REPORT OF

THE SIXTH MEETING OF THE ASIA/PACIFIC AIR TRAFFIC MANAGEMENT AUTOMATION SYSTEM TASK FORCE (ATMAS TF/6)

Bangkok, Thailand
2-4 June 2025

The views expressed in this Report should be taken as those of ATMAS TF/6 Meeting and not of the Organization.

Approved by the Meeting
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HISTORY OF THE MEETING

REPORT ON AGENDA ITEMS

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1. Introduction

1.1 The Sixth Meeting of the Asia/Pacific Air Traffic Management Automation System Task Force (APAC ATMAS TF/6) was held from **2 – 4 June 2025** in the ICAO APAC Regional Office, Bangkok, Thailand.

2. Attendance

2.1 The Meeting was attended by **65** participants from **16** Member States/Administrations, namely Bangladesh, China, Hong Kong China, Fiji, India, Indonesia, Lao PDR, New Zealand, Pakistan, Philippines, Republic of Korea, Singapore, Sri Lanka, Thailand, USA, and Viet Nam, 2 International Organizations, namely ICCAIA and ICAO, and 1 Industry, AIR Lab Thales. The List of participants is provided in **Attachment 1**.

3. Opening of the Meeting

3.1 Ms. Xie Yulan, Deputy Director General of the North China Regional Air Traffic Management Bureau of CAAC, Co-Chair of the ATM Automation System (ATMAS) Task Force (ATMAS TF), opened the Meeting. Ms. Xie Yulan welcomed all participants and shared the importance of the Meeting to promote and progress ATMAS implementation in the APAC region.

3.2 Mr. Kwek Chin Lin, ATC Specialist (Ops-Tech Development), Civil Aviation Authority of Singapore, welcomed all participants and highlighted the key agenda items and expectations from the Meeting. He shared the significance of new agenda items added to this Meeting to initiate deliberation on key topics related to the enhancement of the ATMAS system to meet future aviation requirements.

4. Officers and Secretariat

4.1 Ms. Xie Yulan, Deputy Director General of the North China Regional Air Traffic Management Bureau of CAAC, and Mr. Kwek Chin Lin, ATC Specialist (Ops-Tech Development), Civil Aviation Authority of Singapore, Co-Chaired the Meeting.

4.2 Dr. Soniya Nibhani, Regional Officer ANS (CNS) Implementation, acted as the Secretary of the Meeting with the support of Mr. Zhang De, Regional Officer CNS, Ms. Xu Jian, Associate Programme Officer (CNS) Implementation and Ms. Varapan Meefuengsart, the Programme Assistant from ICAO Asia and Pacific Regional Office.

5. Organization, working arrangement, language and documentation

5.1 The Meeting met as a single body. The working language for the Meeting was English, inclusive of all documentation and this Report. The Meeting considered **Thirteen** (13) Working Papers, **Thirteen** (13) Information Papers, and **Three** (3) Presentations under its **Ten** (10) Agenda Items. A List of Working Papers and Information Papers is provided in **Attachment 2**.

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

6.1 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's 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 the ATMAS TF that relate solely to matters dealing with the internal working arrangements of the ATMAS TF.

7. List of Conclusions/Decisions from ATMAS TF/6

	Reference Number		Title of (Draft) Conclusions/Decisions
1.	Draft Conclusion ATMAS TF/6/01	-	Adoption of the Air Traffic Management Automation System Implementation and Operations Guidance Document Edition 1.5
2.	Draft Conclusion ATMAS TF/6/02	-	Adoption of the AIDC Implementation and Operations Guidance Document (IGD) Edition 2.0

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Agenda Item 1: Adoption of the Agenda

Adoption of Agenda - Sec (WP/01)

1.1 Singapore proposed moving agenda item 2 to agenda item 10 as the current Co-Chairs wish to chair ATMAS TF/6, and the election can be made for the new Co-Chairs for the new term starting from the next Meeting. The revised agenda items adopted by the Meeting are as follows:

Agenda Item 1: Adoption of Agenda

Agenda Item 2: Review of Outcomes of Relevant Meetings

Agenda Item 3: Global and Regional ATM Automation System (ATMAS) Updates

Agenda Item 4: ATM Automation System Implementation Experience by States

4.1 Review ATMAS Implementation Status in APAC
4.2 ATM Automation System Implementation Issues Sharing
4.3 Resilience consideration and contingency planning
4.4 Life cycle management
4.5 Integration with External Systems
4.6 Development of New Technology

Agenda Item 5: ATMAS integration to SWIM

Agenda Item 6: Review of Guidance Material of Implementation of ATMAS in the Asia-Pacific Region (APAC ATMAS IGD)

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

7.1. Review AIDC Implementation Status in APAC
7.2. AIDC Implementation Experience Sharing by States
7.3. Issues Reported and Recommended Solutions

Agenda Item 8: Review of the Terms of Reference (ToR) and Task List

Agenda Item 9: Next Meetings and Any Other Business

Agenda Item 10: Election of Co-Chairs

Agenda Item 2: Review of Outcomes of Relevant Meetings

Review of Relevant ICAO Meetings – Sec (WP/02)

2.1. This paper summarized key outcomes from relevant ICAO Asia/Pacific meetings held in 2024, particularly APANPIRG/35 and CNS SG/28. It highlighted conclusions and decisions that were related to this Meeting.

2.2. The CNS SG/28 meeting adopted 4 Conclusions and 2 Decisions. In addition, based on the outcome of discussions on various agenda items, the CNS SG/28 meeting developed 4 Draft Conclusions and 1 draft Decision for consideration by APANPIRG/35 Meeting, which were further adopted by APANPIRG/35. The Meeting noted the Conclusions/Decisions adopted by the CNS SG/28 and the APANPIRG/35 and discussed the follow-up.

2.3. The Meeting recalled that in the CNS SG/28 Meeting, ATMAS TF was invited to produce a pictorial map to show the latest update for the AIDC implementation against Hotspots in the Region in the next CNS SG/29 Meeting, referred to as ACTION ITEM 28-1**.** ICAO Secretariat coordinated with ATMAS TF Co-Chairs, requesting a way forward for this action item. Singapore informed that it would update the chart and that the original chart was provided in the AIDC Task Force reports, which are now incorporated into ATMAS. Singapore requested the list of LHA updates. It is to be noted that RASMAG produces the consolidated Report every year, which is provided in Appendix G of the RASMAG/29 report. The LHD plots for the Asia region in terms of the various LHD category groupings and the hot spots description were shared with Singapore. Singapore updated the AIDC Implementation chart as requested by CNS SG/28.

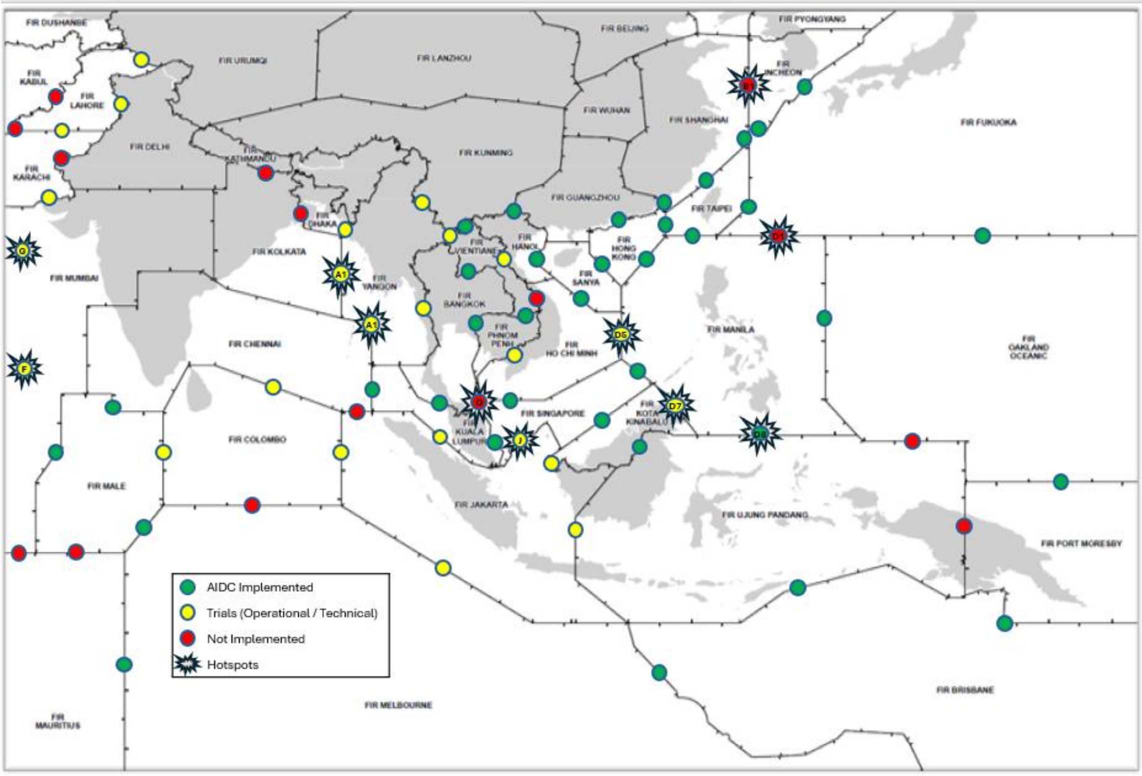

Figure 1- AIDC Implementation and RASMAG Hotspot Chart

2.4. The following caveats are applicable to users of this chart:

1) The FIR boundary representation may not be entirely accurate.
2) The AIDC implementation and hotspots are based on ACSICG/12 WP/08 [dated March 2025] and Appendix G to RASMAG/29 [dated Aug 2024]. The chart is a visual representation of the information contained in the two papers. The papers should be taken as the correct reference in the event of any discrepancy

Note: It was noted that discrepancies in the reported AIDC implementation exist in some shared boundaries between the two States in the ACSICG/10 Meeting. In such situations, the more advanced status is reflected.

2.5. The Meeting recalled that the chart was first developed by the ATS Inter-facility Data-link Communication Implementation Task Force (APA TF) in 2020. The Meeting agreed that the chart is useful for a quick overview of AIDC implementation and hotspots. New Zealand suggested adding the South Pacific States to the charts and updating the status related to them. New Zealand offered to do internal coordination and collate the required information for the future to include the South Pacific States. **ACTION ITEM 6-1**

2.6. The Meeting deliberated on future updates to the *AIDC implementation and RASMAG hotspot chart*. It was agreed that the proposed hotspots recorded in the figure may not be solely due to AIDC issues. Several other factors and their combinations may also trigger the identification of hotspots. One suggestion was to update the chart at regular period intervals; New Zealand commented that the effort required is not insignificant, as accuracy is important in charts of this nature. Another suggestion was to update it after RASMAG flags a sudden surge in hotspots or if there are any significant updates noted at the ATMAS TF meetings. ICAO Secretariat will coordinate internally and check if the RASMAG Meeting updates the list of hotspots, if there are critical changes required to be reflected in the chart, and inform ATMAS TF. **ACTION ITEM 6-2**

Outcomes of ACSICG/12 Meeting – Sec (WP/03)

2.7. The paper summarized relevant information and updates on the outcomes of AMC Workshop and the Twelfth Meeting of the Aeronautical Communication Services Implementation Coordination Group (ACSICG/12) were held at the ICAO APAC Regional Office, Bangkok, Thailand, from 25 to 28 March 2025, including outcomes of CRV Workshop for PSIDS was held from 3-4 March 2025 and the Thirteenth Meeting of the Common aeRonautical Virtual Private Network Operations Group of APANPIRG (CRV OG/13) was held from 5 to 8 March 2025.

Outcomes of SURICG/10 Meeting – Sec (WP/04)

2.8. The Tenth Meeting of the Surveillance Implementation Coordination Group (SURICG/10) was held at the ICAO APAC Regional Office, Bangkok, Thailand, from 21 – 23 April 2025. The Meeting was attended by 53 participants from 18 Member States/Administrations and 1 International Organization. The Meeting report, working papers, information papers, and other resources can be accessed by the following link:
https://www.icao.int/APAC/Meetings/Pages/2025-SURICG10.aspx

Agenda Item 3: Global and Regional ATM Automation System (ATMAS) Updates

3.1. No papers were submitted for this agenda item.

Agenda Item 4: ATM Automation System Implementation Experience by States

4.1. Review ATMAS Implementation Status in APAC

Repository of the ATMAS in APAC – Sec (WP/05)

4.1. The paper presented the updated table of the ATMAS status in the APAC region, the preliminary analysis of the status, and invited States/Administrations to review and take necessary actions to create the regional repository. The Meeting updated the ATMAS repository, which is provided in **Appendix A**.

4.2. ATM Automation System Implementation Issues Sharing

Optimization of STCA in Complex Airspace Environment – China (IP/03)

4.2. China informed that the Short-Term Conflict Alert (STCA) is the most essential alert function of ATM-AS. Since the Reduced Vertical Separation Minimum (RVSM) was implemented in China in November 2007, STCA has adapted to the new technical environment and operational requirements to ensure its effectiveness and reliability in complex and high-density airspaces. Various optimization methods, including integrating vertical and heading intentions, enhancing forward conflict detection, and applying specific treatments for formation flights and Independent Parallel Approaches, were shared with the Meeting. It was informed that these improvements aimed to reduce false alerts and enhance operational safety by supporting real-time monitoring and conflict prediction. China concluded that continuous refinement of STCA architecture was essential to meet future air traffic management needs.

4.3. A query was raised on what data will be used by the STCA for processing if the CFL and SFL information is not equal. China updated that the STCA will continue to project the STCA computation based on the received altitude information. When SFL is not equal to CFL and the vertical separation between the SFL and the flight level of another aircraft is less than the alert parameter, STCA shall lift the predicted conflict exemption granted due to CFL settings.

4.4. Another query was raised about the DAPS data field identification for information on selected heading information. China informed that the selected heading information is from BDS6,2 in ADS-B DAPs, specified in Mode S Downlink Aircraft Parameters IGD.

4.3. Resilience consideration and contingency planning

New Zealand Approach to ATMAS Development Resilience (WP/06)

4.5. New Zealand presented its approach to developing a resilient Air Traffic Management Automation System (ATMAS) through its ANSP, Airways New Zealand. At the Meeting, it was shared that, faced with unique geographic and operational challenges, Airways adopted a long-term, in-house development strategy emphasizing flexibility, responsiveness, and cost-effectiveness. Over the decades, internal teams have evolved for requirements, software, systems engineering, and network management, enabling continuous development and high system availability.

