KARACHI: 1. MAC message for flights those have already operated: Result FPL comes in initial state and all history of that flight is reset. 2. Updation of route through ABI: Recieving ABI messages with wrong route details Result: FPL is updated with incorrect route. 3. Mismatching of the flight data for billing purpose due to both above undesirable AIDC messages.**	Frequent	High	Ahmedabad ACC / INDRA	Coordination protocol dialogue timeout was observed. Karachi AMSS-AFTN system time was also synchronized. Automatic time synchronization through GPS server in AMSS-AFTN system at Ahmedabad and Karachi was done for smooth exchange of AIDC messages. Rejection of AIDC messages have reduced / 30Nov2015. The issue may be removed from the list	**CLOSED**
AIDC-ISSUE-14	India / Varanasi ACC	Varanasi / Nagpur	-	-	b. ATM System, or	AFTN (AMSS) to be upgraded at Nagpur to support unimpeded AIDC message handling. Some HMI issues at both the stations.	Frequent	Low	Varanasi ACC / INDRA Nagpur ACC / INDRA	New AMSS installation at Nagpur has been proposed. Same is under process / 30Jan2018. The issues was observed during trial operations. The trials were not successful and hence AIDC is not operation. The issue may be removed from the list.	**CLOSED**
AIDC-ISSUE-15	India / Kolkata ACC	Kolkata / Varanasi	-	-	b. ATM System, or	Some HMI issues at Varanasi. AIDC has been suspended.	Frequent	Low	Kolkata ACC / INDRA Varanasi ACC / INDRA	Issue resolved.	**CLOSED**
AIDC-ISSUE-16	India / Kolkata ACC	Kolkata / Nagpur	-	-	b. ATM System, or	AFTN (AMSS) to be upgraded to support unimpeded AIDC message handling. Some HMI issues at Nagpur. AIDC has been suspended	Frequent	Low	Kolkata ACC / INDRA Nagpur ACC / INDRA	New AMSS installation at Nagpur has been completed. Issue resolved.	**CLOSED**

AIDC ISSUES FORM - ATMAS TF/5 (2024)

Issue reference	Reporting State/ATSU	Pairing FIR1/FIR2	Date of Reported	Date of Occurrence	Fault Category	Description of Fault	Frequency	Priority (assessed by TF or RO)	ATSU/ Vendor	Actions Taken/ Updated Date	
AIDC-ISSUE-17	India / Kolkata ACC	Kolkata / Chennai	-	-	a. Communication Link, or	LOA signed and AIDC Under trial phase. 1. The ICAO route truncation indicator is not supported by INDRA system. 2. Kolkata system does not support adaptation of multiple center name for one ACC. Therefore different AIDC parameters cannot be adapted for different sectors like OCC and ACC sectors posing operational problems.	Occasionally	Medium	Kolkata ACC / INDRA Chennai ACC / RAYTHEON	Issue resolved.	CLOSED
AIDC-ISSUE-18	India / Chennai ACC	Chennai / Nagpur	-	-	b. ATM System, or	The AIDC testing were done from 8th June 2022 to 15th June 2022. The ICAO route truncation indicator is not supported by Aircon2100 system. Also, Nagpur System sends the EST message for successful ABI messages only.	Occasionally	Medium	Chennai ACC / RAYTHEON Nagpur ACC / INDRA	12th March 2024. 1) The ABI messages from Nagpur does not have route truncation indicator "T". Reference Asia/Pacific Regional Interface Control Document for AIDC version 3.0 – September 2007. 2) The Nagpur System does not send EST messages, if the ABI message transaction from Nagpur is not successful. Vide email dated 12th March 2024, Chennai ATM, requested for an early resolution of the point 1 & 2 and proposes to increase the use of AIDC on trial continuously from a convenient date (may be proposed by VANP).	CLOSED
AIDC-ISSUE-19	India / Chennai ACC	Chennai / Colombo	2015-08-06 2015-10-06 2015-12-06	-	b. ATM System, or	The AIDC Test with Test Flight Plans were conducted on 12th September 2022 and 14th September 2022 between 0900-1100 UTC, and the tests were satisfactory. Chennai suggested to Colombo, to have regular AIDC Tests with the actual traffic on mutually agreeable date and time, so as to resolve the issues for an early implementation of the AIDC between Chennai and Colombo.	Rare	Low	Chennai ACC / RAYTHEON	10th April 2024. Chennai Suggests for the implementation of the AIDC Operation with Colombo and early signing of LoA for implementation.	CLOSED
AIDC-ISSUE-20	India / Chennai ACC	Chennai / Maldives	2014-11-25	-	c. AIDC Message, or	Trials were mostly successful barring some LRMs, like reference ID in ODF 3 is not as per ICD.	Rare	Medium	Chennai ACC / RAYTHEON Maldives ACC / SELEX	Message transaction rate is 100% and the message delivery was successful / 30Nov2015	CLOSED

AIDC ISSUES FORM - ATMAS TF/5 (2024)

Issue reference	Reporting State/ATSU	Pairing FIR1/FIR2	Date of Reported	Date of Occurrence	Fault Category	Description of Fault	Frequency	Priority (assessed by TF or RO)	ATSU/ Vendor	Actions Taken/ Updated Date	
AIDC-ISSUE-21	India / Chennai ACC	Chennai / Trivandrum	-	-	b. ATM System, or	Even after sending a rejection or counter coordination message by Chennai, the sending station continues to send the CDN message. The ICAO route truncation indicator is not supported by INDRA Aircon 2100 system.	Occasionally	Medium	Chennai ACC / RAYTHEON Trivandrum ACC / INDRA	The INDRA system at Trivandrum is capable of performing initial AIDC coordination only. A subsequent AIDC coordination is not possible in this system. Rectification of this anomaly is not suggested as the system is nearing completion of its lifecycle and also due to the non availability of AMC with the vendor. Hence this problem maybe treated as closed.	CLOSED
AIDC-ISSUE-22	India / Chennai ACC	Chennai / Mangalore	-	-	b. ATM System, or	Even after sending a rejection or counter coordination message by Chennai, the sending station continues to send the CDN message.	Occasionally	Medium	Chennai ACC / RAYTHEON	The INDRA system at Mangalore is capable of performing initial AIDC coordination only. A subsequent AIDC coordination is not possible in this system. Rectification of this anomaly is not suggested as the system is nearing completion of its lifecycle and also due to the non availability of AMC with the vendor. Hence this problem maybe treated as closed.	CLOSED
AIDC-ISSUE-23	India / Chennai ACC	Chennai / Trichy	-	-	b. ATM System, or	Even after sending a rejection or counter coordination message by Chennai, the sending station continues to send the CDN message.	Occasionally	Medium	Chennai ACC / RAYTHEON	The INDRA system at Trichy is capable of performing initial AIDC coordination only. A subsequent AIDC coordination is not possible in this system. Rectification of this anomaly is not suggested as the system is nearing completion of its lifecycle and also due to the non availability of AMC with the vendor. Hence this problem maybe treated as closed.	CLOSED

AIDC ISSUES FORM - ATMAS TF/5 (2024)

Issue reference	Reporting State/ATSU	Pairing FIR1/FIR2	Date of Reported	Date of Occurrence	Fault Category	Description of Fault	Frequency	Priority (assessed by TF or RO)	ATSU/ Vendor	Actions Taken/ Updated Date	
AIDC-ISSUE-24	India / Chennai ACC	Chennai / Hyderabad	-	-	b. ATM System, or	The SSR Codes received through AIDC message are getting retained in Chennai FDPS for days and are not available for re-use. Controller have to use Chennai adapted pool of limited SSR codes for track correlation. As a result the adapted Chennai pool of SSR codes gets exhausted very soon. AIDC testing is temporarily suspended.	Frequent	High	Chennai ACC / RAYTHEON Hyderabad ACC / SELEX	SSR code issue at Chennai resolved / 29Mar2019	CLOSED
AIDC-ISSUE-25	India / Chennai ACC	Chennai / Bengaluru	2015-03-24	-	b. ATM System, or	The SSR Codes received through AIDC message are getting retained in Chennai FDPS for days and are not available for re-use. Controller have to use Chennai adapted pool of limited SSR codes for track correlation. As a result the adapted Chennai pool of SSR codes gets exhausted very soon. AIDC testing is temporarily suspended.	Rare	High	Chennai ACC / RAYTHEON	SSR code issue at Chennai resolved / 29Mar2019	CLOSED
AIDC-ISSUE-26	India / Mumbai ACC	Mumbai / Ahmedabad	-	-	b. ATM System, or	Some HMI issues at Ahmedabad	Frequent	Low	Mumbai ACC / RAYTHEON Ahmedabad ACC / INDRA	Nil / 30 Jun 2020	CLOSED
AIDC-ISSUE-27	India / Mumbai ACC	Mumbai / Nagpur	-	-	b. ATM System, or	Some HMI issues at Nagpur.	Frequent	Low	Mumbai ACC / RAYTHEON Nagpur ACC / INDRA	Nil / 30 Jun 2020	CLOSED
AIDC-ISSUE-28	India / Ahmedabad ACC	Ahmedabad / Nagpur	-	-	b. ATM System, or	Some HMI issues at Nagpur.	Frequent	Low	Ahmedabad ACC / INDRA Nagpur ACC / INDRA	Nil / 30Jan2018	CLOSED
AIDC-ISSUE-29	India / Kolkata ACC	Kolkata / Chennai	-	-	e. Others.	Under trial phase. The acceptance of EST message is in manual mode.	Frequent	Low	Kolkata ACC / INDRA Chennai ACC/ RAYTHEON	Nil / 30Jan2018	CLOSED
AIDC-ISSUE-30	India / Chennai ACC	Chennai / Nagpur	-	-	b. ATM System, or	The ICAO route truncation indicator is not supported by INDRA Aircon 2100 system.	Frequent	Medium	Chennai ACC / RAYTHEON Nagpur ACC / INDRA	Refer Explanation AIDC-ISSUE-18	CLOSED
AIDC-ISSUE-31	India / Chennai ACC	Chennai / Maldives	-	-	b. ATM System, or	Seconds field included in lat/long is received which is not as per ICD.	Frequent	Low	Chennai ACC / RAYTHEON Maldives ACC / SELEX	Message transaction rate is 100% and the message delivery was successful / 30Nov2015	CLOSED

AIDC ISSUES FORM - ATMAS TF/5 (2024)

Issue reference	Reporting State/ATSU	Pairing FIR1/FIR2	Date of Reported	Date of Occurrence	Fault Category	Description of Fault	Frequency	Priority (assessed by TF or RO)	ATSU/ Vendor	Actions Taken/ Updated Date	
AIDC-ISSUE-32	India / Chennai ACC	Chennai / Trivandrum	-	-	b. ATM System, or	The ICAO route truncation indicator is not supported by INDRA Aircon 2100 system.	Frequent	Medium	Chennai ACC / RAYTHEON Trivandrum ACC / INDRA	The INDRA system at Trivandrum is capable of performing initial AIDC coordination only. A subsequent AIDC coordination is not possible in this system. Rectification of this anomaly is not suggested as the system is nearing completion of its lifecycle and also due to the non availability of AMC with the vendor. Hence this problem maybe treated as closed.	CLOSED
AIDC-ISSUE-33	India / Chennai ACC	Chennai / Mangalore	-	-	b. ATM System, or	The ICAO route truncation indicator is not supported by INDRA Aircon 2100 system.	Frequent	Medium	Chennai ACC / RAYTHEON	The INDRA system at Mangalore is capable of performing initial AIDC coordination only. A subsequent AIDC coordination is not possible in this system. Rectification of this anomaly is not suggested as the system is nearing completion of its lifecycle and also due to the non availability of AMC with the vendor. Hence this problem maybe treated as closed.	CLOSED
AIDC-ISSUE-34	India / Chennai ACC	Chennai / Trichy	-	-	b. ATM System, or	The ICAO route truncation indicator is not supported by INDRA Aircon 2100 system.	Frequent	Medium	Chennai ACC / RAYTHEON	The INDRA system at Trichy is capable of performing initial AIDC coordination only. A subsequent AIDC coordination is not possible in this system. Rectification of this anomaly is not suggested as the system is nearing completion of its lifecycle and also due to the non availability of AMC with the vendor. Hence this problem maybe treated as closed.	CLOSED
AIDC-ISSUE-35	India / Chennai ACC	Chennai / Nagpur	-	-	d. Airspace Design/Procedures, or	Airspace configuration issue.	Frequent	Medium	Chennai ACC / RAYTHEON Nagpur ACC / INDRA	Nil / 30Jan2018 25th April 2019	CLOSED

AIDC ISSUES FORM - ATMAS TF/5 (2024)