4.6. Key achievements included custom-built domestic and oceanic ATMAS solutions, iterative development cycles, and robust contingency planning. Evolved Approach to ATMAS Management including Airways Modernization Program, replacement of procedural oceanic control with the Oceanic Control System (OCS) in the 1990s, creation of the distinct OCS Requirements and Software teams, implementation of SkyLine, a new Domestic ATMAS in the early 2000s, and Leidos's SkyLine-X, with enhanced capabilities were shared with the Meeting. It was added that the proposed approach had minimized service disruptions, supported tailored innovation, and proved effective in enhancing operational safety and efficiency while maintaining independence and regulatory compliance.

4.7. The Meeting noted New Zealand's approach to building resilient ATMAS and encouraged States/administrations to share such experiences with the Meeting.

4.8. In response to a question, New Zealand informed that New Zealand did not develop its own software, but it had purchased a license to use it, including authorization to update the software as required for use locally.

4.4. Life cycle management

Life Cycle Management of ATM Automation System – China (IP/04)

4.9. China introduced the lifecycle management of ATM Automation Systems, emphasizing the use of Reliability-Centered Maintenance (RCM) during the service phase. It was informed that RCM employs a logical decision-making methodology to determine the required maintenance tasks, types, intervals, and levels for equipment, thereby achieving maintenance optimization. The full Life Cycle of ATM Automation Systems, including initial, service, and final phases, with detailed methods for assessing and maintaining hardware and software reliability, was shared with the Meeting.

4.10. It was noted that by adopting the RCM methodology to guide operational maintenance during the service period in the lifecycle, quantitative analysis of system hardware and software reliability metrics was conducted to optimize maintenance strategies. This approach significantly enhanced system reliability, ensured efficient resource utilization, improved operational efficiency, and reduced costs, thereby providing practical references for lifecycle management. China added that further research on this management model will effectively elevate the operational maintenance capabilities of ATM automation systems across the Asia-Pacific region, offering scientific recommendations and guidance for the periodic inspection and preventive maintenance of ATM automation systems, as well as for the formulation of relevant standards and specifications.

4.11. In response to a question about required changes in software, while hardware upgrades were being made, China informed that the preferred way of upgrading ATMAS should be having independent hardware and software upgrades so that upgrades in one system do not impact another. However, this is not applicable in the real system due to the interdependencies of software and hardware. The Meeting agreed that upgrading ATMAS is critical, which requires systemic planning to avoid additional costs.

4.5. Integration with External Systems

ANS Architecture Design - Key to Flexibility and Interoperability – Singapore (IP/02)

4.12. Singapore highlighted the need to adopt modern architectural design principles in Air Navigation Services (ANS) systems to address increasing air traffic, evolving operations, and rapid technological change. It was informed that the aviation industry is experiencing rapid transformation, driven by increasing air traffic, technological advancements, and evolving operational requirements. However, ANS system architecture is traditionally based on closed system architecture, which constrains system upgrade options and adoption of new technologies to address new operational requirements, as well as interoperability with other systems.

4.13. Key challenges and lessons from Monolithic/Closed System Architecture were shared with the Meeting. Singapore recommended adopting four key architecture design principles for future ANS systems: modularity, open interfaces with common data standards, security-by-design, and continuous innovation. These principles enable flexible, resilient, and interoperable systems. The Meeting noted that Singapore's next-generation ANS system follows these principles to enhance adaptability, cybersecurity, and cost-efficiency. Singapore encouraged ANSPs in the APAC region to consider similar approaches for future-ready, integrated, and sustainable ANS infrastructure.

4.6. Development of New Technology

Enhancements to ATM Automation System for Supporting IPA – China (IP/05)

4.14. China introduced its enhancements to ATM automation systems to better support Independent Parallel Approaches (IPA). China informed that independent parallel approaches were introduced as an efficient operational mode to enhance airport capacity and overcome airspace bottlenecks. This approach effectively improves operational efficiency, optimizes airspace resources, and increases economic benefits. However, independent parallel approaches impose higher demands on ATM automation systems in terms of high-precision surveillance, interval management, and operational coordination. Functional improvements to ATM automation systems to address these requirements for surveillance accuracy, separation management, and operational aspects were shared with the Meeting.

4.15. It was suggested that to better support an independent parallel approach operation, the air traffic control automation system can be optimized and improved in three aspects, including High-precision surveillance and display, refined STCA alerts in the Terminal Area and landing aircraft spacing advisory function. It was added that the improvements in the ATM automation system functionality during the final approach phase have achieved an increase in situational awareness accuracy, enhanced monitoring capability, and optimized separation management, providing more reliable support for IPA operations. However, these enhancements are currently being tested for verification in Chengdu and Chongqing. China added that due to varying runway configurations and individualized operational requirements, the optimization solutions may not always be universally applicable. To support IPA operations better, further exploration is needed.

Application of AMDB in Tower ATM Automation System – China (IP/06)

4.16. This paper outlined the application of the Aerodrome Mapping Database (AMDB) in Tower ATM automation systems. China informed that before Tower ATM Automation System started using the AMDB, the airport pavement maintenance department provided information on air service non-suspend construction by fax. When receiving the air service non-suspend construction information from the airport pavement maintenance department, the tower controller was required to do extensive data entry and verification. AMDB provides digital storage of high-precision geographic information and business data for airport elements, such as runways, taxiways, parking stands, lights, obstacles, and taxiing routes.

4.17. Compared with previously relying on manual data input from faxes and CAD drawings, the system integrates with AMDB to share high-precision airport surface data. China informed that the Tower ATM automation system has been upgraded to support AMDB as the system map and is incorporating it into internal system calculations. The information about air service non-suspend construction pushed through the data interface was not only displayed on the human-machine interface of the Tower ATM automation system but also involved in the functions of the system, such as conflict alert calculation and route planning calculation. China added that compared with CAD drawings, AMDB is more refined and comprehensive, achieving the transformation from the traditional airport intelligence materials being "seen" by people to being "seen" by the system. It provided powerful data support capabilities for the business systems of relevant airport parties, such as air traffic control and the apron. It was added that AMDB also laid a solid foundation for the common situational awareness of all parties involved in aerodrome operations based on "a unified operation map", which is conducive to promoting the digital development of aerodrome stakeholders.

4.18. In response to a question about the in-house development of AMDB or supplied by external parties, China informed that AMDB is designed by a vendor.

4.19. A query was raised on getting a digitalized version of the airport database, which is a critical input for the AMDB system. China informed that Apron Management Software provides digitalized data of the airport.

Research on AMAN Interconnection in ATM Automation System – China (IP/07)

4.20. China informed that AMAN is a decision-making tool that assists air traffic controllers in arrival sequencing. Terminal air traffic controllers use AMAN to negotiate the delay time of each flight phase with ACC (Area Control Center) air traffic controllers within the system. However, when the terminal areas operate as independent ATMAS, there is no solution available for collaboratively managing the arriving flights with adjacent control units to absorb the flight delay time before the flights enter the terminal area. China informed that it has advanced research on the collaborative management of arriving flights among different ATMASs of multiple control units.

4.21. The paper shared the interconnection technology of AMAN between ATM Automation Systems in China to address limited terminal airspace and reduce flight holding times. It introduced a system enabling upstream and downstream ATMAS to collaboratively manage arrival delays by exchanging 4D trajectories and target handover times. It was informed that testing and validation were conducted between Hangzhou, Nanchang, and Hefei from 2022 to 2024, demonstrating improved coordination and safety. The study proposed future integration with ATFM and global AMAN data sharing to enhance air traffic efficiency.

4.22. China concluded that the testing and validation of AMAN interconnection in China have achieved excellent results and have been highly recognized by air traffic controllers. In the future, China will continue to promote the information interaction between the AMAN and the Air Traffic Flow Management (ATFM) system. The time calculated by the AMAN will be sent to the ATFM system to improve the accuracy of flight prediction information, providing effective data support for the formulation of traffic management strategies and further enhancing the collaborative working ability of various air traffic control systems. It was added that global interconnection and sharing of AMAN information could be realized by expanding the FIXM format protocol. In this way, the collaborative operation capability of cross-border flights among countries can be enhanced, and further, the operational efficiency of air transportation in the Asia-Pacific region can be comprehensively improved.

4.23. The Meeting noted the significance of AMAN interconnection in the ATMAS for the electronic handover coordination between adjacent control units.

4.24. On the query about the usage of the FIXM data format for the interconnection of AMAN in the ATMAS, China informed that currently, the simplified flight plan format is used for testing. However, in the future, there is a plan to utilize the FIXM data format.

4.25. For another question, it was clarified that currently DMAN is not interconnected with ATMAS.

Research on Speech Recognition Technology in ATMAS – China (IP/08)

4.26. China shared with the Meeting about the introduction of speech recognition technology in ATM Automation Systems to reduce communication errors. It described technical architecture involving noise reduction, language, and intent models, as well as alert functions for command discrepancies and conflict warnings. The Meeting recalled that Procedures for Air Navigation Services (ICAO) and Annex 10 to the Convention on ICAO clearly defined the communication rules for air-to-ground calls, providing a standardized framework for speech recognition technology. In addition, ICAO Annex 11- Air Traffic Services required standardized expressions of control instructions, which served as an important basis for the design of speech recognition algorithms.

4.27. The Meeting was informed about speech recognition technology in ATMAS applications, primarily consisting of the pre-processing model, a language model, and an intent model. It was added that deploying an independent server in the ATMAS to achieve physical isolation between the speech recognition application functionality and other core ATMAS functions ensures the reliability of ATMAS core operations. Alerts, other functions, and HMI display details were shared with the Meeting. It was informed that in 2021, at Beijing Capital International Airport, speech and semantic recognition technologies were utilized to provide visual display boards, command repetition inconsistency alerts, and conflict warning assistance for apron control, preventing potential conflicts caused by verbal communication. The accuracy of speech-to-text recognition was enhanced through text annotation, achieving an overall character recognition rate exceeding 95%. In 2024, for the Xinjiang Big Data Project, speech recognition technology was utilized to provide management personnel with post-event recitation inconsistency checks, voice call quality analysis (speech rate), and speech saturation statistics, while in 2025, at the North China Air Traffic Management Bureau site, on-site voice and integrated flight track data were connected for installation, deployment, and debugging. Ongoing efforts included data augmentation and noise suppression to enhance model robustness and accuracy for future deployment. It was added that presently, noise reduction can be applied to voice data prior to recognition processing, resulting in a nearly 50% improvement in word error rate (WER) after denouncing.

4.28. In response to a question from a Co-Chair, China informed that code-switching between languages for voice recognition is done automatically. Also, the system is able to identify spoken language, recognizing the voice of the pilot or the controller. It was added that the different accents create issues that require more data in order to train the system.

Research on the Fusion of ADS-B and Approach Radar within Tower Range – China (IP/09)

4.29. China presented its research on fusing ADS-B and approach radar within Tianfu Airport's tower range. It demonstrated that fusion significantly improved tracking accuracy, stability, and update rates compared to using radar alone. ADS-B provided high-precision, real-time data, especially during takeoff and landing, compensating for radar limitations. However, the study also highlighted ADS-B's vulnerability to GNSS interference, suggesting the need for wide-area multilateration to enhance reliability and safety. The findings supported integrating ADS-B with radar to optimize tower surveillance and decision-making.

4.30. In response to the question about the relationship between NACp value and position accuracy, China clarified that the higher the NACp value, the higher the accuracy. Specific details can be found in the definition provided in DO-260B.

Experience Sharing on ATMAS Validation Platform in TBO Application – China (IP/10)

4.31. China shared its experience with a Trajectory-Based Operations (TBO) dual-aircraft trial between Urumqi and Daxing using the ATMAS validation platform. It was informed that TBO is a next-generation air traffic management operational model proposed by the ICAO. Its core concept involves dynamic sharing of aircraft high-precision four-dimensional trajectories (longitude, latitude, altitude, time) and collaborative decision-making to achieve comprehensive flight monitoring, prediction, and control throughout the entire flight process. This concept breaks down data barriers between air traffic controllers, pilots, and airports while significantly reducing fuel consumption and carbon emissions through precise trajectory calculations.

4.32. China informed that since 2018, the Civil Aviation Administration of China (CAAC) has incorporated TBO into its civil aviation construction outline, promoting the phased implementation of technological R&D and application. The Meeting was informed that in China, the TBO validation adopted a dual-aircraft real-flight testing approach, aiming to expand from single-aircraft ground-air traffic control scenarios to collaborative interaction scenarios between two aircraft. Specific Validation Components, Daxing Validation Implementation Plan, achievements and associated challenges were shared with the Meeting. The Meeting noted that validated uplinked ATC instructions and downlinked 4D flight profiles without disrupting operations were key achievements. The trial demonstrated digital ATC capabilities, such as EPP message handling and control command exchanges. It also revealed challenges like system upgrade costs, data link reliability, and procedural shifts.

Exploring AI Application in Intelligent O&M of ATMAS – China (IP/11)

4.33. This paper presented the exploration of AI applications in the intelligent operation and maintenance (O&M) of ATMAS. It introduced a framework combining large language models, a domain-specific knowledge base, and a toolchain to support automated workflows. China informed that AI agents were deployed to assist with tasks like server monitoring and database queries using natural language. The system improved efficiency and reduced reliance on manual operations. It was added that future work aimed to enhance architecture, enrich the knowledge base, and explore autonomous multi-agent collaboration for complex problem-solving.

4.34. Thailand appreciated the content of the paper and shared its significance. The Meeting encouraged Member States/Administrations to share this topic further in future meetings.

Incheon Airport A-CDM Related ARTS Development Status Update – Republic of Korea (IP/12)

4.35. ROK reported the development of Incheon Airport's ARTS, focusing on three key upgrades: the Departure Management System (DMAN), RECAT-based aircraft separation alerts, and a 3-stage AIDC system. The core functions of the Departure Management System, Display and Warning

Function for Separation Distance Between Aircraft, and Digitization of Control Transfer Through Stage 3 AIDC Operation were shared with the Meeting. The purpose of DMAN's automated pre-departure sequencing was to enhance efficiency and minimize slot wastage. A visual alert system was introduced to display and warn of insufficient separation on the final approach. The digitized 3-stage AIDC process streamlined inter-unit control transfers. These advancements, completed by September 2024, aimed to support A-CDM Phase 2 from July 2025 and prepare for Phase 3 expansion. It was added that Incheon ARTS completed its advancement project in September 2024, and A-CDM Phase 2 will be operated from July 2025 through DMAN automation. Following that, further expansion of automation elements in the system and extension of service areas to the landslide area will commence, starting the advancement operation stage of A-CDM Phase 3. Through this, Incheon will actively join the global ATMAS advancement trend and contribute to establishing a stable and efficient airport operation system.