Issue reference	Reporting State/ATSU	Pairing FIR1/FIR2	Date of Reported	Date of Occurrence	Fault Category	Description of Fault	Frequency	Priority (assessed by TF or RO)	ATSU/ Vendor	Actions Taken/ Updated Date	
AIDC-ISSUE-36	India / Chennai ACC	Chennai / Trivandrum	-	-	d. Airspace Design/Procedures, or	Due to dynamic sectorization of UTV between Chennai and Trivandrum, no AIDC coodination is possible for overflying aircraft. But AIDC is possible for aircraft departing/arriving from/to destinations within the lateral limits of UTV. AIDC coordination not possible for level changes after the initial coordination. NOTIFIED (ABI), INITIAL COORDINATION (EST, CPL), TRANSFER OF CONTROL (TOC, AOC) is possible.	Frequent	Medium	Chennai ACC / RAYTHEON Trivandrum ACC / INDRA	The INDRA system at Trivandrum is capable of performing initial AIDC coordination only. A subsequent AIDC coordination is not possible in this system. Rectification of this anomaly is not suggested as the system is nearing completion of its lifecycle and also due to the non availability of AMC with the vendor. Hence this problem maybe treated as closed.	CLOSED
AIDC-ISSUE-37	India / Chennai ACC	Chennai / Mangalore	-	-	d. Airspace Design/Procedures, or	Airspace configuration issue.	Frequent	Medium	Chennai ACC / RAYTHEON	The issues was observed during trial operations. The trials were not successful and hence AIDC is not operation. The issue may be removed from the list.	CLOSED
AIDC-ISSUE-38	India / Chennai ACC	Chennai / Trichy	-	-	d. Airspace Design/Procedures, or	Airspace configuration issue.	Frequent	Medium	Chennai ACC / RAYTHEON	The issues was observed during trial operations. The trials were not successful and hence AIDC is not operation. The issue may be removed from the list.	CLOSED
AIDC-ISSUE-39	India / Kolkata ACC	Kolkata / Chennai	-	-	a. Communication Link, or	AFTN latency issues observed at times.	Occasionally	Low	Kolkata ACC / INDRA Chennai ACC / RAYTHEON	No latency is observed now. Recommended for closure of issue.	OPEN
AIDC-ISSUE-40	Indonesia / Ujung Pandang ACC	Ujung Pandang / Brisbane	2015-12-03	2010-10-10	b. ATM System, or	The system does not rise notification or alert to Controller when the messages sent and not replied by LAM (no ULAM).	Frequent	Medium	Ujung Pandang ACC / THALES Brisbane ACC / THALES	It was a software issue and the software has been upgraded / 21Dec2015	CLOSED
AIDC-ISSUE-41	Indonesia / Ujung Pandang ACC	Ujung Pandang / Kota Kinabalu	2015-12-28	2015-12-28	c. AIDC Message, or	Received wrong header of ODF3 from Kinabalu system	Occasionally	High	Ujung Pandang ACC / THALES Kota Kinabalu ACC / LEONARDO	Investigation has been carried out by Ujung Pandang and Kinabalu ACC and the issue has been solved since Kinabalu has completely upgrade their ATM system / 5Sep2019	CLOSED
AIDC-ISSUE-42	Indonesia / Ujung Pandang ACC	Ujung Pandang / Brisbane	2015-08-01	-	d. Airspace Design/Procedures, or	Ujung Pandang sent back some EST from Brisbane with different time of COP	Occasionally	Medium	Ujung Pandang ACC / THALES Brisbane ACC / THALES	It was a software issue and the software has been upgraded. And also there are some modifications in the dataset to solve this problem / 14Dec2015	CLOSED

AIDC ISSUES FORM - ATMAS TF/5 (2024)

Issue reference	Reporting State/ATSU	Pairing FIR1/FIR2	Date of Reported	Date of Occurrence	Fault Category	Description of Fault	Frequency	Priority (assessed by TF or RO)	ATSU/ Vendor	Actions Taken/ Updated Date	
AIDC-ISSUE-43	Indonesia / Ujung Pandang ACC	Ujung Pandang / Brisbane	2015-09-01	-	a. Communication Link, or	There are some AIDC messages between Ujung Pandang and Brisbane which have transit time more than 180 seconds (3 minutes). The AFTN line between Ujung Pandang and Brisbane is routing via Jakarta.	Occasionally	High	Ujung Pandang ACC / THALES Brisbane ACC / THALES	Since 10 March 2018 direct communication link (AFTN) has been connected. Need to test and trial in exchanging messages / 10Mar2018	CLOSED
AIDC-ISSUE-44	Malaysia / Kuala Lumpur ATCC	Kuala Lumpur / Chennai	2016-03-01	-	e. Others.	We received a lot of complains that Chennai controller didn't respond to CDN.	Frequent	Medium	Kuala Lumpur ATCC / SELEX Chennai ACC / RAYTHEON	Continuous Monitoring under new ATM system for LOA and SOP Evaluation - *Updated May 2024*	**OPEN**
AIDC-ISSUE-45	Malaysia / Kuala Lumpur ATCC	Kuala Lumpur / Chennai	2016-03-01	-	c. AIDC Message, or	Received LRM on ABI for Item 18 (LRM-RMK/48/18/)	Frequent	Medium	Kuala Lumpur ATCC / SELEX Chennai ACC / RAYTHEON	SELEX still investigate this problem. The same AFTN message with item 18 received through FDP system but no error detected. Showing that the ABI-AFTN message format is correct but AIDC system unable to process it / 29Jul2016	CLOSED
AIDC-ISSUE-46	Malaysia / Kuala Lumpur ATCC	Kuala Lumpur / Chennai	2016-03-01	-	b. ATM System, or	AIDC system send more than three times CDN for time revision.	Frequent	Medium	Kuala Lumpur ATCC / SELEX Chennai ACC / RAYTHEON	This problem happen because we had set our AIDC system that CDN will send automatically if there is a time revision more than 3 minutes. Due to complain from Chennai, we stop the automatic send and instruct our Controllers to send all CDN message, including time revision manually / 29Jul2016	CLOSED
AIDC-ISSUE-47	Malaysia / Kuala Lumpur ATCC	Kuala Lumpur / Chennai	2016-03-01	-	c. AIDC Message, or	Did not receive ACP on EST. After 180 seconds system triggered LRM	Frequent	Medium	Kuala Lumpur ATCC / SELEX Chennai ACC / RAYTHEON	This was due to latency of receiving the ACP message. Change the ACP parameter from 180 seconds to 255 seconds / 29Jul2016	CLOSED
AIDC-ISSUE-48	Maldives / Maldives ACC	Maldives / Melbourne	2014-09-17	-	c. AIDC Message, or	Melbourne reported a small number of messages contain a route designator in Field 15 prior to entry COP.	Occasionally	Medium	Maldives ACC / SELEX Melbourne ACC / THALES	Vendor investigated and provided updated software / 22May2015	CLOSED
AIDC-ISSUE-49	Maldives / Maldives ACC	Maldives / Colombo	2014-03-13	-	c. AIDC Message, or	Colombo reported Message ID out to VCCC had wrong ID sent from our system.	Frequent	High	Maldives ACC / SELEX	Configuration corrected / 15Mar2014	CLOSED

AIDC ISSUES FORM - ATMAS TF/5 (2024)

Issue reference	Reporting State/ATSU	Pairing FIR1/FIR2	Date of Reported	Date of Occurrence	Fault Category	Description of Fault	Frequency	Priority (assessed by TF or RO)	ATSU/ Vendor	Actions Taken/ Updated Date	
AIDC-ISSUE-50	Maldives / Maldives ACC	Maldives / Colombo	2014-04-06	-	b. ATM System, or	When Male sends ABI message within Colombo domestic squawk range, it causes complication in their system.	Frequent	High	Maldives ACC/ SELEX	Colombo changed their domestic SSR code allocation / 16Mar2015	CLOSED
AIDC-ISSUE-51	Maldives / Maldives ACC	Maldives / Melbourne	2014-09-17	-	c. AIDC Message, or	Melbourne reported that Field 15 route information contains seconds in the latitude/longitude information generated from our system.	Occasionally	Medium	Maldives ACC / SELEX Melbourne ACC / THALES	Vendor investigated and provided updated software / 22May2015	CLOSED
AIDC-ISSUE-52	Maldives / Maldives ACC	Maldives / -	2014-11-25	-	c. AIDC Message, or	Reference ID of Optional Data Field 3 (ODF) is incorrect in message received by VOMM.	Frequent	Medium	Maldives ACC / SELEX	Vendor investigated and provided updated software / 22May2015	CLOSED
AIDC-ISSUE-53	Maldives / Maldives ACC	Maldives / -	2014-11-25	-	c. AIDC Message, or	Chennai automation system rejected latitude/longitude represented with seconds (041627N0733138E).	Occasionally	Medium	Maldives ACC / SELEX	Vendor investigated and provided updated software / 22May2015	CLOSED
AIDC-ISSUE-54	Maldives / Maldives ACC	Maldives / Colombo	2015-11-19	-	c. AIDC Message, or	Colombo reported LRM received from VRMM saying invalid SSR equipment in FPL.	Occasionally	Medium	Maldives ACC/ SELEX	Configuration changed / 23Feb2016	CLOSED
AIDC-ISSUE-55	Maldives / Maldives ACC	Maldives / Colombo	2015-11-19	-	c. AIDC Message, or	ABI and CPL message in ICAO 2012 FPL format sent from Colombo rejected.	Occasionally	High	Maldives ACC/ SELEX	Software updated / 23Feb2016	CLOSED
AIDC-ISSUE-56	Singapore / Singapore ACC	Singapore / -	2015-11-11	-	c. AIDC Message, or	Rejection of ABI message due to unknown point in route	Occasionally	Low	Singapore ACC/ THALES	Need to update ATMS dataset to include SIDs-STARs that may be filed by operator / 17Nov2015	CLOSED
AIDC-ISSUE-57	Singapore / Singapore ACC	Singapore / -	2015-11-11	-	d. Airspace Design/Procedures, or	Rejected EST message due to invalid flight plan state (coordinated) were queued in erroneous folder.	Occasionally	Low	Singapore ACC/ THALES	Air Traffic Control Support Officer would verify the information on the EST message against the coordinated flight plan. To follow up with the upstream ATSU if any discrepancies were discovered / 12Nov2015	CLOSED
AIDC-ISSUE-58	Singapore / Singapore ACC	Singapore / -	2015-11-11	-	a. Communication Link, or	Message time out parameter set too short whereby ACP messages from downstream ATSU were not processed. More prevailing with network was busy.	Occasionally	High	Singapore ACC/ THALES	Need to update ATMS dataset to increase the timeout parameter / 17Nov2015	CLOSED

AIDC ISSUES FORM - ATMAS TF/5 (2024)

Issue reference	Reporting State/ATSU	Pairing FIR1/FIR2	Date of Reported	Date of Occurrence	Fault Category	Description of Fault	Frequency	Priority (assessed by TF or RO)	ATSU/ Vendor	Actions Taken/ Updated Date	
AIDC-ISSUE-59	Indonesia / Ujung Pandang ACC	Ujung Pandang / Brisbane	2018-01-11	-	b. ATM System, or	Received abnormal EST message (sent back EST) from Brisbane for southbound traffic that previously Ujung Pandang has already sent the EST	Rare	Low	Ujung Pandang ACC / THALES Brisbane ACC / THALES	Brisbane has been modified dataset parameter / 12May2018	CLOSED
AIDC-ISSUE-60	Indonesia / Ujung Pandang ACC	Ujung Pandang / Brisbane	2018-01-11	-	b. ATM System, or	Received MAC message from Brisbane for flight from YSSY to YMML	Rare	Low	Ujung Pandang ACC / THALES Brisbane ACC / THALES	Brisbane has been modified dataset parameter / 12May2018	CLOSED
AIDC-ISSUE-61	Indonesia / Ujung Pandang ACC	Ujung Pandang / Brisbane	-	-	b. ATM System, or	No response messages LAM or LRM were received (blank) from receiving unit as a reply for previous sent messages.	Frequent	High	Ujung Pandang ACC / THALES Brisbane ACC / THALES	There was a poor (unstable) connection in Jakarta's AMHS in that period occurrence date. Had been solved / 16Nov2019	CLOSED
AIDC-ISSUE-62	Indonesia / Ujung Pandang ACC	Ujung Pandang / -	2017-03-10	-	b. ATM System, or	ACP message does not process correctly. Coordination status field of the strip remains "S" and the ACP message is displayed in "Message_In" window	Frequent	High	Ujung Pandang ACC / THALES	Investigation has been carried out by Ujung Pandang and categorized this problem as software issue / 11Feb2017	OPEN
AIDC-ISSUE-63	Indonesia / Ujung Pandang ACC	Ujung Pandang / Manila	2016-03-10	-	c. AIDC Message, or	AOC message format from Ujung Pandang does not contain ODF 3	Frequent	Medium	Ujung Pandang ACC / THALES Manila ACC / THALES	Since Manila used new ATM System (TopSky-HE) last year there was no AOC issue related to ODF3. Last AIDC test with Manila used TopSky-HE was generally good / 21Mar2018	CLOSED
AIDC-ISSUE-64	Indonesia / Ujung Pandang ACC	Ujung Pandang / Manila	2017-05-17	-	c. AIDC Message, or	ABI message from Manila's Topsky-C contained incomplete route of flight	Frequent	High	Ujung Pandang ACC / THALES	Since Manila used new ATM System (TopSky-HE) last year there was no ABI issue. Last AIDC test with Manila used TopSky-HE was generally good / 21Mar2018	CLOSED
AIDC-ISSUE-65	Indonesia / Ujung Pandang ACC	Ujung Pandang / Manila	2017-05-17	-	b. ATM System, or	Manila's Topsky-C was continuously sending unnecessary ABI and EST messages	Frequent	High	Ujung Pandang ACC / THALES	Since Manila used new ATM System (TopSky-HE) last year there was not current issue anymore. Last AIDC test with Manila used TopSky-HE was generally good / 21Mar2018	CLOSED
AIDC-ISSUE-66	India / Trivandrum ACC	Trivandrum / Mangalore	-	-	e. Others.	AIDC coordination not possible for Level changes after the initial coordination. ABI, EST, CPL, TOC and AOC is possible.	Frequent	High	Trivandrum ACC / INDRA	The issues was observed during trial operations. The trials were not successful and hence AIDC is not operation. The issue may be removed from the list.	CLOSED

AIDC ISSUES FORM - ATMAS TF/5 (2024)