Integration of a modern flight planning service into the ATMAS operation- New Zealand (IP/13)

4.36. New Zealand informed that in 2021Airways New Zealand initiated the replacement of its legacy flight planning system with a Flight Plan (FPL) Service Provider – Flightkeys. The airline worked with New Zealand's ANSP (Airways) to collaboratively integrate the new flight planning functionality. New Zealand summarized the ATMAS integration activity and the benefits and challenges encountered in the application. In addition, lessons learned from the New Zealand experience were also provided. New Zealand shared details about the Integration project overview and its timelines. New Zealand informed about the Domestic ATMAS enhancement for route filing without using SRC designators, which resulted in Route/Level filing flexibility.

4.37. The Meeting noted that a modern flight planning system can conduct a lot of recalculation. This reflects the orientation of such systems towards an optimized trajectory. With the new flight planning service calculating/re-calculating up to departure, the level of CHG/DLA and CNL/Re-file messaging received by Airway's ATMASs increased significantly. The increase had a primary operational impact after the point at which FPL distribution to ATS units occurred. It was reported that one occurrence of lost FPLs occurred. This manifested as the crew calling for clearance, but ATC did not find an FPL in the ATMAS. Though resolved on the day with re-filing, Air New Zealand subsequently contacted Airways, and staff began to look through the FPL messaging history. It was added that Airspace users would increasingly expect ATMAS to support modern flight planning functionality, given the benefits such functionality can enable in planning, trajectory optimization/achievement, and efficiency gain.

4.38. It was suggested that ANSPs, airspace users and FPL service/system providers need to carefully consider implementation, particularly operational FPL handling scenarios and message management, because of the dynamic nature of modern flight planning functionality. With the potential for remote FPL service provision and high levels of messaging, airspace users and ANSPs need to assess messaging networks, contingencies and delivery confirmation processes when introducing FPL handling functionality. In addition, it was shared that despite the issues highlighted, the introduction of modern FPL handling should not be delayed. It was suggested that there are immediate trajectory planning, flexibility, and predictability benefits to be gained that directly benefit the aircrew, ATS workload, and safety aspects. The introduction also prepares airspace users and ANSPs for the sunset of FPL 2012 and the coming of TBO.

Agenda Item 5: ATMAS integration to SWIM

SWIM Implementation and ATMAS Integration – SWIM TF Co-Chair (WP/07)

5.1. The paper outlined ongoing efforts by the SWIM Task Force (SWIM TF) and the SWIM Implementation Pioneer Ad-Hoc Group (SIPG) to implement SWIM in the Asia/Pacific region.

It highlighted key outcomes from the SIPG WS/1 and the SWIM TF/10 meetings, with a particular focus on recommendations emphasizing the need for close coordination with expert groups to support the transition to SWIM.

5.2. The Meeting was informed of Conclusion APANPIRG/33/09 which endorsed the Asia/Pacific SWIM implementation timeframe and inclusion of the Asia/Pacific SWIM implementation in the Asia/Pacific Seamless ANS Plan. It was recalled that, under this Conclusion, the implementation timeframe for SWIM in the Asia/Pacific region is set to be between 2024 and 2030, with 2030 being the target timeline for implementation completion. In addition, the SWIM ASBU elements are included in the Asia/Pacific Seamless ANS Plan, v4.0. It was noted that SWIM is not only expected to enhance current operations, such as ATFM, but also serves as a key enabler for future operational concepts, including FF-ICE and TBO. Therefore, its harmonized implementation across the region is essential to achieve the region-wide benefits. The Meeting was also informed that SWIM-driven advancements will impact ATMAS, and it was suggested that a discussion be initiated to address this, particularly in relation to the transition to FF-ICE. This is especially relevant given the recent update to ICAO Doc 4444 PANS-ATM, which introduces FF-ICE, and the AN-Conf/14 Recommendation on cessation of ICAO 2012 flight plan (FPL2012) by 2034.

5.3. The SWIM TF Co-Chair proposed several areas for discussion at the Meeting. Particularly, it was suggested that, in transition to FF-ICE operation where FF-ICE FPL (eFPL) will replace the current FPL2012 and be exchanged between airspace users and ATM service providers through SWIM, the ATMAS TF may wish to assess the ATMAS capabilities required to receive and process e-FPL. Moreover, the Meeting was invited to consider the integration of MET information in IWXXM and aeronautical information, such as NOTAM, in AIXM into ATMAS. It was noted that the group established under the ACSICG is currently focusing only on AMHS/SWIM protocol conversion. However, during the transition period, conversion from existing data formats, e.g., FPL2012, to other SWIM-standardized information exchange models, e.g., FIXM, may also be required in cases where ATMAS does not yet support these data formats. The ATMAS TF may wish to initiate a discussion on this matter as well. Lastly, as discussion on migration of other ATS messages, including AIDC, has only recently been initiated by the Air Traffic Management Requirements and Performance Panel (ATMRPP), the ATMAS TF may wish to closely monitor this development as it may have implications for ATMAS requirements.

5.4. In response to a query from the Co-Chair about the development of regional and global guidance to support States/Administrations in transitioning from FPL2012 to FF-ICE, the SWIM TF Co-Chair informed that related efforts are underway across various global and regional groups. It was added that, in relation to major information domains, Conclusion APANPIRG/35/4 agreed to the adoption of FIXM v4.3 as the standard format for cross-border ATFM information exchange in the SWIM environment from Q3/2026. The Meeting was also informed that, based on the survey conducted during the second FF-ICE Ad-hoc Group meeting and workshop, the regional sunset date for FPL2012 is considered to be 2032, leaving only 7 years left for APAC States/Administrations to implement FF-ICE/R1 services. Moreover, it was shared that the FF-ICE Ad-Hoc Group under the ATM SG is drafting the regional FF-ICE implementation framework to support harmonized implementation within the Asia/Pacific. In addition, the Meteorology Panel (METP) agreed to the proposed removal of the use of TAC and plain text language forms for the international exchange of aeronautical meteorological information, such as METAR, SPECI, TAF, trend forecasts, SIGMET and AIRMET information, volcanic ash advisory (VAA) information, tropical cyclone advisory (TCA) information, and space weather advisory (SWXA) information, with an applicability date of November 2030.

5.5. The Meeting was informed that, under Workstream 1 of the APAC ANSP Committee (AAC), China, Hong Kong China, Singapore, and Thailand successfully conducted ATFM information exchange using FIXM v4.1 over SWIM via CRV in March 2025. Close collaboration among these States is ongoing with a focus on conducting a technical trial of ATFM information exchange using FIXM v4.3. The Meeting was encouraged to participate in such a trial to enhance the understanding of the capabilities required for SWIM compatibility.

5.6. The Meeting was informed that States/Administrations should be prudent when procuring new ATMAS, ensuring that any new systems are compliant with the latest operational and technical requirements, including those related to SWIM and other future operational concepts. The Co-Chair encouraged States/Administrations to share their assessments of the required ATMAS capability enhancements to support future operations, particularly SWIM and FF-ICE, at a future meeting of the ATMAS TF. **ACTION ITEM 6-3**

Regional Collaboration Platform- Launch of Beta Version- AIR Lab (SP/01)

5.7. AIR Lab shared information about the Regional Collaboration Platform (RCP) Launch of the Beta Version. It was informed that the Regional Collaboration Platform is a cloud-based platform for collaborative ATM development (tools, process, technology). It was designed for ANSPs, Airlines, ATM experts, ATCOs, and more and offered visualization and look-ahead capabilities for OEM-agnostic development. It was added that currently, the integrated use cases include Situation Awareness and FF-ICE/R1 stacks that are used across the APAC region for prototyping, especially. FF-ICE concept. Key features of the RCP platform and its demonstration were shared with the Meeting. The Meeting was informed about the latest updates on RCP and how it can address key ATM challenges. Lastly, RCP Roadmap and Objectives for 2025-2026, including Contextualized FF-ICE/R1, City Pairs Network Optimization, and Convective Weather Avoidance, were noted by the Meeting. Lastly, the plan for onboarding to the Regional Collaboration Platform was shared with the Meeting.

Agenda Item 6: Review of Guidance Material of Implementation of ATMAS in the Asia-Pacific Region (APAC ATMAS IGD)

Updates to the Guidance Material of the Implementation of the ATM Automation System – China & Hong Kong China & New Zealand (WP/09)

6.1. The Meeting was informed that following the Conclusion of ATMAS TF/05/01, Edition 1.4 of the ATMAS Implementation and Operations Guidance Document (IGD) was adopted by ATMAS TF/5. China informed that regarding the enhanced function of ATMAS and implementation experience of the system, China cooperated with the Ad-hoc working group to develop the draft (Edition 1.5) of the ATMAS IGD. China circulated the revised draft (Edition 1.5) of the ATMAS IGD to Member States/Administrations for review and comments on 30 April 2025. Suggestions from Hong Kong, China, and New Zealand were received and adopted.

6.2. It was stated that key amendments included new sections on arrival and departure manager functions, cybersecurity level filing, personnel training, and safety assessment before operation. It was informed that the updated guidance document aimed to enhance operational readiness and system resilience. Each new section and its motivations were explained at the Meeting. The Meeting reviewed the document for improved support in the ATM automation system implementation. ATMAS Implementation and Operations Guidance Document (Edition 1.5) reviewed by the Meeting was endorsed by the following draft decision for CNS SG/29 adoption:

<table>
<tr><td colspan="2">Draft Decision ATMAS TF/06/01 – Adoption of the Air Traffic Management Automation System Implementation and Operations Guidance Document Edition 1.5</td></tr>
<tr><td>What: The Air Traffic Management Automation System Implementation and Operations Guidance Document Edition 1.5 provided in Appendix B 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>
</table>

When: 4-Jun-25	Status: Draft to be adopted by Subgroup
Who: ☒Sub groups ☐APAC States ☐ICAO APAC RO ☐ICAO HQ ☒Other: ATMAS TF	

6.3. Co-Chairs encourage Member States/Administrations to continue to review the guidance document and suggest areas of improvement to make it more helpful in enhancing the implementation of ATMAS in the APAC region.

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

7.1. Review AIDC Implementation Status in APAC

Outcomes from AIDC Implementation and Operations Guidance Document (IGD) Ad-Hoc Review Group – Singapore (WP/08)

7.1. Singapore presented the outcomes of the AIDC IGD Ad-Hoc Review Group on core AIDC messages. It was recalled that during ATMAS TF/5, Singapore presented a working paper, WP/08, that proposed a review of core AIDC messages in the IGD to address implementation challenges faced by APAC members while ensuring continued relevance. ATMAS TF/5 agreed to establish an ad-hoc review group with members from China, Hong Kong China, Malaysia, Pakistan, the Philippines and Singapore. The group conducted its review through correspondence and concluded with a virtual meeting on 17 April 2025, where Indonesia joined and contributed to the discussions and outcomes.

7.2. The Meeting was informed that the AIDC IGD (Chapter 4 Para 4.4.1) currently listed five core messages (ABI, EST, ACP, TOC and AOC) for initial implementation by States. These messages were identified as part of the ASBU B0 recommendations pertaining to AIDC implementation. The group assessed that EST-ACP and TOC-AOC message pairs should be retained as recommended core messages, given their significant operational benefits and relative ease of implementation. The high success rates of these message pairs demonstrate their effectiveness. The group recommends that for EST-ACP messages, further improvements should focus on emphasizing to aircraft operators the importance of maintaining up-to-date flight plans. It was added that for TOC-AOC messages, States need to consider the implications when ‘accepting’ (AOC) a flight in ATM automation systems prior to TOC receipt.

7.3. It was shared that the ABI message was used to synchronize flight plan information between ATS units. However, with the high success rates of EST-ACP exchanges, the group assessed that ABI messages provide minimal value added to synchronize flight plan information further. Furthermore, there were significant challenges to implementing ABI as it required the mandatory exchange of Field 15 (Route). As such, the group proposed the **removal of ABI from the recommended core messages**.

7.4. It was informed that the ad-hoc group identified **CDN and REJ messages as valuable additions** to the recommended set. CDN messages have demonstrated substantial operational benefits when implemented with a focused scope. The group noted that limiting CDN implementation to changes in the estimate data in Field 14 provides immediate operational value while avoiding the complexities associated with Field 15 processing that were observed with ABI messages. This targeted approach allowed States to implement useful coordination capabilities without encountering the challenges of route syntax validation and automatic processing of route changes. The inclusion of REJ messages was essential as they provided a clear mechanism to close CDN coordination dialogues. This prevents coordination ambiguity and reduces the need for voice coordination when proposed changes cannot be accepted. This is particularly important in cases where the CDN message contained multiple proposed changes, as REJ allowed for unambiguous rejection when partial acceptance is not possible or appropriate. The group noted that REJ message inclusion naturally complements CDN messages, like how EST-ACP works as a message pair. Adding REJ to the core messages alongside CDN would provide a complete package for coordination dialogue management.

7.5. The group proposed the following changes to the core AIDC messages recommended for initial implementation.

- ✓ Retain EST, ACP, TOC and AOC messages;
- ✓ Remove ABI message; and
- ✓ Add CDN and REJ messages.

7.6. The proposed amendments to Chapter 4.4 of the AIDC IGD were presented. It was informed that these amendments were intended to streamline recommendations towards low-effort, high-value AIDC implementations. It was informed that the proposed addition of new CDN and REJ messages were adopted from the Pan Regional Interface Control Document for ATS Interfacility Data Communications (PAN AIDC ICD). It was advised that States shall retain full discretion to implement and exchange AIDC messages beyond the recommended message set where operationally beneficial, provided such implementation adhered to the published Interface Control Document (ICD).

7.7. The Meeting reviewed and endorsed the proposed amendments to the AIDC IGD and endorsed the following draft decision for CNS SG/29 adoption:

<table>
<tr><td colspan="2">Draft Decision ATMAS TF/06/02 – Adoption of the AIDC Implementation and Operations Guidance Document (IGD) Edition 2.0</td></tr>
<tr><td>What: The AIDC Implementation and Operations Guidance Document (IGD) Edition 2.0 provided in Appendix C 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: 4-Jun-25</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>

7.2. AIDC Implementation Experience Sharing by States

Repository of AIDC Implementation Status in APAC – Sec (WP/10)

7.8. The paper presented the latest repository of AIDC Implementation Status in the APAC region and invited States/Administrations to review and continue to update the AIDC implementation status and Focal Point for AIDC Implementation if necessary. The Meeting updated the table of AIDC Implementation Status in the APAC region, which is provided in **Appendix D**, and the list of focal points for AIDC Implementation, which is provided in **Appendix E** of the Report.

7.9. During the Meeting, several States, including Bangladesh, Sri Lanka and India, shared verbal updates about various AIDC implementation statuses. The Meeting recommended sharing updates by updating AIDC repositories and sharing them with the ICAO APAC Office.