Issue reference	Reporting State/ATSU	Pairing FIR1/FIR2	Date of Reported	Date of Occurrence	Fault Category	Description of Fault	Frequency	Priority (assessed by TF or RO)	ATSU/ Vendor	Actions Taken/ Updated Date	
AIDC-ISSUE-67	India / Trivandrum ACC	Trivandrum / Cochin	-	-	b. ATM System, or	AIDC coordination not possible for level changes after the initial coordination. ABI, EST, CPL, TOC and AOC is possible.	Frequent	High	Trivandrum ACC / INDRA	The issues was observed during trial operations. The trials were not successful and hence AIDC is not operation. The issue may be removed from the list.	CLOSED
AIDC-ISSUE-68	Singapore / Singapore ACC	Singapore / Manila	2018-03-15	2018-03-12	b. ATM System, or	Link to ATMS is disabled after erroeous service message was received from message center	Frequent	Medium	Singapore ACC/ THALES Manila ACC/ THALES	Fault localized to physical link connection problem / 15Mar2019	CLOSED
AIDC-ISSUE-69	Singapore / Singapore ACC	Singapore / Kuala Lumpur	2018-03-15	2018-03-13	b. ATM System, or	Received *"LRM with error code"* upon transmission of messages	Occasionally	Low	Singapore ACC/ THALES Kuala Lumpur ATCC/ LEONARDO	Observation shared with Kuala Lumpur ACC for investigations / 15Mar2019	CLOSED
AIDC-ISSUE-70	Singapore / Singapore ACC	Singapore / Manila	2018-03-15	2018-03-12	b. ATM System, or	ABI message requirement for subsequent EST message processing	Frequent	High	Singapore ACC/ THALES Manila ACC/ THALES	Observation shared with Manila ACC for investigations / 15Mar2019	CLOSED
AIDC-ISSUE-71	Singapore / Singapore ACC	Singapore / Kuala Lumpur	2019-03-25	2018-12-14	b. ATM System, or	LRM messages recived 2 hours after initial AIDC message transmission	Occasionally	-	Singapore ACC/ THALES Kuala Lumpur ATCC/ LEONARDO	Observation shared with Kuala Lumpur ACC for investigations / 25Mar2019	CLOSED
AIDC-ISSUE-72	Singapore / Singapore ACC	Singapore / Kuala Lumpur	2019-03-25	2019-01-18	e. Others.	Invalid EST sent by ATMS	Rare	-	Singapore ACC/ THALES Kuala Lumpur ATCC/ LEONARDO	Fault traced to incorrect flight plan routing, causing FDP to designated the arrival flight as an re-entry flight / 25Mar2019	CLOSED
AIDC-ISSUE-73	Singapore / Singapore ACC	Singapore / Kuala Lumpur	2019-03-25	2019-01-22	b. ATM System, or	Non reception of EST messages	Occasionally	-	Singapore ACC/ THALES Kuala Lumpur ATCC/ LEONARDO	Investigations ongoing / 25Mar2019	CLOSED
AIDC-ISSUE-74	Singapore / Singapore ACC	Singapore / Kuala Lumpur	2019-03-25	2019-03-06	a. Communication Link, or	Unable to exchange AIDC messages	Occasionally	-	Singapore ACC/ THALES Kuala Lumpur ATCC/ LEONARDO	AFTN link outage / 25Mar2019	CLOSED
AIDC-ISSUE-75	Singapore / Singapore ACC	Singapore / Manila	2019-03-25	2019-02-20	b. ATM System, or	AOC/TOC message tranmission constraint	Frequent	-	Singapore ACC/ THALES Manila ACC/ THALES	Dataset settings on Manila ATMS for AOC/TOC messages / 25Mar2019	CLOSED
AIDC-ISSUE-76	ngapore / Singapore A(	Singapore / Manila	2019-03-25	2019-03-11	b. ATM System, or	EST and ACP messages exchanged successfully but not reflected on controller display	Rare	High	Singapore ACC/ THALES Manila ACC/ THALES	Manila ATMS vendor has been informed on the observed issue. Investigations ongoing / 25Mar2019	CLOSED
AIDC-ISSUE-77	Indonesia / Ujung Pandang ACC	Ujung Pandang / Oakland	2019-04-10	2018-12-11	b. ATM System, or	REJ message was accepted but unable to display to Controller HMI and become rejected message in Flight Data HMI (filled in *AIDC_OTHER_QUE* window)	Rare	Medium	Ujung Pandang ACC / THALES	Investigation has been carried out by Ujung Pandang and categorized this problem as software issue / 21Feb2020	**OPEN**

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Issue reference	Reporting State/ATSU	Pairing FIR1/FIR2	Date of Reported	Date of Occurrence	Fault Category	Description of Fault	Frequency	Priority (assessed by TF or RO)	ATSU/ Vendor	Actions Taken/ Updated Date	
AIDC-ISSUE-78	India / Chennai ACC	Chennai / Hyderabad Chennai / Bengaluru	-	-	e. Others.	The SSR Codes received through AIDC message are getting retained in Chennai FDPS for days and are not available for re-use. Controller have to use Chennai adapted pool of limited SSR codes for track correlation. As a result, the adapted Chennai pool of SSR codes gets exhausted very soon.	Frequent	High	Chennai ACC / RAYTHEON Bengaluru ACC / SELEX Hyderabad ACC / SELEX	SSR code issue at Chennai resolved 29-03-2019	CLOSED
IDC-ISSUE-79+B85:M8	India / Kolkata ACC	Kolkata / Nagpur, Varanasi, Guwahati, Chennai	-	-	d. Airspace Design/Procedures, or	The route truncation is not supported by INDRA system , hence there is a likelihood of wrong route modification by ABI message in the accepting ATCC.	Frequent	High	Kolkata ACC / INDRA Nagpur ACC / INDRA Varanasi ACC / INDRA Guwahati ACC / INDRA Chennai ACC / RAYTHEON	Issue resolved.	CLOSED
AIDC-ISSUE-80	Maldives / Maldives ACC	Maldives / Colombo	-	-	b. ATM System, or	Colombo had an issue with their ABI message which was unsuccessful in all 7 AIDC test FPLs. Also their EST showed Error code 62. Rest of the other messages CPL, CDN, TOC, AOC are working perfectly.	Frequent	High	Maldives ACC/ SELEX	Colombo informed that they are consulting with their ATM vendor for the above errors.	OPEN
AIDC-ISSUE-81	India / Kolkata ACC	Kolkata / Yangon	2019-04-10	-	b. ATM System, or	Yangon trials in which ABI (from Kolkata to Yangon only) EST, TOC, AOC were successful. Kolkata system was not sending AIDC reference number in ACP messages for which Yangon system was rejecting it. But Kolkata rectified the issue with the support of vendor and ACP was successful. ABI from Yangon system sends the route from COP instead of one point before COP for which Kolkata system rejects the ABI from Yangon.	Frequent	Medium	Kolkata ACC / INDRA Yangon ACC / THALES	Yangon has been advised to rectify the issue through vendor/1Apr2019. Yangon has rectified the issue in last quarter of 2019. Further tests successful.	CLOSED
AIDC-ISSUE-82	Indonesia / Ujung Pandang ACC	Ujung Pandang / Manila	2020-05-25	2020-04-02	b. ATM System, or	Multiple EST message transmitted from Ujung Pandang to Manila	Occasionally	High	Ujung Pandang ACC / THALES Manila ACC / THALES	Investigation has been carried out by Ujung Pandang. Some modifications in dataset parameter related to message transmition value and condition has been changed / 22Nov2020	CLOSED

AIDC ISSUES FORM - ATMAS TF/5 (2024)

Issue reference	Reporting State/ATSU	Pairing FIR1/FIR2	Date of Reported	Date of Occurrence	Fault Category	Description of Fault	Frequency	Priority (assessed by TF or RO)	ATSU/ Vendor	Actions Taken/ Updated Date	
AIDC-ISSUE-83	Indonesia / Ujung Pandang ACC	Ujung Pandang / Manila	2020-07-09	2019-11-02	d. Airspace Design/Procedures, or	Ujung Pandang's controller activated flight data record prior to AIDC EST message transmitted by Manila. This occurrence happened due Manila verbally coordinated FL which is not accordance with FLAS (Flight Level Allocation Scheme).	Frequent	High	Ujung Pandang ACC / THALES Manila ACC / THALES	Published temporary SOP for Controller not to manually activate flight data record for which an AIDC EST is expected / 1Dec2019	CLOSED
AIDC-ISSUE-84	Malaysia / Kuala Lumpur ATCC	Kuala Lumpur / Chennai	2020-07-07	2020-01-02	c. AIDC Message, or	ACP for Chennai EST & CDN were responded timely but Chennai responded with LRM-RMK/5/3.	Frequent	Medium	Kuala Lumpur ATCC / LEONARDO Chennai ACC / RAYTHEON	No more occurrence, under observation by both ATSUs - *Updated May 2024*	CLOSED
AIDC-ISSUE-85	Malaysia / Kuala Lumpur ATCC	Kuala Lumpur / Chennai	2020-07-07	2020-01-02	c. AIDC Message, or	Chennai responded LRM-RMK/57/ (invalid message) for ABI/EST messages though ABI/EST sent were valid. this occurance only for TOC/AOC (2022 update reported)	Frequent	Medium	Kuala Lumpur ATCC / LEONARDO Chennai ACC / RAYTHEON	No more occurrences, under observation by both ATSUs - *Updated May 2024*	CLOSED
AIDC-ISSUE-86	Philippines / Manila ACC	Manila / Kota Kinabalu	2019-10-22	2019-10-22	b. ATM System, or	Manila received multiple ABI of RBA635 and JAL720 during AIDC test with Kinabalu	Rare	Low	Manila ACC/ THALES Kota Kinabalu ACC/ LEONARDO	Migrated new system in March 2022 and testing on going for Kinabalu -Manila AIDC Implementation plan 2024 - *Updated May 2024*	CLOSED
AIDC-ISSUE-87	ngapore / Singapore A(	Singapore / Kota Kinabalu	2021-02-01	2021-05-28	b. ATM System, or	Multiple FDRs exist, unable to complete AIDC transaction	Occasionally	Medium	Singapore ACC/ THALES Kota Kinabalu ATCC/ LEONARDO	Ensure flightplan records in ATMS is up to date	CLOSED
AIDC-ISSUE-88	ngapore / Singapore A(	Singapore / Kota Kinabalu	2021-03-01	2021-05-28	b. ATM System, or	Message not compatible with FP state	Occasionally	Medium	Singapore ACC/ THALES Kota Kinabalu ATCC/ LEONARDO	Ensure flightplan state is updated correctly	CLOSED
AIDC-ISSUE-89	ngapore / Singapore A(	Singapore / Kota Kinabalu	2021-04-01	2021-05-28	b. ATM System, or	ACT entry time outside window	Occasionally	Medium	Singapore ACC/ THALES Kota Kinabalu ATCC/ LEONARDO	ATMS parameter reconfiguration/software change. Software changes were made to better improve the ACT entry time due to previous incorrect processing of EET and erroneous use of ATD to overwrite the first waypoint in the fix list. / May 2022	CLOSED
AIDC-ISSUE-90	Philippines / Manila ACC	Manila / Singapore	2020-01-27	2020-01-27	b. ATM System, or	No AIDC transfer was made due negative FPL (other aircraft)	Occasionally	Medium	Manila ACC/ THALES Singapore ACC/ THALES	Provide appropriate FPL entry	CLOSED
AIDC-ISSUE-91	Philippines / Manila ACC	Manila / Singapore	2020-02-26	2020-02-26	b. ATM System, or	No TOC was received from Singapore ACC for CEB538	Occasionally	Medium	Manila ACC/ THALES Singapore ACC/ THALES	Correcting time discrepancies on system FPL	CLOSED
AIDC-ISSUE-92	Philippines / Manila ACC	Manila / Singapore	2020-09-21	2020-09-21	b. ATM System, or	No EST message received	Occasionally	Medium	Manila ACC/ THALES Singapore ACC/ THALES	Provide appropriate FPL entry	CLOSED

AIDC ISSUES FORM - ATMAS TF/5 (2024)

Issue reference	Reporting State/ATSU	Pairing FIR1/FIR2	Date of Reported	Date of Occurrence	Fault Category	Description of Fault	Frequency	Priority (assessed by TF or RO)	ATSU/ Vendor	Actions Taken/ Updated Date	
AIDC-ISSUE-93	Philippines / Manila ACC	Manila / Hong Kong	2020-08-03	2020-08-03	b. ATM System, or	Failed EST for CPA104, CPA198 and CSN306. Voice transfer was made to Hong Kong.	Occasionally	Medium	Manila ACC/ THALES	Correcting time discrepancies on system FPL	CLOSED
AIDC-ISSUE-94	Philippines / Manila ACC	Manila / Hong Kong	2020-09-19	2020-09-19	b. ATM System, or	No AIDC transfer was made due negative FPL (Qatar Airlines)	Frequent	Medium	Manila ACC/ THALES	Corresponded with air operator to supply Manila with FPL	CLOSED
AIDC-ISSUE-95	Philippines / Manila ACC	Manila / Hong Kong	2020-10-13	2020-10-13	b. ATM System, or	Failed EST ACT entry time outside window	Occasionally	Medium	Manila ACC/ THALES	Correcting time discrepancies on system FPL	CLOSED
AIDC-ISSUE-96	Malaysia / Kuala Lumpur ATCC	Kuala Lumpur / Chennai	2021-05-28	2021-01-11	b. ATM System, or	Calculated CRC was not tally with received CRC.	Frequent	High	Kuala Lumpur ATCC / LEONARDO Chennai ACC / RAYTHEON	No more occurrence, under observation by both ATSUs. Kuala Lumpur migrated to the new ATM System in September 2021 - *Updated May 2024*	CLOSED
AIDC-ISSUE-97	Malaysia / Kuala Lumpur ATCC	Kuala Lumpur / Chennai	2021-05-28	2021-01-13	d. Airspace Design/Pro	Late response by Chennai for CDN messages. Agreed response time by controller is 300 seconds.	Frequent	High	Kuala Lumpur ATCC / LEONARDO Chennai ACC / RAYTHEON	Lumpur will continue to monitor the CDN process and make any required amendments to the LOA and SOP - *Updated May 2024*	OPEN
AIDC-ISSUE-98	Malaysia / Kuala Lumpur ATCC	Kuala Lumpur / Chennai	2021-05-28	2021-02-14	b. ATM System, or	Chennai transmit second EST or ACP after a complete process cycle of first EST.	Occasionally	High	Kuala Lumpur ATCC / LEONARDO Chennai ACC / RAYTHEON	No more occurrence/ 2022-05-24	CLOSED
AIDC-ISSUE-99	Malaysia / Kuala Lumpur ATCC	Kuala Lumpur / Chennai	2021-05-28	2021-04-06	b. ATM System, or	LRM transmitted in response to AOC received from Chennai.	Occasionally	High	Kuala Lumpur ATCC / LEONARDO Chennai ACC / RAYTHEON	No more occurrences, under observation by both ATSUs. Kuala Lumpur migrated to the new ATM System in September 2021 - *Updated May 2024*	CLOSED
AIDC-ISSUE-100	Malaysia / Kuala Lumpur ATCC	Kuala Lumpur / Singapore	2021-05-28	2021-01-11	d. Airspace Design/Pro	Singapore transmit TOC/AOC message although TOC/AOC is not included in operational implementation	Occasionally	Low	Kuala Lumpur ATCC / LEONARDO Singapore ACC / THALES	TOC triggered due to unintentional action by users. Operational plan to include AOC/TOC in operational messages exchange pending discussions with Kuala Lumpur. / May 2022	CLOSED
AIDC-ISSUE-101	Malaysia / Kuala Lumpur ATCC	Kuala Lumpur / Singapore	2021-05-28	2021-04-05	b. ATM System, or	Singapore transmit second EST after a complete process cycle of first EST.	Rare	Medium	Kuala Lumpur ATCC / LEONARDO Singapore ACC / THALES	No more occurrences/ 2022-05-24	CLOSED
AIDC-ISSUE-102	Malaysia / Kuala Lumpur ATCC	Kuala Lumpur / Bangkok	2021-05-28	2021-01-14	d. Airspace Design/Pro	Bangkok transmit TOC/AOC message although TOC/AOC is not included in operational implementation.	Occasionally	Low	Kuala Lumpur ATCC / LEONARDO Bangkok ACC / THALES	Will be tested and included in next TOC/AOC Trial between Lumpur and Bangkok - *Updated May 2024*	CLOSED

AIDC ISSUES FORM - ATMAS TF/5 (2024)

Issue reference	Reporting State/ATSU	Pairing FIR1/FIR2	Date of Reported	Date of Occurrence	Fault Category	Description of Fault	Frequency	Priority (assessed by TF or RO)	ATSU/ Vendor	Actions Taken/ Updated Date	
AIDC-ISSUE-103	Malaysia / Kuala Lumpur ATCC	Kuala Lumpur / Bangkok	2021-05-28	2021-04-06	d. Airspace Design/Pr	Bangkok transmit MAC message although MAC is not included in Operational Implementation.	Rare	Low	Kuala Lumpur ATCC / LEONARDO Bangkok ACC / THALES	No more occurrences - *Updated May 2024*	CLOSED
AIDC-ISSUE-104	Malaysia / Kuala Lumpur ATCC	Kuala Lumpur / Bangkok	2021-05-28	2021-01-14	b. ATM System, or	Bangkok transmit second EST after a complete process cycle of first EST.	Rare	Medium	Kuala Lumpur ATCC / LEONARDO Bangkok ACC / THALES	No more occurrences - *Updated May 2024*	CLOSED
AIDC-ISSUE-105	Malaysia / Kuala Lumpur ATCC	Kuala Lumpur / Bangkok	2021-05-28	2021-04-10	d. Airspace Design/Pr	Bangkok transmit EST with incorrect COP due to incorrect FPL route was filed by the airline operator (Not following the Flight Planning)	Occasionally	High	Kuala Lumpur ATCC / LEONARDO Bangkok ACC / THALES	No more occurrences/ 2022-05-24	CLOSED
AIDC-ISSUE-106	India / Chennai ACC	Chennai / Kuala Lumpur	2021-09-01	2021/08/31	c. AIDC Message, or	Chennai system transmits correct AIDC EST messages, but the Kuala Lumpur controller reported that, the received AIDC EST time is incorrect.	Rare	High	Chennai / RAYTHEON Kuala Lumpur ATCC / LEONARDO	The Issue appears to have been resolved at Kuala Lumpur end.	CLOSED
AIDC-ISSUE-107	India / Chennai ACC	Chennai / Kuala Lumpur	2021-09-23	2021/09/22	c. AIDC Message, or	Chennai system transmits correct AIDC EST message, but the Kuala Lumpur controller reported that, the received AIDC EST time is incorrect. The issue was earlier reported on 1st Sept 2021.	Rare	High	Chennai / RAYTHEON Kuala Lumpur ATCC / LEONARDO	The Issue appears to have been resolved at Kuala Lumpur end.	CLOSED
AIDC-ISSUE-108	India / Chennai ACC	Chennai / Kuala Lumpur	2021-10-08	2021/10/07	c. AIDC Message, or	Kuala Lumpur system transmits CDN messages even for one minute revision in Estimates also.	Frequent	High	Chennai / RAYTHEON Kuala Lumpur ATCC / LEONARDO	The Issue appears to have been resolved at Kuala Lumpur end.	CLOSED
AIDC-ISSUE-109	India / Chennai ACC	Chennai / Kuala Lumpur	2021-11-30	2021/11/26	c. AIDC Message, or	Chennai system transmits correct AIDC EST message, but the Kuala Lumpur controller reported that, the flight level received in AIDC EST message is incorrect. Similar issues were reported on 1st Sept 2021 and 23rd Sept 2021.	Rare	High	Chennai / RAYTHEON Kuala Lumpur ATCC / LEONARDO	The Issue appears to have been resolved at Kuala Lumpur end.	CLOSED
AIDC-ISSUE-110	Malaysia / Kuala Lumpur ATCC	Kuala Lumpur / Chennai	2022-05-24	2021-01-16	c. AIDC Message, or	Chennai responded LRM-RMK/57/ (invalid message) for TOC message eventhough TOC was sent in valid format timely.	Frequent	Medium	Kuala Lumpur ATCC / LEONARDO Chennai ACC / RAYTHEON	No more occurrence, under observation by both ATSUs. Kuala Lumpur migrated to the new ATM System in September 2021 - *Updated May 2024*	CLOSED
AIDC-ISSUE-111	Malaysia / Kota Kinabalu ATCC	Kota Kinabalu / Singapore	2022-05-24	2021-07-12	b. ATM System, or	Delayed in transmitting auto EST and No ACP received. Occasionally EST was not sent automatically.	Occasionally	High	Kota Kinabalu ATCC / LEONARDO Singapore ACC / THALES	EST is sent automatically under new system development - *Updated May 2024*	CLOSED
AIDC-ISSUE-112	India/ Kolkata	Kolkata / Yangoon	2022-05-27		e. Others.	AIDC testing successfully completed. LOA between India-Mayanmar is required to operationalize AIDC coordination between Kolkata and Yangoon.	Frequent	Medium	Kolkata ACC / INDRA Yangon ACC / THALES	No change in fault status.	**OPEN**

AIDC ISSUES FORM - ATMAS TF/5 (2024)

Issue reference	Reporting State/ATSU	Pairing FIR1/FIR2	Date of Reported	Date of Occurrence	Fault Category	Description of Fault	Frequency	Priority (assessed by TF or RO)	ATSU/ Vendor	Actions Taken/ Updated Date	
AIDC-ISSUE-113	India/ Kolkata	Kolkata / Chennai	2022-05-27		c. AIDC Message, or	Kolkata ATS system has no route trucation feeture. It sends full route in ABI and canot process in coming ABI message with route truncation. Because of this issue ABI messages are not exchanged between Kolkata and Chennai.	To be update	Medium	Kolkata ACC / INDRA Chennai ACC / RAYTHEON	Issue resolved.	CLOSED
AIDC-ISSUE-114	India/ Kolkata	Kolkata / Chennai Kolkata / Nagpur	2022-05-27		b. ATM System, or	Airway 'MEPIP' is cordination points with both Nagpur and Chennai at levels F255 to F460. Kolkata ATS system dose not allow to adopt any point as coordination point with multiple ATC centers for same levels.	Frequent	High	Kolkata ACC / INDRA Chennai ACC / RAYTHEON Kolkata ACC / INDRA Nagpur ACC / INDRA	Issue resolved. This is System limitation. Nagpur Automation System (Aircon 2100) has completed its life cycle and AMC is not available with OEM. This issue may be treated as CLOSED./ 16th May 2024.	CLOSED
AIDC-ISSUE-115	India/ Kolkata	Kolkata / Chennai	2022-05-27		b. ATM System, or	Multiple sectors of Chennai required to defined as separate control centers, but only one control center can be adapted for one ATC center having multiple sectors.	Occasionally	Medium	Kolkata ACC / INDRA Chennai ACC / RAYTHEON	No change in fault status.	**OPEN**
AIDC-ISSUE-116	India/ Kolkata	Kolkata / Chennai	2022-05-27		b. ATM System, or	Different Control center names have been adoted in Chennai ATS system for AIDC and ADS-C/CPDLC, But in Kolkata ATS system there is no feature to adapt separate control name for adjoing control center.	Occasionally	Medium	Kolkata ACC / INDRA Chennai ACC / RAYTHEON	No change in fault status.	**OPEN**

TABLE OF ATS INTER-FACILITY DATA COMMUNICATION (AIDC) IMPLEMENTATION STATUS IN APAC REGION

Explanation of the Table

Column	Element	Explanation	Reason
1	State/Administration	Name of the State/Administration	
2	AIDC Implementation Status (Implemented or not)	AIDC has been implemented in the State/Administration or not (States have the technical capability implemented and at least one bilateral connection with adjacent ATS units in operational use will be regarded as implemented)	
3	Location of AIDC System ATSU1	the location of the AIDC end system under the supervision of State/Administration identified in column 1	
4	ATM Automation System	Make/Model of the ATM automation system used in this ATSU	
5	ATSU2 /Correspondent State/Administration – the correspondent AIDC System	ATSU2 – location of the correspondent AIDC end system Correspondent State/Administration – the name of the State/Administration responsible for management of the correspondent AIDC end system A "/" is placed between the ATSU2 and State/Administration	
6	Intraregional/Interregional	the connection is intraregional (inside APAC) or interregional	
7	Transmission Means	the transmission means used for the AIDC messages exchanged between the corresponding AIDC pair, AFTN, AMHS, etc.	The carriage of AIDC messages is facilitated through existing communication network (e.g. AFTN, AMHS, etc.). The type of network that will be used for AIDC message exchange will need to be defined, including the appropriate recovery/ contingency actions that will be adopted in abnormal situations
8	Frequency of Use (days in a week)	days of AIDC used in a week	to indicate how frequently the AIDC interface has been used
9	Main/Backup Circuit	the circuit is main or backup AIDC connection	if there is two circuits between the two ATSUs, it's better to identify which is main or backup
10	Communication Signal Speed	the communication signal speed for the AIDC messages exchanged (bps)	According to Pan Regional Interface Control Document (PAN ICD) for ATS Inter-facility Data Communications (AIDC) chapter 3.3.2.3, the communication signal speed between ATS systems using AFTN/AMHS should be greater than 2400 bps
11	Average Transmission Delay (One Trip Time Seconds)	the average transmission delay for exchanging AIDC messages	According to Pan Regional Interface Control Document (PAN ICD) for ATS Inter-facility Data Communications (AIDC), Average Transmission Delay (seconds) will influence the AIDC performance. In order to effectively use the AIDC application for the interchange of ATC coordination data, ATSUs should monitor the performance of the communication links to ensure the required performance is achieved. This monitoring should measure the latency of the AIDC message traffic between ATS systems in terms of the time measured between message transmission at the originating ATS system and receipt of the message at the receiving ATS system. The performance of the communications links should be such that 95% of all messages should be received within 12 seconds of transmission and 99.9% of all messages should be received within 30 seconds of transmission. In bilateral agreements, ATSUs, may agree on different performance requirements
12	Implementation Date or Target Date	date of implementation of the AIDC end system in the form of xQyyyy(quarter year), MON yyyy (Month) or yyyy	
13	Interface Status	the AIDC interface status, including Operational (already implemented), Testing (under progressing), Planned (under plan), No plan	
14	Interface Protocol /Version (OLDI or AIDC Version)	the AIDC service between the corresponding ATSUs	to show which AIDC version used and supported between two ATSUs and refer to Reason under Item 15

TABLE OF ATS INTER-FACILITY DATA COMMUNICATION (AIDC) IMPLEMENTATION STATUS IN APAC REGION			
Explanation of the Table			
15	List of AIDC Messages Applicable between the Two ATSUs	the AIDC messages can be exchanged between the two ATSUs, including ABI, EST, ACP, TOC, AOC, LAM, LRM, PAC, CDN, CPL, REJ, MAC; TRU, EMG, MIS, TDM, ASM, FAN, FCN; ADS	According to Asia/Pacific Seamless ANS Plan V3.0, PASL Phase II (expected implementation by 07 November 2019) and APANPIRG/24 CONCLUSION 24/16, ATS systems should enable AIDC (version 3 or later), or an alternative process that achieves at least the same level of performance as AIDC, between en-route ATC units and terminal ATC units where transfers of control are conducted consistent with FICE-B0/1, unless alternate means of automated communication of ATM system track and flight plan data are employed (Priority 1). As far as practicable, the following AIDC messages types should be implemented: • Advanced Boundary Information (ABI); • Coordinate Estimate (EST); • Acceptance (ACP); • TOC; and • Assumption of Control (AOC). Note: States should note the necessity to utilise Logical Acknowledgement Message processing (LAM) when implementing AIDC
16	Coordination by CDN or Voice	the method used in coordination phase	to show if the AIDC process a totally automatic or not
17	Automatic or Manual EST	the EST is sent out automatically or manually	to evaluate the automatic level of AIDC
18	A Warning Message to Controller in Case of AIDC Failure	the warning message for AIDC failure is capable or not	According to Pan Regional Interface Control Document (PAN ICD) for ATS Interfacility Data Communications (AIDC), failure to receive an operational response within timeout period Top should result in a warning message being displayed to the controller. Non receipt of a response to an ASM may indicate either a communication link failure or an ATC system failure. If an ATSU that has sent an ASM message does not receive an application response within a specified time, a warning message should be displayed at an appropriate position so that local contingency procedures can be executed
19	Remarks	any additional information describing the AIDC connection, including issues faced if any, mitigation, and limitation	