7.10. ICAO Secretariat recalled the pending hotspot issue between Muscat and Mumbai and requested India to share further updates. India informed that the new ATMAS is under installation and is likely to be commissioned by December 2025. It was added that AIDC Trials between Mumbai and Muscat can only be commenced after the commissioning of the new ATMAS. India will update the status and present a WP/IP regarding the same in the next TF Meeting. **ACTION ITEM 6-4**

7.11. Sri Lanka requested the Meeting to share experiences about AIDC's implementation at crossing airways at the FIR boundaries. New Zealand informed that it has some experience handling AIDC implementation issues at boundaries, and it will share a point of contact information with Sri Lanka to discuss the matter. **ACTION ITEM 6-5**

7.3. Issues Reported and Recommended Solutions

7.12. No paper under the agenda.

Agenda Item 8: Review of the Terms of Reference (ToR) and Task List

Review of ToR and Task List – Sec (WP/11)

8.1. The paper presented the current ToR and Action Items as of the ATMAS TF/5 Meeting. The Meeting reviewed the current ToR and agreed on the need to modify it further to accommodate the latest needs of ATMAS TF, such as accommodating FF-ICE and SWIM requirements. An ad-hoc group consisting of China, Hong Kong China, India, New Zealand, Singapore, Thailand, and the USA was formed to review the ToR. The revised draft ToR will be presented by the ad-hoc group in the ATMAS TF/7 Meeting. **ACTION ITEM 6-6** The current ToR of ATMAS TF is provided in **Appendix F**.

8.2. The Meeting updated the Action Item List, which is provided in **Appendix G** of this Report.

Agenda Item 9: Next Meetings and Any Other Business

Outcomes of the Second Asia Pacific Ministerial Conference on Civil Aviation – Sec (WP/12)

9.1. The Second Asia Pacific Ministerial Conference on Civil Aviation was held from 11 - 12 September 2024 in New Delhi, India. In the Conference, the APAC Ministers reviewed commitments made under the Beijing Declaration and agreed to another set of commitments to high-priority aviation strategic objectives in the form of the Asia Pacific Ministerial Declaration on Civil Aviation (Delhi). The Conference endorsed the Second Asia and Pacific Ministerial Declaration on Civil Aviation (Delhi), also known as the Delhi Declaration, which is provided in **Appendix H.**

9.2. The Meeting noted that the Delhi Declaration generates the political will needed to support the organization's various objectives for an effective and efficient aviation system. The Declaration incorporated various critical aspects that required immediate attention from the APAC States. It included substantial commitments needed from the APAC States for effective implementation of ICAO global plans, implementation of aviation safety and air navigation services priority elements, and addition of resilience to health-related disruptions. Furthermore, it has highlighted commitments required for gender equality, resourcing for civil aviation, aviation environment protection, and ratification of international air law treaties.

9.3. The Meeting was invited to collaborate towards achieving the targets of the Delhi Declaration and to share the latest implementation status of commitments with the ICAO APAC Office for accurate progress tracking.

CNS-related ASBU in Asia/Pacific Seamless ANS Plan – Sec (WP/13)

9.4. ICAO Secretariat recalled the steps taken in past CNS SG meetings to provide inputs for Seamless ANS Plan v4.0, which was adopted by the Thirty-Fifth Meeting of the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG/35) held at the ICAO Asia and Pacific Regional Office in Bangkok, Thailand, from 25 to 27 November 2024 by Conclusion 35/1.

9.5. The Meeting was informed that recently, it was observed that the priorities of some CNS ASBUs finalized by CNS-related ASBUs review Ad-hoc Group for the next edition of the Seamless ANS Plan were not correctly reflected in the published Asia/Pacific Seamless ANS Plan Version 4.0. This discrepancy could be due to an inadvertent mistake when compiling feedback from all sources. It was also added that if a Priority 1 were assigned to the NAVS ASBU elements, it would require a consequential review and amendment to the following paragraphs in the Asia/Pacific Seamless ANS Plan Version 4.0.

9.6. To resolve this issue, after internal coordination within the ICAO Secretariat, it was decided that the responsible ICAO Secretariat would share the issues associated with proposed changes in the priorities of NAVS ASBUs with the responsible contributory bodies. These included GBAS-SBAS ITF and PBNICG. It was also decided that the ICAO secretariat will share this information with all contributory bodies under CNS for their information and necessary action, if any. Based on the outcomes of the discussion with relevant contributory bodies, the plan to correct the list of CNS-related ASBUs and other impacted ASBUs, if any, will be finalized and shared with the CNS SG/29 meeting planned to be held from 16-20 June 2025. The Meeting was requested to review CNS/other ASBUs in the Seamless ANS plan and share any discrepancies, if any.

9.7. The information was shared with the GBAS SBAS ITF/7 meeting held from 14-16 May 2025 in the ICAO APAC Office, Bangkok, Thailand by WP/02. The Meeting was informed about a comparison of the priorities adopted by CNS SG/28 based on a proposal from the CNS-related ASBUs Review Ad-hoc Group for the next edition of the Seamless ANS Plan and the priorities published in the Asia/Pacific Seamless ANS Plan Version 4.0. Recognizing the fact that not all ASBU NAVS module Block 0 elements may be implemented as Priority 1 in the Asia/Pacific Region, the ICAO Secretariat proposed considering the splitting of the elements from a 'Thread' into individual elements to ensure that appropriate Priority is assigned to each element.

9.8. The GBAS SBAS ITF/7 discussed the revised priorities and agreed to modify them as follows and publish as amendments in the plan v4.0.

Functional Category	Element	Description	Priority	Responsibility for Review
Technology	NAVS-B0/1	GBAS	2	CNS SG
	NAVS-B0/2	SBAS	2	
	NAVS-B0/3	ABAS	1	
	NAVS- B0/4	MON	1	

Table 1- Revised priorities of NAVS in Seamless ANS Plan v4.0

9.9. It was informed that the ICAO Secretariat is debating the way forward and the need for change in Seamless ANS Plan v4.0. The outcomes of the discussion will be shared with the CNS SG/29 meeting planned to be held from 16 to 20 June 2025.

Date and Venue for the Next Meeting

9.10. The Meeting discussed the next ATMAS TF meeting date. It was agreed that the ATMAS TF /7 meeting will be held from **02-04 June 2026**. It was suggested that a one-day seminar covering SWIM and FF-ICE aspects impacting ATMAS be conducted before the ATMAS TF/7 Meeting on **1 June 2026**.

Agenda Item 10: Election of Co-Chair

10.1. Nominated by Hong Kong China and seconded by Singapore, Ms. Wenxiu Chen, Director of CNS Department, East China Regional ATMB, CAAC, was elected as a Co-Chair of ATMAS TF.

10.2. Nominated by the Philippines and seconded by Hong Kong China, Mr.Wee Jui Chua, Head (TMA), Civil Aviation Authority of Singapore (CAAS), was elected as a Co-Chair of ATMAS TF.

10.3. Both newly elected Co-Chairs shared their appreciation to Ms. Yulan Xie and Mr. Kwek Chin Lin for their leadership in chairing ATMAS TF from 2020-2025, achieving several milestones and formulating a strategic direction for its future.

Closing of the Meeting

10.4. In closing the Meeting, the Co-Chairs and ICAO Secretariat thanked all participants for their active participation in the Meeting and valuable contributions to the work program of the ATMAS TF.

10.5. The Meeting extended sincere gratitude to Ms. Yulan Xie and Mr. Kwek Chin Lin for their dedication, contributions, and Services in the APAC Region as the Chairperson of ATMAS TF from 2020-2025.

10.6. Both Co-Chairs expressed their appreciation to all participants from Member States/Administrations, International Organizations, and sponsoring industries for their full support and active participation in making the Meeting successful and fruitful.

10.7. Mr. Tao Ma, Regional Director, ICAO APAC Office, shared the significance of ANS enhancement to meet APAC aviation needs and his appreciation to Ms. Yulan Xie and Mr. Kwek Chin Lin for their chairpersonship.

10.8. The ICAO Secretariat appreciated Ms. Yulan Xie and Mr. Kwek Chin Lin for conducting the Meeting expeditiously and efficiently. Lastly, the ICAO Secretariat expressed gratitude for the contribution and support from APAC Member States, international organizations, and industry partners.

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	Dhaka FIR	Dhaka ACC	18	Thales TopSky ATC	Main	PSR+Mode A/C+Mode S+ADS-B+WAM	Yes	AMHS	Flight Message Processing+ Life Cycle Management+ SSR Code Management	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	Online	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	Integated Tower System+A-SMGCS+ Tower Electronic Strip System	flight data+ operational setting data	Yes	This ATM system is currently available under Trial Operations.
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 Management+Sec Manage&Posting Comput	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+Enhancement	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
		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 Management+Sec Manage&Posting Comput	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+Enhancement	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~~ QNH+mono-radar+GRIB	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																																											

ATM Automation System Repository in APAC Region

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	Safety Net Function: Emergency code warning (7500,7600,7700)	Safety Net Function: Short Term Conflict Alert (STCA)	Safety Net Function: Minimum Safe Altitude Warning (MSAW)	Safety Net Function: Area Proximity Warning (APW)	Safety Net Function: Approach Path Monitoring (APM) Warning	Safety Net Function: Route Adherence Monitoring (RAM)	Safety Net Function: 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	Extended Alerts and Warning: Departure No TRANSGRESSION Zone (DTZ)	Extended Alerts and Warning: No Transgression Zone (NTZ)	Extended Alerts and Warning: Medium Term Conflict Detection Warning (MTCD)	Extended Alerts and Warning: Similar Callsign Advisory (SCA)	Extended Alerts and Warning: Reduce Vertical Separation Minimum (RVSM) Warning	Extended Alerts and Warning: Position Report Monitoring (PMON) Warning	Extended Alerts and Warning: Last Known Position Display	Extended Alerts and Warning: SSR Inconsistency Warning	Extended Alerts and 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	FIR 1	ACC1/City1	40	INDRA Aircon 2100	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+DLC	Online+Offline	Basic	Yes	Basic+Enhancement	Monitor+Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Track Fusion+Related Warnings+Downlink Data Window	AMAN+DMAN+PST	Yes	Integated Tower System+A-SMGCS+ Tower Electronic Strip System	flight data+ operational setting data	Yes	
	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
	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
		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	Flight Message Processing+ Life 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	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	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	Basic+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	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	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	46	Thales / TopSky-ATC / ~~V 20.2.9.0~~ V22.2.13.0	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	Electronic	No	SSR code+24-bit Address+ACID	Yes	Basic	Yes	Yes	Yes	Yes	Yes	QNH	ADS-C+CPDLC+DCL	Online+Offline	Basic+Handover+Coordination	Yes	Basic+Enhancement	Monitor+Control	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Track Fusion+Related Warnings+Downlink Data Window	AMAN+DMAN+PST	Yes	Tower Electronic Strip System	None	Yes	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	BACC / Bangkok	27	Thales / TopSky-ATC / ~~V 20.2.9.0~~ V22.2.13.0	Emergency	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	No	SSR code+24-bit Address+ACID	Yes	Basic	Yes	Yes	Yes	Yes	Yes	QNH	ADS-C+CPDLC+DCL	Online+Offline	Basic+Handover+Coordination	Yes	Enhancement	Monitor+Control	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Track Fusion+Related Warnings+Downlink Data Window	AMAN+DMAN+PST	Yes	Tower Electronic Strip System	None	Yes	Mode A/C+Mode S+ADS-B
	BANGKOK	BAPP / Suvarnabhumi	27	Thales / TopSky-ATC / ~~V 20.2.9.0~~ V22.2.13.0/TopSky-Tower	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	Electronic	No	SSR code+24-bit Address+ACID	Yes	Basic	Yes	Yes	Yes	Yes	Yes	QNH	ADS-C+CPDLC+DCL	Online+Offline	Basic+Handover+Coordination	Yes	Basic+Enhancement	Monitor+Control	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Track Fusion+Related Warnings+Downlink Data Window	AMAN+DMAN+PST	Yes	Integated Tower System+A-SMGCS	None	Yes	PSR+Mode A/C+Mode S+ADS-B
	BANGKOK	BAPP / Suvarnabhumi	21	Thales / TopSky-ATC / ~~V 20.2.9.0~~ V22.2.13.0/TopSky-Tower	Emergency	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	No	SSR code+24-bit Address+ACID	Yes	Basic	Yes	Yes	Yes	Yes	Yes	QNH	ADS-C+CPDLC+DCL	Online+Offline	Basic+Handover+Coordination	Yes	Basic+Enhancement	Monitor+Control	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Track Fusion+Related Warnings+Downlink Data Window	AMAN+DMAN+PST	Yes	Integated Tower System+A-SMGCS	None	Yes	PSR+Mode A/C+Mode S+ADS-B
	BANGKOK	CMAP / Chiangmai	14	Thales /TopSky-ATC/V22.2.13.0/TopSky-Tower	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	Electronic	No	SSR code+24-bit Address+ACID	Yes	Basic	Yes	Yes	Yes	Yes	Yes	QNH	ADS-C+CPDLC+DCL	Online+Offline	Basic	Yes	Basic+Enhancement	Monitor+Control	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Track Fusion+Related Warnings+Downlink Data Window	AMAN+DMAN+PST	Yes	Integated Tower System+A-SMGCS	None	Yes	Mode A/C+Mode S+ADS-B
	BANGKOK	CMAP / Chiangmai	5	Thales /TopSky-ATC/V22.2.13.0/TopSky-Tower	Emergency	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	No	SSR code+24-bit Address+ACID	Yes	Basic	Yes	Yes	Yes	Yes	Yes	QNH	ADS-C+CPDLC+DCL	Online+Offline	Basic	Yes	Basic+Enhancement	Monitor+Control	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Track Fusion+Related Warnings+Downlink Data Window	AMAN+DMAN+PST	Yes	Integated Tower System+A-SMGCS	None	Yes	Mode A/C+Mode S+ADS-B
	BANGKOK	PUAP / Phuket	14	Thales /TopSky-ATC/V22.2.13.0/TopSky-Tower	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	Electronic	No	SSR code+24-bit Address+ACID	Yes	Basic	Yes	Yes	Yes	Yes	Yes	QNH	ADS-C+CPDLC+DCL	Online+Offline	Basic	Yes	Basic+Enhancement	Monitor+Control	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Track Fusion+Related Warnings+Downlink Data Window	AMAN+DMAN+PST	Yes	Integated Tower System+A-SMGCS	None	Yes	Mode A/C+Mode S+ADS-B
	BANGKOK	PUAP / Phuket	5	Thales /TopSky-ATC/V22.2.13.0/TopSky-Tower	Emergency	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	No	SSR code+24-bit Address+ACID	Yes	Basic	Yes	Yes	Yes	Yes	Yes	QNH	ADS-C+CPDLC+DCL	Online+Offline	Basic	Yes	Basic+Enhancement	Monitor+Control	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Track Fusion+Related Warnings+Downlink Data Window	AMAN+DMAN+PST	Yes	Integated Tower System+A-SMGCS	None	Yes	Mode A/C+Mode S+ADS-B
	BANGKOK	HYAP / HatYai	13	Thales /TopSky-ATC/V22.2.13.0/TopSky-Tower	Emergency	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	No	SSR code+24-bit Address+ACID	Yes	Basic	Yes	Yes	Yes	Yes	Yes	QNH	ADS-C+CPDLC+DCL	Online+Offline	Basic		Basic+Enhancement	Monitor+Control	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Track Fusion+Related Warnings+Downlink Data Window	AMAN+DMAN+PST	Yes	Integated Tower System+A-SMGCS	None	Yes	Mode A/C+Mode S+ADS-B
	BANGKOK	HYAP / HatYai	5	Thales /TopSky-ATC/V22.2.13.0/TopSky-Tower	Emergency	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	No	SSR code+24-bit Address+ACID	Yes	Basic	Yes	Yes	Yes	Yes	Yes	QNH	ADS-C+CPDLC+DCL	Online+Offline	Basic	Yes	Basic+Enhancement	Monitor+Control	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Track Fusion+Related Warnings+Downlink Data Window	AMAN+DMAN+PST	Yes	Integated Tower System+A-SMGCS	None	Yes	Mode A/C+Mode S+ADS-B
	BANGKOK	STRT / Suratthanee	5	Thales /TopSky-ATC/V22.2.13.0/TopSky-Tower	Main	PSR+Mode A/C+Mode S+ADS-B+WAM	No	AFTN+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	ADS-C+CPDLC+DCL	Online+Offline	Basic	Yes	Basic+Enhancement	Monitor+Control	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Track Fusion+Related Warnings+Downlink Data Window	None	Yes	Integrated Tower System+A-SMGCS	None	Yes	Mode A/C+Mode S+ADS-B
	BANGKOK	KSRT / Koh Samui	5	Thales /TopSky-ATC/V22.2.13.0/TopSky-Tower	Main	PSR+Mode A/C+Mode S+ADS-B+WAM	No	AFTN+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	ADS-C+CPDLC+DCL	Online+Offline	Basic	Yes	Basic+Enhancement	Monitor+Control	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Track Fusion+Related Warnings+Downlink Data Window	None	Yes	Integrated Tower System+A-SMGCS	None	Yes	Mode A/C+Mode S+ADS-B
	~~BANGKOK~~	~~UDRT / Udonrathanee~~		~~Thales / TopSky-Tower~~	~~Main~~					~~Electronic~~	~~No~~												~~Basic~~	~~Yes~~	~~Enhancement~~							~~Yes~~				~~Yes~~				~~Integated Tower System+A-SMGCS~~			
	BANGKOK	DMRT / Donmuang	10	Thales /TopSky-ATC/V22.2.13.0/TopSky-Tower	Main	PSR+Mode A/C+Mode S+ADS-B+WAM	No	AFTN+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	ADS-C+CPDLC+DCL	Online+Offline	Basic	Yes	Basic+Enhancement	Monitor+Control	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Track Fusion+Related Warnings+Downlink Data Window	None	Yes	Integrated 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 Window~~	~~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 Window~~	-	~~Yes~~	~~Integated Tower System+A-SMGCS+ Tower Electronic Strip System~~			
	BANGKOK	CRRT / Chiangrai	4	Thales / TopSky-ATC / V 22.2.13.0	Main	PSR+Mode A/C+Mode S+ADS-B+WAM	No	AFTN+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	ADS-C+CPDLC+DCL	Online+Offline	None	Yes	Basic+Enhancement	Monitor+Control	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Track Fusion+Related Warnings+Downlink Data Window	None	Yes	Tower Electronic Strip System	None	Yes	Mode A/C+Mode S+ADS-B
	BANGKOK	KRRT / Krabi	4	Thales / TopSky-ATC / V 22.2.13.0	Main	PSR+Mode A/C+Mode S+ADS-B+WAM	No	AFTN+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	ADS-C+CPDLC+DCL	Online+Offline	None	Yes	Basic+Enhancement	Monitor+Control	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Track Fusion+Related Warnings+Downlink Data Window	None	Yes	Tower Electronic Strip System	None	Yes	Mode A/C+Mode S+ADS-B
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																																											