Table of AIDC Implementation Status in APAC

State/Administration	AIDC Implementation Status(Implemented or not)	Location of AIDC System ATSU1	ATM Automation System (Make/Model)	ATSU2 /Correspondent State – Administration	Intraregional/Interregional	Transmission Means	Frequency of Use(days in a week)	Main/Back up Circuit	Communication Signal Speed (bps)	Average Transimission Delay (One Trip Time in Seconds)	Implementation Date or Target Date as MON yyyy or xQyyyy	Interface Status (Operational, Testing, Planned, No plan)	Interface Protocol / Version (OLDI or AIDC Version)	List of AIDC Messages Applicable between the Two ATSUs (ABI, EST, ACP, TOC, AOC, LAM, LRM, PAC, CDN, CPL, REJ, MAC; TRU, EMG, MIS, TDM, ASM, FAN, FCN; ADS)	Coordination by CDN or Voice	Automatic or Manual EST	A Warning Message to Controller in Case of AIDC Failure	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
AFGHANISTAN	**non-implemented**	Kabul ACC		Kabul ACC /Afghanistan	Intraregional	AMHS												
				Karachi ACC/Pakistan	Intraregional	AFTN												
AUSTRALIA	**Implemented**	Brisbane ACC	Thales ATM system	Oakland ARTCC /USA	Interregional	AFTN	7					Operational	ICD V.X.0	ABI, EST, ACP, TOC, AOC, LAM, LRM, CDN, REJ, MAC, CPL	CDN	Automatic	yes	Up- and down conversion of AMHS and AFTN required as connection between Australian ATM system and national Message Transfer Agent is X25/AFTN.
				Auckland ACC /New Zealand	Intraregional	AFTN	7					Operational	ICD V.X.0	ABI, EST, ACP, TOC, AOC, LAM, LRM, CDN, REJ, MAC, CPL, PAC	CDN	Automatic	yes	
				Melbourne ACC /Australia	Intraregional	AFTN	7					Operational	ICD V.X.0	ABI, ACP, AOC, EST, LAM, LRM, MAC, PAC, TOC	Voice	Automatic	yes	
				Ujung Pandang ACC /Indonesia	Intraregional	AFTN	7					Operational	ICD V.X.0	ABI, ACP, AOC, EST, LAM, LRM, MAC, TOC	Voice	Automatic	yes	
				Nadi ACC /Fiji	Intraregional	AFTN	7					Operational	ICD V.X.0	ABI, EST, ACP, TOC, AOC, LAM, LRM, CDN, REJ, MAC, CPL, PAC	CDN	Automatic		
				Port Moresby/PNG	Intraregional	AFTN	7					Operational	ICD V.X.0	ABI, EST, ACP, TOC, AOC, LAM, LRM	Voice	Automatic	yes	
		Melbourne ACC	Thales ATM system	Brisbane ACC /Australia	Intraregional	AFTN	7					Operational	ICD V.X.0	ABI, ACP, AOC, EST, LAM, LRM, MAC, PAC, TOC	Voice	Automatic	yes	
				Colombo ACC / Sri Lanka	Intraregional	AFTN	N/A					No plan		N/A				
				Jakarta ACC /Indonesia	Intraregional	AFTN	N/A					No plan		N/A				
				Johannesburg ACC / South Africa	Interregional	AFTN	7					Operational	ICD V.X.0	EST, ACP, LAM, LRM	Voice	Automatic	yes	
				Male ACC / Maldives	Intraregional	AFTN	7					Operational	ICD V.X.0	ABI, ACP, EST, LAM, LRM	Voice	Automatic	yes	
				Mauritius ACC /Mauritius	Interregional	AFTN	7					Operational	ICD V.X.0	ABI, ACP, AOC, CPL, EST, LAM, PAC, TOC, LRM	Voice	Automatic	yes	
				Auckland ACC /New Zealand	Intraregional	AFTN	7					Operational	ICD V.X.0	ABI, EST, ACP, TOC, AOC, LAM, LRM	Voice	Automatic	yes	
BANGLADESH	non-implemented	Dhaka ACC		Kolkata ACC /India	Intraregional	AMHS					4Q2023							Implementation of AIDC is included in the “Modernization of CNS-ATM System of CAAB” project which is going on G2G agreement with French Government and likely to be implemented by the end of 2023.
				Yangon ACC /Myanmar	Intraregional	AMHS					4Q2023		ICD V.2.0					
BHUTAN	non-implemented											No plan						Currently not applicable. If required in the future, will decide after CRV implementation.
BRUNEI DARUSSALAM	non-implemented																	
CAMBODIA	Implemented	Phnom Penh ACC	THALES	Bangkok ACC /Thailand	Intraregional	AMHS	7	Main	64000		Oct 2020	Operational	ICD V.2.0	ABI, EST, ACP, TOC, AOC, LAM, LRM	Voice	Automatic	yes	
				Vientiane ACC/Laos PDR	Intraregional	AMHS	7	Main	5Mbps		Jan 2020	Operational	ICD V.2.0	ABI, EST, ACP, TOC, AOC, LAM, LRM	Voice	Automatic	yes	
				Ho Chi Minh ACC/Viet Nam	Intraregional	AFTN						Testing	ICD V.1.0	EST, ACP, TOC, AOC, LRM, LAM				Technical Trial was completed
		Beijing ACC	THALES	Ulaanbaatar ACC/Mongolia	Interregional	AFTN					Dec 2023	Operational	ICD V.3.0	EST, ACP, TOC, AOC, LRM, LAM		Automatic	yes	
		Harbin ACC	AirNet	Khabarovsk/Russia	Intraregional						Dec 2024	Planned						
		Sanya ACC	NUMEN	Hong Kong ACC / Hong Kong, China	Intraregional	AFTN					Dec 2007	Operational	ICD V.3.0	EST, ACP, TOC, AOC, LRM, LAM		Automatic	yes	
				Hanoi ACC/Vietnam	Intraregional	AFTN					Jun 2024	Testing		EST, ACP, TOC, AOC, LRM, LAM				
				Ho Chi Minh ACC /Vietnam	Intraregional	AFTN					Dec 2023	Operational	ICD V.3.0	EST, ACP, TOC, AOC, LRM, LAM		Automatic	yes	
		Kunming ACC	NUMEN	Vientiane ACC/Laos PDR	Interregional						Jan 2021	Operational	ICD V.3.0	EST, ACP, TOC, AOC, LRM, LAM		Automatic	yes	
				Yangon ACC /Myanmar	Intraregional	AFTN						Testing		EST, ACP, TOC, AOC, LRM, LAM				

Table of AIDC Implementation Status in APAC

State/Administration	AIDC Implementation Status(Implemented or not)	Location of AIDC System ATSU1	ATM Automation System (Make/Model)	ATSU2 /Correspondent State – Administration	Intraregional/Interregional	Transmission Means	Frequency of Use(days in a week)	Main/Back up Circuit	Communication Signal Speed (bps)	Average Transimission Delay (One Trip Time in Seconds)	Implementation Date or Target Date as MON yyyy or xQyyyy	Interface Status (Operational, Testing, Planned, No plan)	Interface Protocol / Version (OLDI or AIDC Version)	List of AIDC Messages Applicable between the Two ATSUs (ABI, EST, ACP, TOC, AOC, LAM, LRM, PAC, CDN, CPL, REJ, MAC; TRU, EMG, MIS, TDM, ASM, FAN, FCN; ADS)	Coordination by CDN or Voice	Automatic or Manual EST	A Warning Message to Controller in Case of AIDC Failure	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
CHINA	Implemented	Lanzhou ACC	NUMEN	Ulaanbaatar ACC/Mongolia	Intraregional	AFTN					Dec 2023	Operational	ICD V.3.0	EST, ACP, TOC, AOC, LRM, LAM		Automatic	yes	
		Lhasa ACC		Kathmandu ACC/Nepal	Interregional	AFTN												
		Guangzhou ACC	THALES	Taibei ACC /China	Intraregional						Jan 2013	Cancel	ICD V.3.0	EST, ACP, TOC, AOC, LRM, LAM		Automatic	yes	
				Hong Kong ACC / Hong Kong, China	Intraregional	AFTN					May 2018	Operational	ICD V.3.0	EST, ACP, TOC, AOC, LRM, LAM		Automatic	yes	
		Taibei ACC		Hong Kong ACC / Hong Kong, China	Intraregional	AFTN						Operational	ICD V.3.0					
				Fukuoka ATMC/Japan	Interregional	AFTN						Operational						
				Manila ACC/Philippines	Interregional	AFTN												
		Shenyang ACC	NUMEN	Khabarovsk/Russia	Interregional						Oct 2019	Operational	OLDI	ABI, ACT, MAC, HOP, ACP, LAM, and LRM		Automatic	yes	
		Urumqi ACC	NUMEN	Lahore ACC /Pakistan	Intraregional	AMHS					Jun 2024	Testing						
			NUMEN	Bishkek ACC/Kyrgyzstan	Intraregional						Dec 2024	Planned						
		Nanning ACC	NUMEN	Hanoi ACC/Vietnam	Intraregional	AMHS					Dec 2023	Operational						
		Dalian ACC	NUMEN	Incheon ACC /Republic of Korea	Interregional						Oct 2016	Operational	ICD V.3.0 (trial operat	ABI, EST, ACP, TOC, AOC, LRM, LAM		Automatic	yes	
			NUMEN	Khabarovsk/Russia	Intraregional						Dec 2024	Planned						
		Shanghai ACC	NUMEN	Taibei ACC /China	Intraregional						Jan 2013	Operational	ICD V.3.0	LAM		Automatic	yes	
HONG KONG, CHINA	Implemented	Hong Kong ACC	Raytheon ATM system	Guangzhou ACC /China	Intraregional	AFTN	7	Main	2400	4	May 2018	Operational	ICD V.3.0	EST, ACP, TOC, AOC, LAM, LRM	Voice	Automatic	yes	
				Sanya ACC /China	Intraregional	AFTN	7	Main	2400	4	Feb 2007	Operational	ICD V.3.0	EST, ACP, TOC, AOC, LAM, LRM	Voice	Automatic	yes	
				Manila ACC /Philippines	Intraregional	AMHS	7	Main	up to 2M on Cl	1	May 2019	Operational	ICD V.3.0	EST, ACP, LAM, LRM	Voice	Automatic	yes	
				Taibei ACC /China	Intraregional	AMHS	7	Main	up to 2M on Cl	1	Nov 2012	Operational	ICD V.3.0	EST, ACP, TOC, AOC, LAM, LRM	Voice	Automatic	yes	
				Shanghai ACC / China	Intraregional	AMHS	7	Main	up to 2M on Cl	1	May 2024	Operational	ICD V.3.0	EST, ACP, LAM, LRM	Voice	Automatic	yes	
				Xiamen ATMS / China	Intraregional	AMHS	7	Main	up to 2M on Cl	1	May 2024	Operational	ICD V.3.0	EST, ACP, LAM, LRM	Voice	Automatic	yes	
MACAO, CHINA	non-implemented	Macao ATZ										No plan						
COOK ISLANDS	non-implemented																	
DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA	non-implemented											Planned						
FIJI	Implemented	Nadi ACC	Adacel ATM system	Auckland ACC /New Zealand	Intraregional	AFTN						Operational	ICD V. 2.0	ABI, EST, ACP, TOC, AOC, CDN, CPL				
				Brisbane ACC /Australia	Intraregional	AFTN						Operational	ICD V.1.0	ABI, EST, ACP, TOC, AOC, CDN, CPL				
				Oakland ARTCC /USA	Intraregional	AFTN						Operational	ICD V. 2.0	ABI, EST, ACP, TOC, AOC, CDN, CPL				
FRANCE FRENCH POLYNESIA, NEW CALEDONIA	Implemented	Papeete ACC	THALES EUROCAT	Auckland ACC /New Zealand	Intraregional	AFTN					2009	Operational	ICD V.3.0					
				Oakland ARTCC /USA	Intraregional	AFTN					2009	Operational	ICD V.3.0					
INDIA	Implemented	Ahmedabad ACC	INDRA Aircon 2100	Karachi ACC /Pakistan	Intraregional	AFTN						Testing		ABI, EST				
		Chennai ACC	Raytheon Auto track III +	Colombo ACC / Sri Lanka	Intraregional	AMHS					4Q2018	Planned						
				Jakarta ACC /Indonesia	Intraregional	AFTN					4Q2019	Planned						
				Kuala Lumpur ACC / Malaysia	Intraregional	AFTN					Jan 2021	Operational	ICD V.3.0	ABI, EST, TOC, AOC	Voice			
				Male ACC /Maldives	Intraregional	AFTN					Sep 2021	Operational						
				Yangon ACC /Myanmar	Intraregional	AFTN						Testing	ICD V.2.0					
		Delhi ACC	INDRA Aircon	Karachi ACC /Pakistan	Intraregional	AFTN					1Q2019	No plan						
				Lahore ACC /Pakistan	Intraregional	AFTN						Testing						
		Kolkata ACC	INDRA Aircon	Dhaka ACC /Bangladesh	Intraregional	AMHS					4Q2018	Planned						
				Yangon ACC /Myanmar	Intraregional	AFTN					4Q2018	Testing	ICD V.2.0					

Table of AIDC Implementation Status in APAC

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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
				Kathmandu ACC /Nepal	Intraregional	AFTN												
		Mumbai ACC	Raytheon Auto track III	Karachi ACC /Pakistan	Intraregional	AMHS					1Q2019	Planned						
				Male ACC /Maldives	Intraregional	AFTN					Nov 2021	Operational						
				Mogadishu ACC/Somalia	Interregional							Testing						
				Muscat ACC /Oman	Interregional	AFTN						Testing						
				Seychelles ACC / Mauritius	Interregional	AFTN												
		Trivandrum ACC	INDRA Aircon 2100	Male ACC/Maldives	Intraregional	AFTN					3Q2018							
		Varanasi ACC	INDRA Aircon 2100	Kathmandu ACC /Nepal	Intraregional	AFTN						Planned						
INDONESIA	Implemented	Jakarta ACC		Melbourne/Australia	Intraregional	AFTN					2025	Testing						
				Colombo ACC/Srilanka	Intraregional	AFTN					2024	Testing						
				SingaporeACC/Singapore	Intraregional	AFTN					2025	Testing	ICD V.3.0					
				Kuala Lumpur ACC/Malaysia	Intraregional	AFTN					2026	Testing	ICD V.3.0					
				Kota Kinabalu ACC/Malaysia	Intraregional	AFTN					2026	Testing						
		Ujung Pandang ACC		Brisbane ACC/ Australia	Intraregional	AMHS	7	Main	9600		Jul-27	Operational	ICD V.3.0	ABI,EST,ACP,TOC,AOC,LAM,LRM	Voice	Automatic	Yes	
				Oakland ARTCC/USA	Intraregional	AMHS	7	Main	9600		2Q 2023	Planned	ICD V.3.0	ABI,EST,ACP,TOC,AOC,LAM,LRM	CDN	Automatic	Yes	
				Por Moresby ACC/PNG	Intraregional	AFTN	7	Main	9600		2Q 2021		ICD V.3.0	ABI,EST,ACP,TOC,AOC,LAM,LRM	Voice	Automatic	Yes	
				Kota Kinabalu ACC/Malaysia	Intraregional	AFTN	7	Main	9600			Operational	ICD V.3.0	ABI,EST,ACP,TOC,AOC,LAM,LRM	Voice	Automatic	Yes	
				Jakarta ACC/Indonesia	Intraregional	AFTN	7	Main	19200		3Q 2022	Testing	ICD V.3.0	ABI,EST,ACP,TOC,AOC,LAM,LRM	Voice	Automatic	Yes	
				Manila ACC/Philippines	Intraregional	AMHS	7	Main	9600		4Q 2020	Testing	ICD V.3.0	ABI,EST,ACP,TOC,AOC,LAM,LRM	Voice	Automatic	Yes	
JAPAN	Implemented	Fukuoka ATMC	JCAB/ADEX-19	Manila ACC /Philippines	Intraregional							Planned						
				Anchorage ACC /USA	Intraregional	AMHS	7	Main	64000		2005	Operational	ICD V.2.0		CDN	Automatic	yes	
				Incheon ACC /Republic of Korea	Intraregional		7	Main	64000		Jun 2009	Operational	ICD V.1.0	EST,ACP,TOC,AOC,LAM,LRM,CPL	CDN	Automatic	yes	
				Oakland ARTCC /USA	Intraregional	AMHS	7	Main	64000		May 2017	Operational	ICD V.2.0		CDN	Automatic	yes	
				Shanghai ACC /China	Intraregional	AFTN						Planned						
				Taibei ACC / China	Intraregional		7	Main	64000		2012	Operational	ICD V.3.0	ABI,EST,ACP,LAM,LRM,MAC	CDN	Automatic	yes	
		Tokyo ACC	JCAB/ADEX-19	Incheon ACC /Republic of Korea	Intraregional		7	Main	64000		2010	Operational	ICD V1.0	EST,ACP,TOC,AOC,LAM,LRM,CPL	CDN	Automatic	yes	
		Kobe ACC	JCAB/ADEX-19	Incheon ACC /Republic of Korea	Intraregional	AFTN	7	Main	64000		2012	Operational	ICD V.3.0					
JAPAN	Implemented	Fukuoka ATMC	NEC	Manila ACC /Philippines	Intraregional	AFTN						Planned						
				Anchorage ACC /USA	Intraregional	AMHS	7	Main	64000		2005	Operational	ICD V.2.0		CDN	Automatic	yes	
				Incheon ACC /Republic of Korea	Intraregional	AFTN	7	Main	64000		Jun 2009	Operational	ICD V.1.0	EST,ACP,TOC,AOC,LAM,LRM,CPL	CDN	Automatic	yes	
				Oakland ARTCC /USA	Intraregional	AMHS	7	Main	64000		May 2017	Operational	ICD V.2.0		CDN	Automatic	yes	
				Taibei ACC / China	Intraregional	AFTN	7	Main	64000		2012	Operational	ICD V.3.0	ABI,EST,ACP,LAM,LRM,MAC	CDN	Automatic	yes	
		Tokyo ACC	NEC	Incheon ACC /Republic of Korea	Intraregional		7	Main	64000		2010	Operational	ICD V1.0	EST,ACP,TOC,AOC,LAM,LRM,CPL	CDN	Automatic	yes	
		Kobe ACC	NEC	Incheon ACC /Republic of Korea	Intraregional	AFTN	7	Main	64000		2012	Operational	ICD V.3.0					
KIRIBATI	non-implemented																	
LAO PEOPLE'S DEMOCRATIC REPUBLIC	Implemented	Vientiane ACC	THALES TOPSKY (EUROCAT-C)	Bangkok ACC /Thailand	Intraregional	AMHS	7	Main	9600		14-Jul-20	Operational	ICD V.2.0	ABI, EST, ACP, TOC, AOC, LAM, LRM	Voice	Automatic	no	
				Hanoi ACC /Veitnam	Intraregional	AFTN	7	Main	9600		4Q2024	Planned	ICD V.2.0	ABI, EST, ACP, TOC, AOC, LAM, LRM				
				Phnom Penh ACC /Cambodia	Intraregional	AFTN	7	Main	9600		2-Jan-20	Operational	ICD V.2.0	ABI, EST, ACP, TOC, AOC, LAM, LRM	Voice	Automatic	no	
				Yangoon/ Myanmar	Intraregional	AFTN	7	Main	9600		1Q2025	Planned	ICD V.2.0	ABI, EST, ACP, TOC, AOC, LAM, LRM				
				Kunming ACC /China	Intraregional	AFTN	7	Main	9600		23 November 202	Operational	ICD V.2.0	ABI, EST, ACP, TOC, AOC, LAM, LRM	Voice	Automatic	no	
				Ho Chi Minh/ Vietnam	Intraregional	AFTN	7	Main	9600		4Q2024	Planned	ICD V.2.0	ABI, EST, ACP, TOC, AOC, LAM, LRM				
				Bangkok ACC /Thailand	Intraregional	AMHS	7	Main	9600	7	Mar 2020	Operational	ICD V.3.0	EST, ACP, LAM, LRM	Voice	Automatic	yes	

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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
MALAYSIA	Implemented	Kuala Lumpur ACC	LEONARDO	Singapore ACC /Singapore	Intraregional	AMHS	7	Main	9600	7	Nov 2019	Operational	ICD V.3.0	EST, ACP, LAM, LRM	Voice	Automatic	yes	
				Chennai ACC /India	Intraregional	AMHS	7	Main	9600	7	Apr 2020	Operational	ICD V.3.0	ABI, EST, ACP, LAM, LRM, CDN, REJ,MAC,TOC,AOC	CDN	Automatic	yes	
				Ho Chi Minh ACC /Vietnam	Intraregional	AMHS	7	Main	TBA	TBA	3Q2024	Planned	ICD V.3.0	EST, ACP, LAM, LRM, TOC, AOC	Voice	Automatic	yes	
				Jakarta ACC /Indonesia	Intraregional	AMHS	7	Main	TBA	TBA	3Q2024	Planned	ICD V.3.0	EST, ACP, LAM, LRM, TOC, AOC	Voice	Automatic	yes	
		Kota Kinabalu ACC	THALES	Ujung Pandang ACC /Indonesia	Intraregional	AMHS	7	Main	TBA	TBA	2Q2024	Planned	ICD V.3.0	EST, ACP, LAM, LRM, TOC, AOC	Voice	Automatic	yes	
				Manila ACC /Philippines	Intraregional	AMHS	7	Main	TBA	TBA	3Q2024	Planned	ICD V.3.0	EST, ACP, LAM, LRM, TOC, AOC	Voice	Automatic	yes	
				Singapore ACC /Singapore	Intraregional	AMHS	7	Main	9600	1	Jul 2021	Operational	ICD V.3.0	EST, ACP, LAM, LRM	Voice	Automatic	yes	
											2Q2024	Planned	ICD V.3.0	TOC, AOC	Voice	Automatic	yes	
				Jakarta ACC /Indonesia	Intraregional	AMHS	7	Main	TBA	TBA	3Q2024	Planned	ICD V.3.0	EST, ACP, LAM, LRM, TOC, AOC	Voice	Automatic	yes	
		Kuching ACC	THALES	Singapore ACC /Singapore	Intraregional	AMHS	7	Main	9600	1	Feb 2021	Operational	ICD V.3.0	EST, ACP, LAM, LRM	Voice	Automatic	yes	
											2Q2024	Planned	ICD V.3.0	TOC, AOC	Voice	Automatic	yes	
				Jakarta ACC /Indonesia	Intraregional	AMHS	7	Main	TBA	TBA	3Q2024	Planned	ICD V.3.0	EST, ACP, LAM, LRM, TOC, AOC	Voice	Automatic	yes	
MALDIVES	Implemented	Male ACC	LEONARDO	Mumbai ACC / India	Intraregional	AFTN	7	Main			3Q2021	Operational	ICD V.3.0	ABI, EST, ACP, LAM, LRM, TOC, AOC	Voice	Automatic	yes	
				Chennai ACC /India	Intraregional	AFTN	7	Main			3Q2021	Operational	ICD V.3.0	ABI, EST, ACP, LAM, LRM, TOC, AOC	Voice	Automatic		
				Mauritius ACC/Mauritius	Interregional	AFTN						No plan						
				Melbourne ACC /Australia	Intraregional	AFTN	7	Main			TBA	Testing	ICD V.3.0		Voice			
				Colombo ACC/Sri Lanka	Intraregional	AFTN		Main	64K		TBA	Testing	ICD V.3.0		Voice			Colombo AIDC connection temporarily disabled due to request from VCCC
				Trivandrum ACC/India	Intraregional	AFTN	7	Main			3Q2021	Operational	ICD V.3.0	ABI, EST, ACP, LAM, LRM, TOC, AOC	Voice			
MARSHALL ISLANDS	non-implemented																	
MICRONESIA (FEDERATED STATE OF)	non-implemented																	
MONGOLIA	Implemented	Ulaanbaatar ACC	INDRA Aircon-2100	Irkutsk ACC/Russia	Interregional	FMTP	7	Main/Backup	4800	Less than a second	2Q2017	Operational	OLDI Ver. 4.2	ABI, ACT, LAM, REV, PAC, MAC		Auto		
				Krasnoyarsk ACC/Russia	Interregional	FMTP	7	Main/Backup	4800	Less than a second	4Q2018	Operational	OLDI Ver. 4.3	ABI, ACT, LAM, REV, PAC, MAC		Auto		
				Beijing ACC/China	Intraregional	Dedicated line	7	Main/Backup	4800	6	4Q2023	Testing	ICD V.3.0	EST, ACP, TOC, AOC, LAM, LRM, PAC, MAC		Auto		
				Lanzhou ACC/China	Intraregional	Dedicated line	7	Main/Backup	4800	7.4	4Q2023	Testing	ICD V.3.0	EST, ACP, TOC, AOC, LAM, LRM, PAC, MAC		Auto		
MYANMAR	Testing	Yangon ACC	THALES Automation system (Topsky ATC)	Bangkok ACC /Thailand	Intraregional	AMHS					4Q2020	Testing	ICD V.2.0					
				Kolkata ACC /India	Intraregional	AFTN					4Q2018	Testing	ICD V.2.0					Existing ATM system are likely to be upgraded in Lahore and Karachi ACC.
				Chennai ACC /India	Intraregional	AFTN					4Q2018	Testing	ICD V.2.0					
				Kunming ACC /China	Intraregional	AFTN						Testing	ICD V.2.0					
				Vientianne ACC /Lao PDR	Intraregional	AFTN					4Q2018	Testing	ICD V.2.0					
				Dhaka ACC /Bangladesh	Intraregional	AFTN					4Q2018		ICD V.2.0					
NAURU	non-implemented																	
NEPAL	non-implemented	Kathmandu ACC	ATM system from NEC	Kolkata ACC /India	Intraregional	AFTN												
				Varanasi ACC/India	Intraregional	AFTN												
				Lhasa ACC /China	Intraregional	AFTN												