ATM Automation System Repository in APAC Region

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
1	2	3	4	5	6	7	8	9	10	11	12	13
VIETNAM	HANOI FIR	ATCC HAN	10	Leonardo SpA	Main	PSR+Mode A/C+Mode S+ADS-B	Yes	AFTN+AMHS	Flight Message Processing+ Life Cycle Management+ SSR Code Management+Sec Manage&Posting Comput	Paper	Yes	SSR code+24-bit Address+ACID
	HCM FIR	AACC HCM	12	THALES/EUROCAT X	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	Yes	SSR code+24-bit Address+ACID

State/Administration	Safety Net Function							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
	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)								
1	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
VIETNAM	Yes	YES	Yes	Yes	Yes	Yes	Yes	QNH	CPDLC	Offline	Basic	Yes	Basic	Monitor+Control	Yes
	Yes	YES	Yes	Yes	Yes	Yes	Yes	QNH+mono-radar+GRIB	ADS-C+CPDLC	Offline	Basic+Handover+Coordination	Yes	Basic	Monitor+Control	Yes

State/Administration	Extended Alerts and Warning									Downlink Aircraft Parameters Processing and Display	Integrated Technology	System Log Management	Interoperability	Operational Data Synchronization Function	Statistics and Analysis Function	Remarks
	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							
1	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
VIETNAM	No	No	yes	yes	yes	Yes	Yes	Yes	Yes	Track Fusion	None	Yes	Integated Tower System	flight data+ operational setting data	yes	
	No	No	no	yes	Yes	no	Yes	Yes	Yes	None	None	Yes	Integated Tower System	flight data	Yes	

State/Administration	Last updated	Meeting	History
Afghanistan			
Australia			
Bangladesh	6/2/2025	ATMAS TF/6	
Brunei Darussalam			
Bhutan			
Cambodia	6/29/2023	ATMAS TF/4	
China	6/4/2025	ATMAS TF/6	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	2/26/2025		2/22/2023 2/28/2024
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	6/1/2025	ATMAS TF/6	2/28/2023 - AP139/22 (CNS)
Tonga			
Thailand	6/1/2025	ATMAS TF/6	3/3/2023 5/31/2023-AP139/22 (CNS)
Tuvalu			
Timor LESTE			
United States	6/17/2024	ATMAS TF/5	
Vanuatu			
Viet Nam	5/31/2025	ATMAS TF/6	

INTERNATIONAL CIVIL AVIATION ORGANIZATION
ASIA AND PACIFIC OFFICE

AIR TRAFFIC MANAGEMENT AUTOMATION SYSTEM

IMPLEMENTATION AND OPERATIONS GUIDANCE DOCUMENT

Edition 1.5-June 2025

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
1.5	Jun 2025	China，Hong Kong China, New Zealand	Add some subsections 3.2.5 Arrival and Departure Manager Functions 4.8.4 Filing of Cybersecuirty Level 5.3 Personnel Training 5.4 Safety Assessment Before Operation

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.

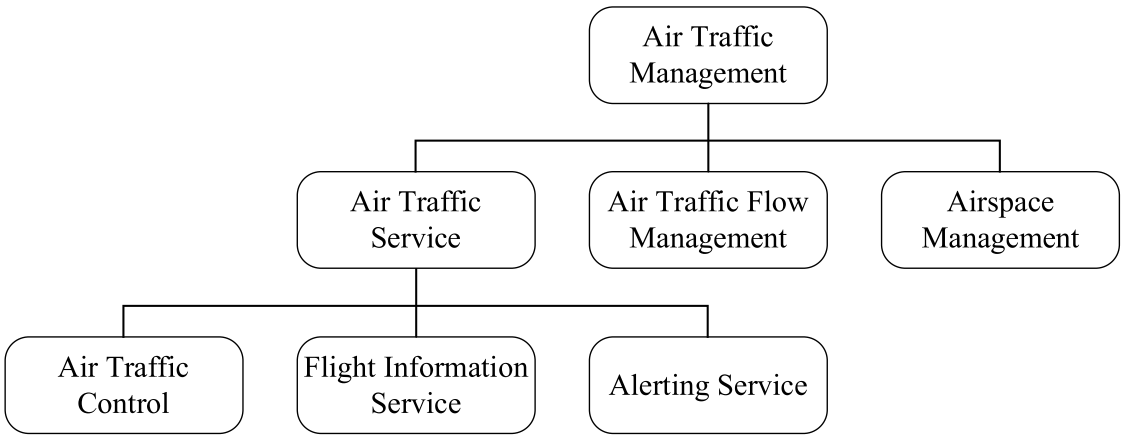

Figure 1.2.2-1 Composition of air traffic management

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

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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. <u>Passive Playback</u>

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 and Departure Manager Functions

3.2.5.1 Arrival Manager

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.

3.2.5.2 Departure Manager Function

The basic function of Departure Manager (DMAN) shall include stakeholders to file Target Off-Block Time (TOBT) for 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 taxiing and waiting time on taxiways.

a. Filing TOBT

When operators and stakeholder file a TOBT, it enables ATC to know when the aircraft will be ready for pushback. This enables 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 taxi times to DMAN based on ground sensors rather than a fixed system configuration table.

3.2.5.3 Integrated Arrival and Departure Manager

An Integrated Arrival and Departure Manager (IAD) with enhanced ATMAS to provide comprehensive advisories to air traffic controllers for their safe and efficient management of the arrival and departure traffic in an integrated manner.

3.2.5.3.1 Mixed-mode Runway Capacity Management

To optimize runway utilization and mitigate delays for an airport with runway in mixed-mode operations, the AMAN and DMAN functions in ATM automation system could be tightly integrated for the calculation of arrival and departure sequences of runways.

Without a tight integration, the AMAN and DMAN may create imbalances in the allocation under excessive arrivals or departures on a mixed-mode runway, causing undue delays for the opposite type of traffic. To address this, an Integrated Arrival and Departure Manager could be designed to allow dynamic adjustment of sequencing based on capacity thresholds. Through the input of the maximum arrivals and departures per hour for mixed-mode runways, excess traffic could be offloaded to available runways when necessary. This ensures balanced demand distribution, minimizes delays, and enhances overall airport throughput.

3.2.5.3.2 Handling Adverse Weather Operations in AMAN and DMAN

Thunderstorms or adverse weather conditions impact both arrival and departure operations, requiring specific system adaptations to maintain safety and efficiency.

For arrival traffic, adverse weather may block portions of airspace or arrival routes, forcing aircraft to deviate from published paths. Such deviations cause discrepancies between pre-defined Estimated Time Over (ETO) values and actual flight trajectories. To maintain sequencing stability, the AMAN may incorporate a weather mode that suspends trajectory updates for aircraft within affected airspace, preventing unnecessary recalculation of sequence due to sudden track changes.

For departure operations, severe weather may require temporary suspension of ground activities due to lightning hazards. During such events, affected aircraft must have their Target Start-Up Approval Time (TSAT) and Target Take-Off Time (TTOT) adjusted. The DMAN may incorporate functionality for users to input warning status of the affected area, enabling automatic re-sequencing of flights and updates to TSAT/TTOT when operations resume.

3.2.5.3.3 **Display** of AMAN/DMAN Advisories

The operational efficiency could be further enhanced through **display** AMAN/DMAN advisories **within the HMI of ATM Automation System**. This **function** could be achieved by direct presentation of AMAN/DMAN advisory data ~~within the HMI of ATM automation system,~~ such as data blocks or flight lists, thereby eliminating the need for referring to separate a AMAN/DMAN display.

Essential information, such as Time to Lose (TTL) or Time to Gain (TTG), and holding advisories, could be considered to display in track labels and flight lists within the ATM automation system. In addition, synchronization of information such as runways and routes mechanism may also be established to ensure accurate and up-to-date information between AMAN/DMAN and ATM automation system.

A comprehensive integration could significantly enhance situational awareness, streamline decision-making processes, and provides air traffic controllers with a unified HMI that consolidates available information and tools.

3.2.5.3.4 Integration with Approach Spacing Tool (AST)

Further operational benefits could be achieved by extending the integration of AMAN/DMAN with the AST. The AMAN/DMAN could provide AST with flow constraints, such as departure slots for mixed-mode runways, special spacing requirements for VIP flights, etc.. These constraints, defined as relative gaps from leading aircraft, help AST to determine optimal spacing for arrival pairs. In addition, IAD could inform AST about runway availability constraints, such as closures or reservation slots, ensuring aircraft land after a specified time. The AST could then generate indicators for air traffic controllers, helping them manage arrivals in compliance with flow constraints and runway restrictions.

3.2.6 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.

3.2.7 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.

3.2.8 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.

Projection of Spacing

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.

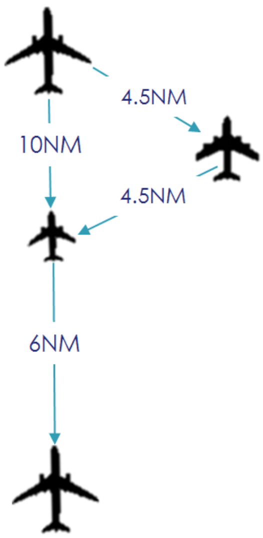


Figure 3.2.8-1 Minimum Separation

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.

AST Guidance Cues

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.

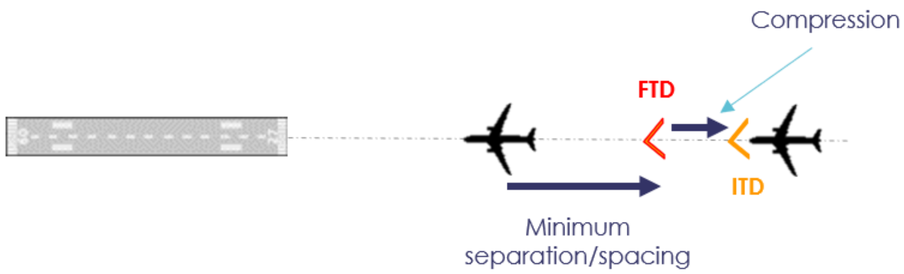
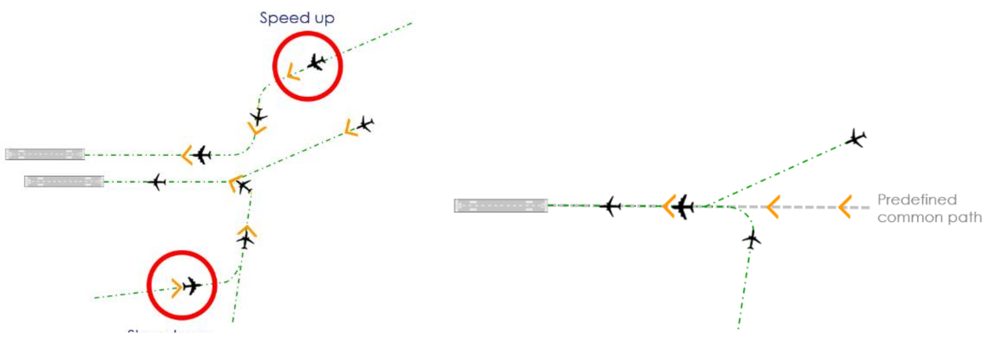


Figure 3.2.8-2 FTD and ITD Guidance

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.