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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
NEW ZEALAND	Implemented	Auckland ACC	ADACEL OCS (Oceanic Control System)	Brisbane ACC /Australia	Intraregional	AFTN	7	Backup				Operational		ABI, CDN, EST, PAC, ACP, REJ, MAC, MIS, TOC, AOC, LAM, LRM	CDN	Automatic		
						AMHS	7	Main	IP?	1.5		Operational		ABI, CDN, EST, PAC, ACP, REJ, MAC, MIS, TOC, AOC, LAM, LRM	CDN	Automatic		
				Nadi ACC /Fiji	Intraregional	AFTN	7	Backup				Operational		ABI, CPL, CDN, PAC, ACP, REJ, MAC, MIS, TOC, AOC, LAM, LRM	CDN	Automatic		
						AMHS	7	Main	IP?	1		Operational		ABI, CPL, CDN, PAC, ACP, REJ, MAC, MIS, TOC, AOC, LAM, LRM	CDN	Automatic		
				Oakland ARTCC /USA	Intraregional	AFTN	7	Backup				Operational		ABI, CPL, CDN, PAC, ACP, REJ, MAC, MIS, LAM, LRM	CDN	Automatic		
						AMHS	7	Main	IP?	1		Operational		ABI, CPL, CDN, PAC, ACP, REJ, MAC, MIS, LAM, LRM	CDN	Automatic		
				Papeete ACC /French Polynesia	Intraregional	AFTN	7	Main	64k	5		Operational		ABI, CPL, CDN, PAC, ACP, REJ, MAC, MIS, TOC, AOC, LAM, LRM	CDN	Automatic		
				Chile	Interregional	AFTN	7	Backup				Operational		EST, ACP	Voice	Automatic		
						AMHS	7	Main	IP/??			Operational		EST, ACP	Voice	Automatic		
PAKISTAN	Testing	Karachi ACC	Indra AIRCON 2100	Mumbai ACC /India	Intraregional	AMHS	7	Main	128 & 64Kbps		Jun 2025	Testing	ICD Version 2.0	ABI, EST, ACP, TOC, AOC, LAM, LRM, PAC, CDN, CPL, REJ, MAC	Voice	Automatic	Yes	*Trial run carried out between Karachi and Ahmedabad. Partial connectivity between both systems is observed and Some issues regarding the auto acceptance of EST messages in Karachi ATM need to be addressed *Trial run between Karachi and Mumbai was remained unsuccessful due to integration problems. * Trial run carried out between Lahore and Delhi ACCs in March 2021. Delhi ATM system rejects the ABI messages due to adding double space in FPL by Lahore ATM system (East bound Flights). Lahore ATM does not generate ACP message in responce to ABI message sent by Delhi ATM system (West Bound) Note :- Due to restructuring of Karachi ACC and Lahore ACC no need to AIDC testing /requirement between Karachi ACC and Delhi ACC. .*AIDC is not fully functional with neighbouring FIRs due to difference in AIDC version. AIDC will be fully functional up to June, 2025 after replacement of ATM System at Karachi & Lahore ACCs.
				Muscat ACC /Oman	Interregional	AFTN	7	Main	64Kbps		Jun 2025	No Plan	ICD Version 2.0	ABI, EST, ACP, TOC, AOC, LAM, LRM, PAC, CDN, CPL, REJ, MAC	Voice	Automatic	Yes	
				Tehran ACC /Iran	Interregional	AFTN	7	Main	1 Mbps		Jun 2025	No Plan	ICD Version 2.0	ABI, EST, ACP, TOC, AOC, LAM, LRM, PAC, CDN, CPL, REJ, MAC	Voice	Automatic	Yes	
				Ahmadabad ACC /India	Intraregional	AMHS	7	Main	Via Mumbai AMHS		Jun 2025	Testing	ICD Version 2.0	ABI, EST, ACP, TOC, AOC, LAM, LRM, PAC, CDN, CPL, REJ, MAC	Voice	Automatic	Yes	
				Kabul ACC /Afghanistan	Intraregional	AFTN	7	Main	1Mbps		Jun 2025	No Plan	ICD Version 2.0	ABI, EST, ACP, TOC, AOC, LAM, LRM, PAC, CDN, CPL, REJ, MAC	Voice	Automatic	Yes	
		Lahore ACC	Indra AIRCON 2100	Delhi ACC /India	Intraregional	AMHS	7	Main	VIA Mumbai AHMS		Jun 2025	Testing	ICD Version 2.0	ABI, EST, ACP, TOC, AOC, LAM, LRM, PAC, CDN, CPL, REJ, MAC	Voice	Automatic	Yes	
				Kabul ACC /Afghanistan	Intraregional	AFTN	7	Main	1 Mbps via Karachi AMHS		Jun 2025	No Plan	ICD Version 2.0	ABI, EST, ACP, TOC, AOC, LAM, LRM, PAC, CDN, CPL, REJ, MAC	Voice	Automatic	Yes	
		Islamabad ACC	Si ATM	Kabul ACC /Afghanistan	Intraregional	AFTN	7	Main	1 Mbps via Karachi AMHS			No Plan	ICD Version 3.0	ABI, EST, ACP, TOC, AOC, LAM, LRM, PAC, CDN, CPL, REJ, MAC	Voice	Automatic	Yes	
				Urumqui ACC /China	Intraregional	AFTN	7	Main	Via Beijing AFTN			No Plan	ICD Version 3.0	ABI, EST, ACP, TOC, AOC, LAM, LRM, PAC, CDN, CPL, REJ, MAC	Voice	Automatic	Yes	
				Tajakistan ACC /Tajakistan	Interregional	AFTN	7	Main	Via Tehran AFTN			No Plan	ICD Version 3.0	ABI, EST, ACP, TOC, AOC, LAM, LRM, PAC, CDN, CPL, REJ, MAC	Voice	Automatic	Yes	
PALAU	non-implemented																	
PAPUA NEW			Thales (TopSky	Brisbane ACC/Australia	Intraregional	AMHS						Operational	ICD V.3.0					

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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
PAPUA NEW GUINEA	Implemented	Port Moresby	Thales (TopSky-ATC)	Ujung Pandang ACC/Indonesia	Intraregional	AFTN						Planned	ICD V.3.0					
				Oakland ARTCC /USA	Intraregional	AFTN						Testing	ICD V.3.0					
PHILIPPINES	Implemented	Manila ACC	THALES	Hong Kong ACC / Hong Kong, China	Intraregional	AFTN												
					Intraregional	AMHS					May 2019	Operational						
				Singapore ACC /Singapore	Intraregional	AMHS					Dec 2020	Operational						
				Taibei ACC/China	Intraregional	AFTN												
					Intraregional	AMHS					Dec 2019	Operational						
				Kota Kinabalu ACC /Malaysia	Intraregional	AMHS						Testing						
				Ho Chi Minh ACC /Viet Nam	Intraregional	AMHS						Testing						
				Oakland ARTCC /USA	Intraregional	AMHS						Planned						
				Fukoka ATMC /Japan	Intraregional	AMHS					1Q2019							
				Ujung Pandang ACC /Indonesia	Intraregional	AMHS					Dec 2020	Operational						
REPUBLIC OF KOREA	Implemented	Incheon ACC	Leidos System	Fukuoka ATMC /Japan	Intraregional	Dedicated L	7	Main	64000	1	2010	Operational	ICD V.1.0	CPL, EST, ACP, TOC, AOC, LAM, LRM	Voice	Automatic	yes	
				Shanghai ACC/China	Intraregional						3Q2023	Planned						
				Dalian ACC /China	Intraregional	Dedicated L	7	Backup	64000	1	Nov 2016	Operational	ICD V.3.0	ABI, EST, ACP, TOC, AOC, LAM, LRM	Voice	Automatic	yes	
		Daegu ACC	Leidos System	Fukuoka ATMC /Japan	Intraregional	Dedicated L	7	Backup	64000	1	2010	Operational	ICD V.1.0	CPL, EST, ACP, TOC, AOC, LAM, LRM	Voice	Automatic	yes	
				Shanghai ACC/China	Intraregional						3Q2023	Planned						
				Dalian ACC /China	Intraregional	Dedicated L	7	Main	64000	1	Nov 2016	Operational	ICD V.3.0	ABI, EST, ACP, TOC, AOC, LAM, LRM	Voice	Automatic	yes	
SAMOA	non-implemented																	
SINGAPORE	Implemented	Singapore ACC	THALES	Ho Chi Minh ACC /Vietnam	Intraregional	AMHS	7	Main	64k	80ms	Jul 2014	Operational	ICD V.1.0	EST,ACP,LAM,LRM	Voice	Automatic	yes	
				Manila ACC /Philippines	Intraregional	AMHS	7	Main	64k	45ms	Nov 2019	Operational	ICD V.3.0	EST,ACP,LAM,LRM,TOC,AOC	Voice	Automatic	yes	
				Jakarta ACC /Indonesia	Intraregional	AMHS	0	Main	64k	60ms		Planned	ICD V.3.0					
				Kuala Lumpur ACC /Malaysia	Intraregional	AMHS	7	Main	64k	20ms	Nov 2019	Operational	ICD V.3.0	EST,ACP,LAM,LRM	Voice	Automatic	yes	
				Kota Kinabalu ACC /Malaysia	Intraregional	AMHS	7	Main	64k	55ms	Jul 2021	Operational	ICD V.3.0	EST,ACP,LAM,LRM,TOC,AOC	Voice	Automatic	yes	
SOLOMON ISLANDS	non-implemented			Nadi ACC /Fiji	Intraregional													
				Port Moresby ACC/PNG	Intraregional													
				Brisbane ATSC /Australia	Intraregional													
SRI LANKA	Testing	Colombo ACC	INTELCAN	Male ACC /Maldives	Intraregional	AFTN			64000		SEP 2023	Testing	ICD V.3.0		Voice	Manual	no	ABI message is not working during trials.
				Jakarta ACC / Indonesia	Intraregional	AMHS			2048000		SEP 2023	Planned	ICD V.3.0		Voice	Manual	no	
				Melbourne ACC /Australia	Intraregional	AMHS			2048000		SEP 2023	Planned	ICD V.3.0		Voice	Manual	no	
				Chennai ACC /India	Intraregional	AMHS			2048000		SEP 2023	Testing	ICD V.3.0		Voice	Manual	no	ABI message is not working during trials.
THAILAND	Implemented	Bangkok ACC	THALES	Kuala Lumpur ACC /Malaysia	Intraregional	AMHS					Mar 2020	Operational	ICD V.3.0	EST, ACP, LAM, LRM	Voice	Automatic	yes	
				Phnom Penh ACC /Cambodia	Intraregional	AMHS					Feb 2021	Operational	ICD V.3.0	ABI, EST, ACP, LAM, LRM	Voice	Automatic	yes	
				Vientiane ACC /Lao PDR	Intraregional	AMHS					Jul 2020	Operational	ICD V.3.0	ABI, EST, ACP, TOC, AOC, LAM, LRM	Voice	Automatic	yes	
				Yangon ACC /Myanmar	Intraregional	AMHS						Testing						Continuous operational use still not possible due to system limitation at Yangon ACC
TIMOR LESTE	non-implemented																	
TONGA	non-implemented																	
TUVALU	non-implemented																	
VANUATU	non-implemented																	
				Anchorage ARTCC /United States	Intraregional	AMHS	7	Main	64,000	3	Oct 2005	Operational	ICD V.2.0	ABI, CPL, EST, MAC, CDN, ACP, REJ, EMG, MIS, LAM, LRM, PAC	CDN	Automatic	yes	
				Auckland OAC /New Zealand	Intraregional	AMHS	7	Main	64,000	4	Oct 2005	Operational	ICD V.2.0	ABI, CPL, MAC, CDN, ACP, REJ, LAM, LRM, PAC	CDN	Automatic	yes	
				Fukuoka ATMC /Japan	Intraregional	AMHS	7	Main	64,000	4	Oct 2005	Operational	ICD V.2.0	ABI, ACP, CDN, CPL, LAM, LRM, MAC	CDN	Automatic	yes	
				Nadi ATMC /Fiji	Intraregional	AMHS	7	Main	64,000	5	Oct 2005	Operational	ICD V.2.0	ABI, CPL, CDN, PAC, ACP, MAC, REJ, LAM, LRM	CDN	Automatic	yes	
				Brisbane ACC /Australia	Intraregional	AMHS	7	Main	64,000	1	Oct 2005	Operational	ICD V.2.0	ABI, EST, ACP, MAC, CDN, LAM, LRM	CDN	Automatic	yes	Full CDN functionality proposed 1-30-2023 via LOA.
				Tahiti ACC /French Polynesia	Intraregional	AMHS	7	Main	64,000	10	Dec 2014	Operational	ICD V 2.0	ABI, CPL, CDN, PAC, ACP, MAC, LAM, LRM	CDN	Automatic	yes	