3.2.9 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.

3.2.10 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

[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

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 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)

[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.

in the operations, while post-analysis can provide guidance in improving the operational processes and activities complementary to the technical aspect of the operations.

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. <u>User Account Management</u>

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. <u>System Development Life Cycle</u>

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. <u>Removable Media Control</u>

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. <u>Software Security Patch Management</u>

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. <u>Physical Security Measures</u>

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 Maintenance 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.

4.8.4 Filing of Cybersecurity Level

ICAO Doc 10204 Manual on Aviation Information Security provides guidance to States on how to determine the levels of confidentiality, integrity and availability protection required for a system based on the level of risk the State accepts. The approach, though system specific, considers integration and the risk of propagation.

States will need to determine the cybersecurity level for ATMAS, and file that cybersecurity level at the local cybersecurity department based on State/Administration regulations. Based on the guidance steps, States are suggested to:

a. Determine the cybersecurity level of the information system referring to the guidance and relevant State/Administration regulations.

b. Rectify and strengthen the information system in accordance with the relevant State/Administration regulations, from the aspect of physical environment, security devices, security technique, security management etc.

c. Entrust a qualified evaluation agency to test and evaluate the Cybersecurity Level of information system and form the evaluation report.

d. Submit the evaluation report to local cybersecurity department and finish the filing of system cybersecurity level.

When procuring systems, it is the responsibility of both Vendors and Customer parties to identify and determine cybersecurity levels for ATMAS. Such processes, determination and filing of cybersecurity level need be clearly specified in the procurement contract ensure system integrity when deployed.

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, Flight Inspection, Personnel Training and Safety Assessment 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. Cybersecurity testing, including tests of physical security, network security, device security, application security, data security and recovery, and etc.

f. 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.

g. 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.

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.

5.3 Personnel Training

Personal training is an essential element for any ATMAS implementation. ICAO provides extensive detail on ATC training via Doc 9868 and further guidance on competency-based training and assessment for both ATC, OJTI and Technical staff via Doc 10056 Vol I and II and 10057 respectively.

Particularly for Doc 10056 and 10057, as their guidance is not application specific and promotes effective training via competency assessment, States should refer to these documents for guidance on:

a. Training/Assessment planning

b. Training material creation

c. Trainer competency

d. Assessment processes

e. On-going training processes

Personnel-training may be included in the procurement contract for the vendor to provide or States may have the capability to create and conduct it themselves. Either way it needs to be structured to support effective training while not overtly impacting on-going operations - and be conducted before transition.

Based on the ICAO guidance, Vendors and/or States should decide on the type of training being conducted (for new ATMAS its most likely conversion training) and conduct a competency-based assessment of their current operations/systems and the new system to identify gaps and resulting topics for both theoretical and practical training.

This gap analysis and resulting topic list will then be included in Training and Assessment Plans. The Training Plan is the core document for training delivery and should include:

a. Identification of target audience, scope and training approach

b. Syllabus

c. Milestones

d. Training modules/events/sequence

e. Course Schedule

The resulting Training Plan should be user specific (ATS type or Tech) and would at least includes system functions, system processing mechanisms, system operations, hardware configurations, network configurations, software installation - as required for the target audience.

When planning, States should identify opportunities in scheduled project activity to help ATMAS users familiarize themselves with equipment performance and interface operations as soon as possible. These early opportunities are particularly important when creating a cadre of ATC or Technical instructors that will either create training material and or conduct or support operational orientated training. Opportunities could include development periods, FAT/SAT or identified factory and on-site training.

Moreover, controller and technician participation in equipment/system development and testing phases mean expert-level talents can be cultivated by this way to support training, transition and post-transition system management.

An Assessment Plan will also be required – either within or separate to the Training Plan. This plan will identify:

a. The methods to be used for assessment － written/oral/observation

b. Assessment milestones

c. Course numbers

d. Assessor qualification and conduct

e. Re-sit and failure processes

With the Training and Assessment Plans in place, training and assessment materials can be created.

Note - because of high degree of ATMAS software integration and adaptation, it is suggested that States assess their capability to support such activity and devise specialized training as a result. This training may include courses and assessment for offline data configuration (adaptation), validation (testing) and development (coding), ab initio controller training, and instructor qualification.

States should also consider the creation of operational familiarization periods. These periods are usually conducted after a system passes SAT and the cadre of instructors and unit (Sector/Tower/ATSS) representatives are sufficiently familiar with the system to operate the system. The intent of these periods is to facilitate:

a. Operational application of the system in a simulated environment

b. Unit specific design/adaptation needs to be identified

c. Unit specific training needs and materials to be identified/created

d. New functionality to be used and training material created

Finally – States may need to consider any overarching State Regulator/Government department or auditory requirements for training development/conduct.

5.4 Safety Assessment before Operation

ICAO has extensive Safety guidance material in both Annex and Doc forms. States should establish effective Safety Management System frameworks to support effective ATMAS development, validation, training and implementation.

Specifically, Doc 9882 (Manual on ATM System Requirements) identifies overall safety requirements in Chapter 2 and specific criteria applicable to readiness in Section 2.1.2:

a. ensure application of the system safety approach to all life-cycle phases of the ATM system and its elements, supported by safety cases

b. ensure that ATM system safety is maintained during any transition

c. establish contingency plans at all levels of operation to deal with anomalies/disruptions and to ensure safety and appropriate level of operations

States should conduct a comprehensive safety assessment of the various aspects affected by the ATMAS transition; these include:

a. System validation and acceptance of functionality and operation
b. Operational readiness – both functional training/endorsements and operational application
c. Technical readiness – both functional training/endorsements and operational application
d. Failover/Contingency planning and operation
e. Stakeholder readiness – including and reduction in service during transition and contingency actions
f. Regulatory readiness – including any documentation changes and approvals

Such assessment should be conducted collaboratively and be inclusive of operations and maintenance teams, stakeholders, regulators, ANSP management, safety office expertise. ,. The safety assessment should at least cover the following aspects:

a. Scope and content of the evaluation
b. Departments and personnel involved in the assessment
c. Description of the current environment and system
d. Identification and risk analysis of potential hazards
e. Risk control measures
f. Conclusions of the safety assessment

It is recommended that States consider supporting safety assessment activities with tabletop and, if the new ATMAS is remote from the in-use system, actual readiness/transition process activities. Such activities may include:

a. System failover and contingency scenarios
b. Power failover and contingency
c. Network and Security testing
d. Overall transition process conduct

The conduct of such activities will support the ID of safety gaps, their mitigation and generation of an effective Transition plan. That plan should safely merge the various workstream steps to be conducted during transition. It also supports the identification of both readiness criteria (to commence transition activity) and go/no-go determination points through a transition. For detail guidance of the transition, please refer to section 6 System Transition.

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.

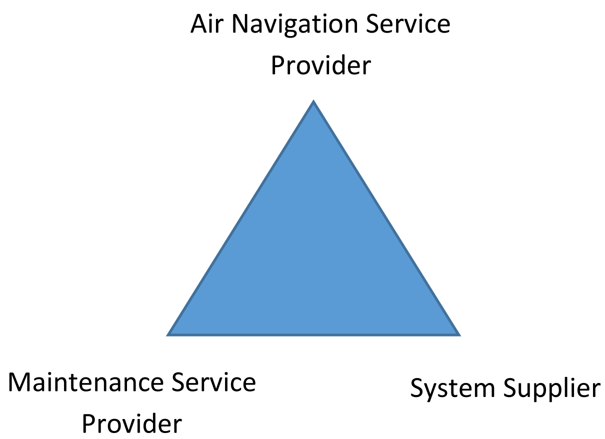


Figure7.1-1: Trio for Maintenance Framework

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

<table>
<tr><th></th><th colspan="8">RSUR specification 5NM-SEP_ER_TIER-C</th></tr>
<tr><th></th><th colspan="2">Coherence</th><th colspan="3">Integrity</th><th colspan="2">Time</th><th>Reliability</th></tr>
<tr><th>DATA</th><th>Update Interval UI</th><th>Probability of Update</th><th>Core Error</th><th>Tail error</th><th>Integrity</th><th>Age</th><th>Delay</th><th></th></tr>
<tr><td>2D Horizontal Position (HP)</td><td rowspan="3">DAT_{UI} $\leq 12s$</td><td rowspan="3">PoU $\geq 97\%$</td><td>HPE_{RMS} <825m or $HPE_{95\%}$ <1430m</td><td>$RNBE_{LB}$= 2714m $RNBE_{UP}$= 3644m</td><td>HP_{INT}</td><td>HP_{MDA} = 36.3s</td><td>-</td><td>-</td></tr>
<tr><td>Pressure Altitude (PA)</td><td>-</td><td>-</td><td>PA_{INT} <0.1%</td><td>PA_{MDA}= 30s</td><td>-</td><td>-</td></tr>
<tr><td>Mode A code Identity (ID)</td><td>-</td><td>-</td><td>ID_{INT} <0.1%</td><td>-</td><td>ID_{MUD} = 48s</td><td>-</td></tr>
<tr><td>Flight Status (emergency, SPI = FS)</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>FS_{MUD} = 24.2s</td><td>-</td></tr>
<tr><td>Time of applicability</td><td>With HP</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Service</td><td colspan="2">In defined OCV
HP_{RTD} <0.3s</td><td colspan="3">FGT_{DEN}< 0.1%
SRV_{INT} <10^{-5} per report</td><td colspan="2"></td><td>SRV_{CNT} = 0.999 /hour</td></tr>
</table>

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}** $\leq 8s$	**PoU** $\geq 97\%$	**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$5s	**PoU ≥97%**	**HPE_{RMS}** <230m or **$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$_{UI}$** ≤5s	**PoU** ≥97%	**HPE$_{RMS}$** <450m or **HPE$_{95\%}$** <780m	**RNBE$_{LB}$=** 1478m **RNBE$_{UI}$=** 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/air-borne							**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,**	System requirement review (SRR)	Review the system requirement based on the bidding document		

		HMI customization & prototype testing	System Design Review (SDR)	Any gap in understanding the System requirement by 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.			

INTERNATIONAL CIVIL AVIATION ORGANIZATION
ASIA AND PACIFIC OFFICE

ATS Inter-Facility Data Communication (AIDC)
IMPLEMENTATION AND OPERATIONS GUIDANCE DOCUMENT

Edition 2.0 - June 2025

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Chapter 1: INTRODUCTION

1.1 Introduction

1.1.1 The ATS Inter-Facility Data-Communication (AIDC) Implementation and Operations Guidance Document (IGD) is the result of the task entrusted to the Asia/Pacific ATS Inter-Facility Data-Link Coordination Task Force (APA/TF) by APANPIRG. This main objective of this document is to provide guidance, complementing relevant ICAO standards, on AIDC implementation within the APAC region. The ultimate goal is that countries within APAC region are able to meet the regional AIDC targets according to APAC seamless ATM plan and continue to advance on Flight and Flow Information for a Collaborative Environment (FF-ICE) according to GANPs ASBU.

1.1.2 The Communications, Navigation, Surveillance and Air Traffic Management (CNS/ATM) environment is an integrated system including physical systems (hardware, software, and communication network), human elements (pilots, controllers and engineers), and the operational procedures for its applications.

1.1.3 Recognized by ICAO under its Global Air Navigation Plan (GANP) and Aviation System Block Upgrades (ASBU) framework as an effective tool to reduce manual intervention and ground-ground coordination errors between adjacent ATSUs, the ATS Inter-facility Data Communications (AIDC) is a data link application that provides the capability to exchange data between air traffic service units during the notification, coordination and transfer of aircraft between flight information regions. It is an automated system that facilitates routine coordination by providing a reliable and timely data exchange between ATSUs in which accurate information can be derived directly from the system, thus effectively reducing controllers' workload and hence human errors.

1.2 The Arrangement of AIDC IGD

The AIDC IGD will define the following:

Chapter 1	Introduction
Chapter 2	Abbreviations
Chapter 3	Reference Documents
Chapter 4	AIDC Messages – Message sets to be used for AIDC Implementation
Chapter 5	AIDC Implementation Considerations – Information to support the implementation activities including checklist and how to handle implementation issues.
Chapter 6	Harmonization Framework for AIDC Implementation – Information on the harmonization framework on AIDC implementation activities and plan.
Chapter 7	AIDC Performance Monitoring and Validation – Information on the infrastructure supporting the AIDC implementation including performance criteria, validation, monitoring, etc.
Chapter 8	AIDC Training – Guidance on operations and technical training to support effective implementation

1.3 Document History and Management

This document is managed by the APANPIRG. It was introduced as draft to the First meeting of the ATS Inter-facility Data Communication Task Force Working Group on AIDC Implementation Guidance Document (APA IGD WG/1) in Bangkok in December 2016, at which it was agreed to develop the draft to an approved working document that provides guidance for States in the APAC region for effective implementation of AIDC . The first edition was presented to APANPIRG for adoption in September 2017. It is intended to supplement SARPs, PANS and relevant provisions contained in ICAO documentation and it will be regularly updated to reflect evolving provisions.

Chapter 2: ABBREVIATIONS

2.1 Introduction:

When the following abbreviations are used in the present document they have the following meanings. Where the abbreviation has "(ICAO)" annotated, the term has already been decoded in ICAO DOC 8400 (*PANS-ICAO Abbreviations and Codes, Eighth Edition-2010*).