Table of AIDC Implementation Status in APAC

State/Administration	AIDC Implementation Status(Implemented or not)	Location of AIDC System ATSU1	ATM Automation System (Make/Model)	ATSU2 /Correspondent State – Administration	Intraregional/Interregional	Transmission Means	Frequency of Use(days in a week)	Main/Back up Circuit	Communication Signal Speed (bps)	Average Transimission Delay (One Trip Time in Seconds)	Implementation Date or Target Date as MON yyyy or xQyyyy	Interface Status (Operational, Testing, Planned, No plan)	Interface Protocol / Version (OLDI or AIDC Version)	List of AIDC Messages Applicable between the Two ATSUs (ABI, EST, ACP, TOC, AOC, LAM, LRM, PAC, CDN, CPL, REJ, MAC; TRU, EMG, MIS, TDM, ASM, FAN, FCN; ADS)	Coordination by CDN or Voice	Automatic or Manual EST	A Warning Message to Controller in Case of AIDC Failure	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
UNITED STATES	Implemented	Oakland ARTCC	Liedos, ATOP System	Port Moresby/PNG	Intraregional	AMHS	7	Main	64,000	6	Dec 2021	Operational	ICD V 2.0	ABI, EST, ACP, LAM, LRM	Voice	Automatic	yes	
				Manila /Philippines	Intraregional	AMHS	7	Main	64,000	5	Dec 2022	Planned	ICD V.2.0	ABI, EST, ACP, LAM, LRM	Voice	Automatic	yes	AIDC testing implemented via MOU with verbal verification for 30 days. Pending test results AIDC incorporation permanently via LOA.
				Mazatlan ACC	Interregional	AMHS	7	Main	64,000	4	Mar 2015	Operational	ICD V.2.0	ABI, ACP, EST, LAM, LRM	Voice	Automatic	yes	
				Ujung Padang/Indonesia	Intraregional	AMHS		Main	64,000		Mar 2023	Planned	ICD V 2.0	TBD-ABI, EST, ACP, LAM, LRM	Voice	Automatic	yes	Pending meeting to determine implementation dates in Jan 2023. Initial testing completed, propose additional live testing phase followed by revised LOA.
		Anchorage ARTCC	Liedos, ATOP System	Magadan ACC	Interregional	AMHS	7	Main	64,000	7	Jun 2018	Operational	ICD V.2.0	ABI, CPL, ACP, LAM, LRM	Voice	Automatic	yes	
				Fukuoka ATMC /Japan	Intraregional	AMHS	7	Main	64,000	4	Mar 2007	Operational	ICD V.2.0	ABI, ACP, CDN, CPL, LAM, LRM, MAC	CDN	Automatic	yes	
				Oakland ARTCC /United States	Intraregional	AMHS	7	Main	64,000	1	Mar 2007	Operational	ICD V.2.0	ABI, CPL, EST, MAC, CDN, ACP, REJ, EMG, MIS, LAM, LRM, PAC	CDN	Automatic	yes	
VIET NAM	Implemented	Ho Chi Minh ACC	THALES	Sanya ACC /China	Intraregional	AFTN						Testing	ICD V.1.0	EST, ACP, TOC, AOC, LAM, LRM	Voice	Automatic	yes	
				Phnom Penh ACC /Cambodia	Intraregional	AFTN						Testing	ICD V.1.0	EST, ACP, TOC, AOC, LAM, LRM	Voice	Automatic	yes	
				Vientiane ACC /Lao PDR	Intraregional	AFTN					3Q2025	Planned						
				Singapore ACC /Singapore	Intraregional	AFTN	7	Main	9600		Jul 2014	Operational	ICD V.1.0	EST, ACP, TOC, AOC, LAM, LRM	Voice	Automatic	yes	
				Manila /Philippines	Intraregional	AFTN						Testing	ICD V.1.0	EST, ACP, TOC, AOC, LAM, LRM	Voice	Automatic	yes	
				Kuala Lumpur /Malaysia	Intraregional	AFTN					3Q2025	Planned						
		Ha Noi ACC	Selex	Vientiane ACC/Lao PDR	Intraregional	AFTN						Testing	ICD V3.0	ABI, EST, ACP, TOC, AOC, LAM, LRM	Voice	Automatic	yes	
				Sanya ACC /China	Intraregional	AFTN	7	Main	9600		Dec 2023	Operational	ICD V3.0	EST, ACP, LAM, LRM, TOC, AOC	Voice	Automatic	yes	
				Naning ACC	Intraregional	AFTN	7	Main	9600		Dec 2023	Operational	ICD V.3.0	EST, ACP, LAM, LRM, TOC, AOC	Voice	Automatic	yes	

State/Administration	Last updated	Meeting	History
Afghanistan			
Australia	1/30/2023	AP135/22(CNS)	
Bangladesh			
Brunei Darussalam			
Bhutan			
Cambodia	6/29/2023	ATMAS TF/4	
China	3/21/2024	ACSICG/11	12/6/2022
Hong Kong, China	6/18/2024	ATMAS TF/5	1/30/2023
Macau China			
Cook Islands			
Democratic People's Republic of Korea			
France (New Caledonia, French Polynesia, and Wallis & Futuna)			
Fiji			
India			
Indonesia	3/21/2024	ACSICG/11	
Lao PDR	6/6/2024	ATMAS TF/5	1/24/2023
Japan	3/29/2024	ACSICG/11	1/16/2023 8/25/2023
Kiribati			
Malaysia	6/29/2023	ATMAS TF/4	1/9/2023 4/3/2023 4/13/2023
Maldives	5/24/2023	AP135/22(CNS)	
Marshall Islands			
Micronesia (Federated States of)			
Mongolia	8/31/2023	CNS SG/27	
Myanmar			
Nauru			
Nepal			
New Zealand	8/25/2023	CNS SG/27	12/21/2022
Pakistan	11/29/2022	AP135/22(CNS)	
Papua New Guinea			
Palau			
Philippines			
Republic of Korea	1/31/2023	AP135/22(CNS)	
Samoa			
Solomon Islands			
Singapore	6/6/2024	ATMAS TF/5	1/6/2023
Sri Lanka	2/14/2023	AP135/22(CNS)	
Tonga			
Thailand	1/16/2023	AP135/22(CNS)	
Tuvalu			
Timor LESTE			
United States	12/21/2022	AP135/22(CNS)	
Vanuatu			
Viet Nam	3/21/2024	ACSICG/11	

LIST OF FOCAL POINT FOR AIDC IMPLEMENTATION

No.	States	Name/Title/Address	Tel/Fax/E-mail
1.	**Afghanistan**		
2.	**Australia**	Mr. Adam Watkin	Tel: Fax: E-mail: Adam.Watkin@AirservicesAustralia.com
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5.	**Brunei Darussalam**		
6.	**Cambodia**	Ms. Heng Sovannrath Dy. Chief Bureau (CNS) Air Navigation Standard and Safety Department 44, Phnom Penh International Airport, Russian Federation Blvd., Phum Ta Ngoun, Sangkat Kakab, Khan Porsenchey, Phnom Penh	Tel: +855 (78) 961616 Mobile: +855 (23) 890102; 890108 E-mail: sovannrathheng@gmail.com
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		Mr.GuoWei Senior Electronics Engineer, Technical Center of Air Traffic Management Bureau of CAAC . No.12 East Sanhuan Road Chaoyang District Beijing	Tel: +(86) 10842 47263 Email: guowei7826@126.com
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9.	**Macau China**		

No.	States	Name/Title/Address	Tel/Fax/E-mail
10	**Cook Islands**		
11	**Democratic People's Republic of Korea**		
12	**Fiji**		
13	**France:** **-New Caledonia** **-French Polynesia**		
14	**India**	Mr. Ritesh Kumar Gupta, Joint General Manager (CNS) Airports Authority of India CHQ Rajiv Gandhi Bhawan, New Delhi	Tel: Fax: E-mail: g.ritesh@aai.aero
		Mr. Indu Shekhar Joint General Manager (ATM) Airports Authority of India CHQ Rajiv Gandhi Bhawan, New Delhi	Tel: Fax: E-mail: indushekhar@aai.aero
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17	**Kiribati**		
18	**Lao PDR**	Mr. Maity Sylithammavoing Dy. Director of ATS Division Lao Air Navigation Services P.O. Box 2985 Wattay International Airport Vientiane	Tel: +856 (21) 512006 Mobile: +8562055414040 Fax: +856(21) 512216 E-mail: maitymt1975@gmail.com
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No.	States	Name/Title/Address	Tel/Fax/E-mail
19	**Malaysia**	Mior Adli Bin Mior Sallehhuddin Acting Deputy Director CNS Civil Aviation Authority of Malaysia Air Navigation Services Technical Division Address: Kuala Lumpur Air Traffic Control Centre Complex Aras 1 West Wing Terminal North Jalan CTA3 (KLIA) Kuala Lumpur International Airport 64000 KLIA, Sepang Selangor, Malaysia	Tel : +603 8529 1213 Fax : +603 8529 1210 E-mail: mior.adli@caam.gov.my
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20	**Maldives**	Mr. Ishag Abdulla Associate General Manager Maldives Airports Co., Ltd Velana International Airport Hulhule 22000	Tel: +960 795 7235 Fax: E-mail: ishag@macl.aero
21	**Marshall Islands**		
22	**Micronesia (Federated States of)**		
23	**Mongolia**	Mr. Khatanbold Jargalsaikhan CNS Officer of ATM Civil Aviation Authority of Mongolia	Tel: +976 (11) 283 069 Mobile: +976 8802 4499 Fax: +976 (11) 285 021 E-mail: khatanbold.j@mcaa.gov.mn
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		Mr. Aung Zaw Thein Assistant General Manager (ATM)	Tel: +95 (1) 533 268 Fax: +95 (1) 533 016 E-mail: azawthein@gmail.com

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		Department of Civil Aviation, Myanmar	
25	**Nauru**		
26	**Nepal**	Mr. Hansha Raj Pandey Director, CNS Planning & Development Department Head Office, Babarmahal Kathmandu	Tel: +977 (1) 424 9379 Fax: +977 (1) 426 2516 E-mail: hrp@caanepal.org.np cnsatm@mos.com.np
27	**New Zealand**	Mr. Paul Radford Oceanic Systems Manager Airways New Zealand P.O. Box 53093 Auckland Airport, Auckland 2150	Tel: +64 (9) 257 7508 Mobile: +64 21 334 2150 E-mail: Paul.Radford@airways.co.nz
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29	**Palau**		
30	**Papua New Guinea**		
31	**Philippines**	Ms. Anna Joy C. Papag Facility-In-Charge, Manila Area Control Center Civil Aviation Authority of the Philippines Old Mia Road, Ninoy Aquino Avenue Pasay City, Metro Manila 1300	Tel: +63 (2) 944 2222 E-mail: ae_jae0627@yahoo.com
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No.	States	Name/Title/Address	Tel/Fax/E-mail
32	**Republic of Korea**		
33	**Samoa**		
34	**Singapore**	Mr. Joe Chua Wee Jui Senior Chief (Ops Tech Planning) Air Traffic Services Division Civil Aviation Authority of Singapore P.O. Box 1	Tel: +65 8518 6300 Fax: E-mail: joe_chua@caas.gov.sg
35	**Solomon Islands**		
36	**Sri Lanka**		
37	**Thailand**	Mr. Chavalit Ithiapa Air Navigation Services Standards Senior Officer The Civil Aviation Authority of Thailand	Tel: +66 (2) 568 8800 Ext. 0831 Fax: Email: chavalit.i@caat.or.th
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38	**Timor Leste**		
39	**Tonga**		
40	**Tuvalu**		
41	**USA**	Mr. Braks Etta Senior FAA/ATO Representative Asia Pacific 27 Napier Road Singapore 258508	Tel: +65 6476 9170 Fax: E-mail: braks.etta@faa.gov
42	**Vanuatu**		
43	**Viet Nam**	Mr. Nguyen Hong Hiep, IT team leader, CNS dept/VATM 119, Nguyen Son street Long Bien District, Ha Noi City	Tel: +84 (24) 38 723 600 Fax: +84 (24) 38 274 194 Email: guyenhonghiepbk@vatm.vn
		Mr. Vu Ngoc Tuan CNS Officer, Air Navigation Dept. Civil Aviation Authority of Viet Nam No. 199 Nguyen Son Street Long Bien District, Hanoi City	Tel: +84 (24) 3872 0199 Email: vungoctuan@caa.gov.vn

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LIST OF ACTION ITEMS FOR ATMAS TF

Action Item	Subject	Forum Raised	Status / Target Date	Action Party	Status	Remarks / follow-up
2-3	Further progress the development of ATMAS PRD and consider to include AIDC as well.	ATMAS TF/2	ATMAS TF/3	Ad-hoc group Members: China, Hong Kong China, Indonesia, ICAO Secretariat	**Closed**	ATMAS TF/3: Updated by Hong Kong China through WP/10, the meeting agreed to further discuss.
3-3	For each group of common issues, identify in an ACTION PLAN which small working groups to be established when necessary and possible with invitation to aviation industry for input. Develop an action plan for the identified ATSUs with priorities for implementation; Go-teams to assist when required (subject to funding available and requirement in place);	APA TF/1	~~January to June 2016~~	by the Task Force	**Closed**	APA TF/2: few small working group already in place to address some of the issues and established the target date of implementation. (in most case two parties). APA TF/4: Small working group (based on TOR) is considered not practical. Bilateral parties to address some of the issues and established the target date of implementation. (in most case two parties). ATMAS TF/3: From Action Item 1-2 of APA TF/1
3-4	Development of AIDC IGD Edition 1.0 in accordance with item C of TOR. Also need to maintain the AIDC IGD to current and update the consolidated list of issues.	APA TF/4		by the Task Force	On-going	APA TF4: This task link with item c) of ToR, work has been done by the ad hoc WG and endorsed by the Task Force adopted by CNS SG/21 in July 2017 on behalf of APANAPIRG. It may require maintaining the document by the Task Force as necessary. The updated list of consolidated issues is indicators for implementation progress and the list should be updated with items closed or open. APA TF/5: **The development of AIDC IGD completed and maintenance of the IGD -** On-going APA TF/6: States/Administrations may wish to provide recommendation for updates if necessary. ATMAS TF/3: From Action Item 4-1 of APA TF/4
4-1	Member States/Administrations are requested to bring their latest data to future task force meetings in order to keep the AIDC and ATMAS Repositories up-to-date.	ATMAS TF/4		Member States, ICAO Secretariat		
4-2	The meeting invited Member States/Administrations to review provisional agenda for next ATMAS TF meeting and provide comments or suggestions to the ICAO Secretariat within 2 months.	ATMAS TF/4	Aug-23	Member States, ICAO Secretariat		
5-1	Nominate/recommend experts, engage industry for required expertise, and share experiences with ATMAS TF.	ATMAS TF/5		Member States, ICAO Secretariat		
5-2	Consider incorporating the relevant design considerations of an Integrated Arrival and Departure Manager into the ATMAS IGD after implementation and verification.	ATMAS TF/5		Concerned States, ICAO Secretariat		
5-3	review and update the information contained in the ATMAS Repository	ATMAS TF/5		Member States, ICAO Secretariat		
5-4	Form an expert group within ATMAS TF to review the core AIDC messages in the IGD (Members: China, Hong Kong China, Malaysia, Pakistan, Philippines and Singapore(led)), which will work in offline mode and conduct online meeting when necessary.	ATMAS TF/5		Concerned States		