Abbreviations	
ABI	Advance Boundary Information (AIDC Message)
ACC	Area Control Centre
ACI	Area of Common Interest
ACP	Acceptance (AIDC Message)
AFTN	Aeronautical Fixed Telecommunication Network
AIDC	ATS Inter-Facility Data Communication
AMSS	Automatic Message Switching System
ANSP	Air Navigation Service Providers
AOC	Acceptance of Control (AIDC Message)
APAC	Asia and Pacific Office
APANPIRG	Asia/Pacific Air Navigation Planning and Implementation Regional Group
ASBU	Aviation System Block Upgrades
ASM	Application Status Monitor (AIDC Message)
ATM	Air Traffic Management
ATS	Air Traffic Service
ATSU	Air Traffic Service Unit
CDN	Coordination Negotiation (AIDC Message)
COP	Change Over Point
CPL	Current Flight Plan (AIDC Message)
CRC	Cyclic Redundancy Check
CRV	Common aeRonautical Virtual private network
CWP	Air Traffic Controller Work Position
DBM	Data Base Management
EMG	Emergency (AIDC Message)
EST	Coordination Estimate (AIDC Message)

FDPS	Flight Plan Data Processing System
FF-ICE	Flight and Flow Information for a Collaborative Environment
FPL	Flight Plan
GANP	Global Air Navigation Plan
GPS	Global Positioning System
HMI	Human Machine Interface
ICAO	International Civil Aviation Organization
ICD	Interface Control Document
IGD	Implementation and Operations Guidance Document
LAM	Logical Acknowledgement Message (AIDC Message)
LHD	Large Height Deviation
LOA	Letter of Agreement
LRM	Logical Rejection Message (AIDC Message)
LTO	Logical Time Out Response
MAC	Cancellation of Notification and/or Coordination (AIDC Message)
MDT	Mean Down Time for the System
MTBF	Mean Time Between Failure
OEM	Original Equipment Manufacturer
ORCAM	Originating Region Code Allocation Method
PAC	Preliminary Activate (AIDC Message)
PANS-ATM	Procedures for Air Navigation Services – Air Traffic Management
PCA	Profile Confirmation Acceptance (AIDC Message)
PCM	Profile Confirmation Message (AIDC Message)
REJ	Rejection (AIDC Message)
SOP	Standard Operating Procedures
TF	Task Force
TOC	Transfer of Control (AIDC Message)
TRU	Track Update (AIDC Message)
UTC	Coordinated Universal Time
VVIP	Very Very Important Person

Chapter 3: REFERENCE DOCUMENTS

No.	Name of the Document	Reference	Date	Origin	Domain
i.	PAN-ATM (Doc 4444/ATM501)	Fifteenth Edition including Amendment 4 applicable on 15/11/12	2007	ICAO	
ii.	Pan Regional (NAT and APAC) Interface Control Document for ATS Interfacility Data Communications (PAN ICD AIDC)	Version 1.0	September 2014	ICAO	
iii.	Asia/Pacific Regional Interface Control Document (ICD) for ATS Interfacility Data Communications (AIDC)	Version 3.0	September 2007	ICAO APAC	
iv.	Manual of Air Traffic Services Data Link Applications (Doc 9694-AN/955)	First Edition	1999	ICAO	
v.	Safety Management Manual (Doc 9859-AN/474)	Third Edition	2013	ICAO	
vi.	ICAO Abbreviations and Codes (Doc 8400)	Eighth Edition	2010	ICAO	

Chapter 4: AIDC MESSAGES

4.1 Introduction

4.1.1 This chapter describes the permitted fields and formats of AIDC messages. AIDC message fields conform to ICAO definitions contained in PANS-ATM Appendix 3 except as described below for ICAO flight plans Fields 14 and 15, as well as a “Text” field that is used in some AIDC messages.

4.1.2 ATS data in AIDC messages is enclosed between parentheses. Only one ATS message is permitted to be included in each transmission.

4.1.3 Unless specified otherwise by the ATSU, the optional elements in the AIDC message fields defined in the relevant AIDC ICD versions should be made available in the system by the manufacturer and be user configurable. An example of the elements available is shown in Table 4-13 (PAN ICD AIDC Version 1.0).

4.2 Message Field Requirements

Fields in AIDC messages do not always require the full contents of the defined ICAO message field. This section specifies the usage of specific elements from message fields defined in the PANS-ATM as well as additional information that may be included in Fields 14 and 15.

4.2.1 Field 3 requirements.

4.2.1.1 All AIDC messages should use Field 3a (Message type) only.

4.2.1.2 Fields 3b (Message number) and 3c (Message reference data) are not used, since in AIDC messages the reference numbers contained in these fields are included in the Optional Data Field (ODF), option 2 and 3. See PAN ICD AIDC Version 1.0, Chapter 3, Para 3.2.3.2.

4.2.2 Field 7 requirements.

4.2.2.1 Where Field 7 is required in an AIDC message, Field 7a (Aircraft Identification) must be included. Fields 7b (SSR Mode) and 7c (SSR Code) are optional but should be included if the information is available and applicable.

4.2.3 Field 13 requirements.

4.2.3.1 Where Field 13 is required in an AIDC message only Field 13a (Departure aerodrome), is required. Field 13b (Departure time) is not to be transmitted. The use of ZZZZ in Field 13 is supported.

4.2.4 Field 14 requirements

4.2.4.1 The following section describes the allowed contents of Field 14 (Estimate data), as well as providing examples of how Field 14 data can be incorporated in an AIDC message.

4.2.4.2 Field 14 may contain a number of mandatory and optional items. The following Table 4-1 provides an overview on the type of information that may be included in Field 14.

Table 4-1: Contents of Field 14

Data	Example	Mandatory/Optional	Comment
Position (14a)	0034S10413E 0017S10452E ANITO	M	Normally a waypoint or system calculated position on or near the FIR or ACI boundary as agreed to through bilateral agreement. Field 14a is followed by an oblique stroke “/”
Estimated time (14b)	2200	M	The estimate for the position in 14a
Level (14c)	A090 F330 F330F370	M	The coordinated level of the aircraft While 14c is mandatory, the support for the block level format is Optional
Supplementary crossing data (14d)	A120 F350	Included when applicable	Use in conjunction with 14e to indicate that an aircraft may be on climb or descent at, or within tolerances of, the FIR boundary
Crossing condition (14e)	Example (A) Example (B) Example (C)	Included when applicable	(A) The aircraft may be on climb from the level specified in 14d (B) The aircraft may be on descent from the level specified in 14d (C) The aircraft is cruise climbing from the level specified in 14d. The support for the cruise climb format is optional

Mach Number	GM084 EM076 LM083	O	Used when a Mach Number speed restriction has been assigned to the aircraft by ATC.
Offset and weather deviation	W25R W100E O30L	O	When an offset or weather deviation is in effect, the position in14a should be a position on the flight planned route, rather than the offset route

Note1. Each item of optional information in Field 14 is separated from the previous item by an oblique stroke "/";
Note2. The order that the item is included in Field 14 is the order in which it is listed in Table 4-1. For example, if an AIDC message were to include an assigned Mach cc as well as a weather deviation, the Mach number information would precede the weather deviation information in Field 14.

4.2.4.3 Supplementary Crossing Data and Crossing Conditions in Field 14

4.2.4.3.1 Field 14 may contain information that an aircraft is on climb, descent or cruise climb to the specified level. This is achieved by including supplementary crossing data and crossing conditions in Field 14.

4.2.4.3.2 The inclusion of cruise climb information in AIDC messages should only be made following bilateral agreement.

Table 4-2: Field 14 Crossing Information examples

Field 14	Explanation
ANITO/2130F310F290A	The aircraft is estimating ANITO at 2130, assigned F310 and is climbing from (or "above") F290.
0034S10413E/0215F310F330B	The aircraft is estimating 30N160W at 0215, assigned F310 and is descending from (or "below") F330.
PARDI/1547F360F340C	The aircraft is estimating PARDI at 1547 and is cruise climbing from F340 to F360.

4.2.4.4 Block level information in Field 14

4.2.4.4.1 Field 14 may contain information that an aircraft is operating in a block level clearance. It is permissible to include supplementary crossing data and a crossing condition with a block level, but if this occurs the supplementary information may only be a single level (i.e. it cannot be a block level).

Table 4-3: Field 14 Block Level examples

Field 14	Explanation
DUDIS/2125F320F340	The aircraft is estimating DUDIS at 2125, and is operating in a block of levels between F320 and F340 (inclusive).
0700N10533E/0244F310F350F290A	The aircraft is estimating 0700N10533E at 0244, and has been assigned a block of levels between F310 and F350 (inclusive) and is climbing to the cleared block and will be at or above F290 at 0700N10533E.

4.2.4.4.2 The AIDC format does not support a cruise climb into a block clearance.

4.2.4.4.3 The inclusion of block level information in AIDC messages should only be made following bilateral agreement.

4.2.4.5 Mach Number information in Field 14

4.2.4.5.1 Field 14 may contain information that an aircraft has been assigned a speed restriction (Mach number). When included in an AIDC message, any Mach number information should always follow directly after the level information and be separated from the level information by an oblique stroke “/”.

Table 4-4: Field 14 Mach Number examples

Field 14	Explanation
AKMON/0349F350/GM085	The aircraft is estimating AKMON at 0349 at F350 and has been instructed to maintain M0.85 or greater
0145N10354E/0215F310/EM076	The aircraft is estimating 0145N10354E at 0215 at F310 and has been instructed to maintain M0.76

4.2.4.5.2 The absence of speed information in Field 14 of an AIDC message provides advice that any previously notified speed has been cancelled.

Table 4-5: Field 14 Mach Number removed example

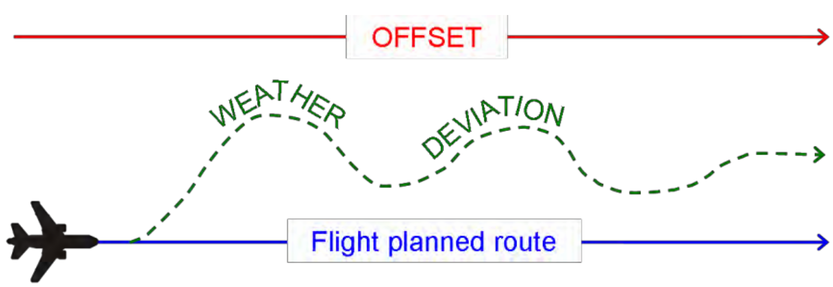
Field 14	Explanation
ESPOB/1237F310F330B/LM083	The aircraft is estimating ESPOB at 1237, assigned F310 and will cross ESPOB at or below F330, maintaining M0.83 or less.
Subsequently followed by: ESPOB/1238F310	The aircraft is now estimating ESPOB at 1238, is maintaining F310 (i.e. no longer on descent at ESPOB), and the Mach Number restriction has been cancelled.

4.2.4.5.3 The inclusion of Mach number information in AIDC messages should only be made following bilateral agreement.

4.2.4.6 Offset and Weather Deviation Information in Field 14

4.2.4.6.1 Field 14 may contain information that an aircraft is subject to either a weather deviation or offset clearance. When included in an AIDC message, any offset and weather deviation information should always be the last information in Field 14, and should be separated from preceding information by an oblique stroke "/".

4.2.4.6.2 It is important that the difference between an offset and a weather deviation is correctly understood. This difference is depicted in the diagram below.



4.2.4.6.3 An offset is a flight trajectory that is parallel to the original route, offset by a specified distance and direction. Once an aircraft is established on the offset, separation may be applied solely based on the offset path.

4.2.4.6.4 A weather deviation permits an aircraft to operate anywhere between the original route and the specified distance and direction from the original route. Separation must therefore be applied to the entire airspace in which the aircraft has been cleared to operate in.

4.2.4.6.5 The following examples show various combinations of weather deviations and offsets, combined with other optional information allowed in Field 14.

Table 4-6: Offset Weather Deviation example

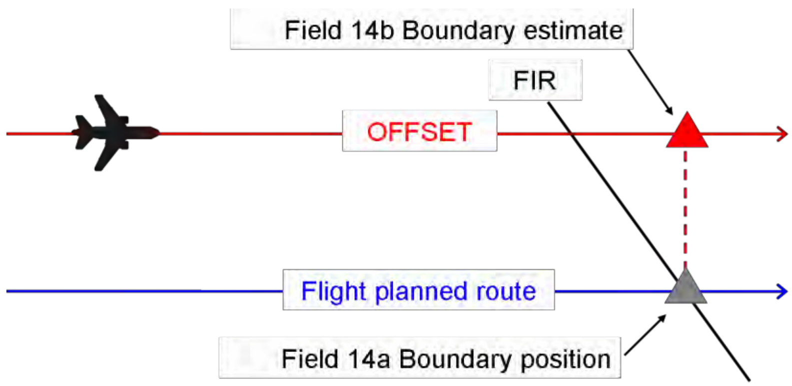
Field 14	Explanation
0856N11551E/0140F330/W20L	The aircraft is estimating 0856N11551E at 0140, maintaining F330, and has been cleared to deviate up to 20NM to the left of route.
TEGID/2330F310/GM084/O30R	The aircraft is estimating TEGID at 2330, maintaining F310, instructed to maintain M0.84 or greater, and has been cleared to offset 30NM to the right of route.
0949N11448E/0215F310F330/W25E	The aircraft is estimating 0949N11448E at 0215, is operating in a block of levels between F310 and F330 (inclusive), and has been cleared to deviate up to 25NM either side of route.
LAXOR/0215F310F350F370B/W100L	The aircraft is estimating LAXOR at 0215, and has been assigned a block of levels between F310 and F350 (inclusive), will cross LAXOR at or below F370, and has been cleared to deviate up to 100NM to the left of route.

4.2.4.6.6 The absence of offset or weather deviation in Field 14 of an AIDC message provides advice that any previously notified off-track information has been cancelled.

Table 4-7: Offset Weather Deviation removed example

Field 14	Explanation
0042N10216E/1519F330/W15R Subsequently followed by: 0042N10216E /1520F330	The aircraft is deviating up to 15NM right of track. The aircraft is back on track (and one minute later than previously coordinated).

4.2.4.6.7 When an aircraft is offsetting or deviating, the coordination point included in Field 14a should be a position based on the flight planned route rather than the offset route. The estimate included in Field 14b shall be the estimate for the "abeam" position for the position included in Field 14a.



4.2.4.6.8 The inclusion of offsets and weather deviation information in AIDC messages should only be made following bilateral agreement. Depending on their operational requirements, some ATSUs may choose to only implement the weather deviation format. If applicable, this should also be specified in bilateral agreements.

4.2.5 Field 15 requirements

4.2.5.1 The following section describes the allowed contents of Field 15 (Route), as well as providing examples of how Field 15 data can be incorporated in an AIDC message.

4.2.5.2 A number of different AIDC messages (e.g. ABI, PAC, CPL, CDN and PCM) may contain Field 15 (Route) information. Depending on the AIDC message being used, this route information may be either the current cleared route of the aircraft, or a proposed amendment to it.

4.2.5.3 While Field 15 may be optional in an AIDC message (refer Table 4-13), if it is included, all Field 15 sub-fields (15a, b and c) must also be included.

Table 4-8: Contents of Field 15

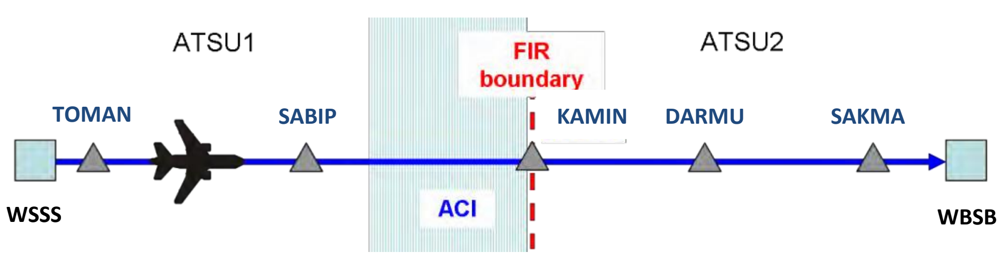
Data	Example	Mandatory /Optional	Comment
Speed (15a)	M084 N0488	M	(Included in a flight plan as the initial requested speed for a flight). In AIDC messaging: • if a speed has been specified in Field 14c, then the speed in Field 15a should be the same value; otherwise, • it should represent the expected speed of the aircraft at the coordination point included in Field 14a.
Level (15b)	F310	M	(Included in a flight plan as the initial requested flight level for a flight). In AIDC messaging: • if a block level has been specified in Field 14, then the level in Field 15a should be a single level within the block; otherwise, • it should be the level specified in Field 14c.

Data	Example	Mandatory /Optional	Comment
Route (15c)	• LAXOR • VMR • WSSS • 094937N1144829E • 033341N1065534E • L625, N884 • SJ235100 • M080F350 • M084 • F370 • M084F370 • 1230 • T • DCT	M	The route (or proposed route) of flight. It may contain any or all of the following elements: • Waypoint • Navigation aid • Aerodrome • Latitude/longitude • Latitude/longitude • ATS route • Place/bearing/distance • Speed/level changes (See Note 2) • Speed restriction • Level restriction • Speed/Level restriction (See Note 2) • Time associated with a restriction. May include a suffix of "A", "B" or "L" • Truncation indicator ('T') • Direct to

Note 1: The contents of Field 15c are defined in PANS-ATM Appendix 3, with the exception of level/time/speed restrictions which are described in PAN ICD AIDC Version 1.0 under paragraph 2.4 **Restriction Formats**. Planned speed/level changes from the filed FPL are included in some AIDC implementations although they do not reflect the current cleared profile of the aircraft.

Note 2: Flight planned speed/level changes and level/time/speed restrictions as defined in 2.4 **Restriction Formats** of PAN ICD AIDC Version 1.0, cannot both be included in Field 15 because in some cases they both use the same format. ATSUs should specify in bilateral agreements which group of information (if any) will be supported.

4.2.5.4 At the minimum, Field 15 in an AIDC message should commence at a position prior to the ACI associated with the adjacent FIR. Some ATSUs may include route information commencing at the Departure aerodrome.



4.2.5.5 Field 15 information transmitted by ATSU1 to ATSU2 should commence at (or before) SABIP. This permits ATSU2 to calculate the profile of the aircraft commencing at the ACI boundary.

4.2.5.6 ATS Route

4.2.5.6.1 An ATS route may only be preceded and followed by a waypoint that is defined to be on that ATS route.

4.2.5.7 Latitude/Longitudes

4.2.5.7.1 Latitude and longitude in Field 15 must either be both in whole degrees, or both in degrees and minutes.

4.2.5.8 Flight Planned Speed/Level Changes

4.2.5.8.1 Some ATSUs may include flight planned speed/level changes in Field 15c although they do not reflect the current cleared profile of the aircraft. An ATSU receiving Field 15c data containing planned FPL level speed changes should accept the information. However, the receiving ATSU may choose not to use the planned FPL level speed changes to update their flight plan, and may choose not to forward it in any subsequent AIDC messages.

4.2.5.9 Time/Speed/Level Restrictions

4.2.5.9.1 While the information in Field 14 defines the conditions for crossing the ACI or FIR boundary, ATSU1 may include in Field 15 time/speed/level restrictions that have been issued in a clearance to an aircraft. These clearances may include a requirement for an aircraft to cross a position at a specific time or to change level and/or speed at or by a specific time or position.

4.2.5.10 Truncation Indicator

4.2.5.10.1 While it is desirable for Field 15 to describe the entire route to destination, on occasions this may not be possible. If it is not possible to define the route to destination, it is necessary to truncate (delete the remainder of the route) and insert a truncation indicator (‘T’).

4.2.5.10.2 Bilateral agreements should define the use and meaning of the truncation indicator. For example the truncation indicator may represent:

i. the point at which the route in Field 15 rejoins the original flight planned route, or
ii. the end of the oceanic cleared route.

4.2.5.10.3 The truncation indicator should only follow a significant point in Field 15 and should not follow an ATS Route, or “DCT”.

Note: A significant point also refers to a significant point followed or preceded by:

i. A speed/level change; or
ii. A speed and/or level and/or time restriction

Table 4-9: Field 15 examples

SY L521 AA	Navaid, ATS Route Note that both "SY" and "AA" are defined on airway L521
SY L521 GEROS 3425S16300E LUNBI AA	Navaid, ATS Route, waypoint, lat/long (ddmm)
SY GEROS GEROS045100 ESKEL L521 AA	Place/bearing/distance
SY L521 GEROS/M085F370 L521 AA DCT BB	Speed/level change, DCT
SY L521 LUNBI T SY L521 GEROS 3425S16300E T SY L521 LUNBI/M085F370 T	Truncation indicator
SY L521 GEROS/F370 L521 F370/LUNBI AA SY GEROS/2245L ESKEL/M085F390 AA SY L521 M084F350/GEROS/1230A ESKEL/M083 L521 AA	Restrictions

4.2.6 Field 16 Requirements

4.2.6.1 Where Field 16 is required in an AIDC message, only Field 16a (Destination aerodrome), is required. Field 16b (Total estimated elapsed time) and Field 16c (Alternate aerodrome/s) are not to be transmitted. The use of ZZZZ in Field 16 is supported.

4.2.7 Field 18 Requirements

4.2.7.1 Field 18 should contain other information from the current flight plan and is used to update the flight plan at the receiving ATSU.

4.2.7.2 When transmitting Field 18 in an AIDC message, all Field 18 indicators should be included, even if the change only affects data in an individual Field 18 indicator. However, ATSUs may agree by bilateral agreement to omit specific indicators (e.g. EET/) if required. If omitting indicators, ATSUs should have due regard to the potential effect to downstream ATSUs.

4.2.7.3 The contents of Field 18 in AIDC messages should be specified in bilateral agreements between ATSUs.

Note: Some legacy implementations allowed provision for the modification of individual sub fields by communicating only that specific subfield. This is not recommended practice.

4.2.7.4 In some AIDC messages, Field 18 may contain only a RMK/ indicator which is used to convey free text data information. This applies to the MAC, EMG, LRM and MIS messages.

4.3 AIDC Message Groups

4.3.1 From a technical and operational perspective it is advantageous to standardize AIDC implementation to the full extent possible. This document identifies a group of messages as a "core" message set in Table 4-10 (based on PAN ICD AIDC Version 1.0) which is recommended to be supported by all ATSUs. This will aid standardization of system and procedure development.

4.3.2 It is nevertheless acknowledged that even a limited message set implementation, such as only CPL and ACP, can bring significant benefits to ATSUs. Some ATSUs may, due to technical, financial, or operational reasons, have a need to gradually implement the AIDC message set or may even determine that not all messages in the core message set are required.

4.3.3 Unless specified otherwise by the ATSU, the non-core messages shown in Table 4-10 should be supported by the manufacturer in ground systems and their availability be configured by the ATSU as required.

4.3.4 The specific AIDC messages to be used between ATSUs should be included in bilateral agreements.

Table 4-10: AIDC Messages (PAN ICD AIDC Version 1.0)

Core	Non-core	Message Class	Message
X		Notification	ABI (Advance Boundary Information)
X		Coordination	CPL (Current Flight Plan)
X		Coordination	EST (Coordination Estimate)
	X	Coordination	PAC (Preliminary Activate)
X		Coordination	MAC (Coordination Cancellation)
X		Coordination	CDN (Coordination Negotiation)
X		Coordination	ACP (Acceptance)
X		Coordination	REJ (Rejection)
	X	Coordination	PCM (Profile Confirmation Message)
	X	Coordination	PCA (Profile Confirmation Acceptance)
	X	Coordination	TRU (Track Update)

Core	Non-core	Message Class	Message
X		Transfer of Control	TOC (Transfer of Control)
X		Transfer of Control	AOC (Acceptance of Control)
X		General Information	EMG (Emergency)
X		General Information	MIS (Miscellaneous)
X		Application Management	LAM (Logical Acknowledgement Message)
X		Application Management	LRM (Logical Rejection Message)
	X	Application Management	ASM (Application Status Monitor)
	X	Application Management	FAN (FANS Application Message)
	X	Application Management	FCN (FANS Completion Notification)
	X	Surveillance Data Transfer	ADS (Surveillance ADS-C)

4.4 Core AIDC Messages

4.4.1 This section lists down the basic core AIDC messages for the initial implementation phase (~~ABI,~~ EST, ACP, CDN, REJ, ~~AOC~~ TOC and ~~TOC~~ AOC) that are recommended to be adopted. These messages are also identified ~~are~~ as part of the ASBU B0 recommendations pertaining to AIDC implementation

Note.— Notwithstanding the capability of CDN messages to support amendments to multiple fields, the recommended initial implementation scope encompasses only amendments to Field 14 (a, b, c) within Field 22.

4.4.2 The complete list of AIDC messages, their purpose, message format and examples can be found in the relevant "AIDC Messages" chapter of the various versions of AIDC ICD.

Table 4-11: Core AIDC Messages

AIDC Message	Purpose	Message format
~~ABI~~	~~• An ABI message is transmitted to provide information on a flight to the receiving ATSU. The purpose of the ABI is to synchronize the flight plan information held between two ATS Units.~~	~~ICD documents can be referred to for the required message format and examples.~~

AIDC Message	Purpose	Message format
	• ~~The transmission of the initial ABI will normally be triggered at an agreed time or position prior to the common boundary or ACI, or possibly by a change in flight state. Before coordination occurs, amendments to information contained in a previously transmitted ABI should be notified by the transmission of another ABI.~~	
EST	• An EST message is used to initiate coordination for a flight. • The transmission of the EST message is used in conjunction with (and generally following) an ABI message and is triggered at an agreed time or position prior to the common boundary or ACI, or possibly by a change in flight state. • The only valid response to an EST message is an ACP message, which closes the coordination dialogue.	Respective ICD documents can be referred to for the required message format and examples.
ACP	• An ACP message is used to confirm that the coordination proposed in a received CPL, CDN, EST or PAC message is acceptable and to close the coordination dialogue. The agreed coordination conditions are updated in accordance with the proposed coordination. • An ACP message is linked to the original AIDC message using message identifier and reference identifier information described in the PAN ICD AIDC Version 1.0, section 3.2 Message Headers, Timers and ATSU Indicators.	Respective ICD documents can be referred to for the required message format and examples.
CDN	• A CDN message is used to propose amendments to previously agreed coordination conditions or coordination proposed in a CPL message or a CDN message. • An initial coordination dialogue following a CPL message is always terminated by an ACP message; otherwise an ATSU receiving a CDN message can indicate that the proposed revision is not acceptable (by replying with an REJ message) or propose an amendment to the proposed coordination by replying with a CDN message.	Respective ICD documents can be referred to for the required message format and examples

AIDC Message	Purpose	Message format
	• If sent in response to another AIDC message, the CDN message is linked to the original AIDC message using message identifier and reference identifier information described in the PAN ICD AIDC Version 1.0, section 3.2 Message Headers, Timers and ATSU Indicators.	
REJ	• A REJ message is used to reject the coordination proposed in a received CDN message and to close the coordination dialogue. The previously agreed coordination conditions remain unchanged. • An REJ message may not be used to close an initial coordination dialogue. • An REJ message is linked to the original CDN message using message identifier and reference identifier information described in the PAN ICD AIDC Version 1.0, section 3.2 Message Headers, Timers and ATSU Indicators.	Respective ICD documents can be referred to for the required message format and examples
TOC	• The TOC message is sent to propose executive control of a flight to the receiving ATSU.	Respective ICD documents can be referred to for the required message format and examples.
AOC	• The AOC message is transmitted in response to a received TOC message to indicate acceptance of executive control of a flight.	Respective ICD documents can be referred to for the required message format and examples.

4.5 Application Management Messages

Table 4-12: Application Management Messages

AIDC Message	Purpose	Message format
LAM	• The LAM is transmitted in response to each AIDC message (except for another LAM or LRM) that has been received, and found free of syntax and semantic errors. • A LAM is linked to the original AIDC message using message identifier and reference identifier information described in the PAN ICD AIDC Version 1.0, Chapter 3 Communications and Support Mechanisms.	Respective ICD documents can be referred to for the required message format and examples.

AIDC Message	Purpose	Message format
	• Non-receipt of a LAM may require local action.	
LRM	• The LRM is transmitted in response to each AIDC message not eligible for a LAM to be sent. • An LRM is linked to the original AIDC message using message identifier and reference identifier information described in the PAN ICD AIDC Version 1.0, Chapter 3 Communications and Support Mechanisms. • The LRM will identify the first message field found that contains invalid information if this field information is available. • Receipt of an LRM may require local corrective action.	Respective ICD documents can be referred to for the required message format and examples.
ASM	• The ASM message is transmitted to an adjacent ATSU to confirm that end-to-end messaging is available with that ATSU. • The transmission of an ASM message normally occurs when no AIDC messages (including Application messages) have been received from the adjacent ATSU within a specified time as defined in bilateral agreement.	Respective ICD documents can be referred to for the required message format and examples.

Table 4-13: PAN ICD AIDC Version 1.0 Messages and their Field Composition

Message	**3** **a b c**	**7** **a b c**	**8** **a b**	**9** **a b c**	**10** **a b**	**13** **a b**	**14** **a b c d e**	**15** **a b c**	**16** **a b c**	**18**	**19**	**20**	**21**	**22**						
														8 **a b**	**9** **a b c**	**10** **a b**	**14** **a b c d e**	**15** **a b c**	**18**	**Text**
ABI	M - -	MOO				M -	MMMOO		M - -					OO	MMM	OO		MMM	O	
CPL	M - -	MOO	MM	MM M	MM	M -	MMMOO	MMM	M - -	M										
EST	M - -	MOO				M -	MMMOO		M - -											
PAC	M - -	MOO				M -	MMMOO		M - -					OO	OOO	OO		OOO	O	
MAC	M - -	MOO				M -			M - -								OOOOO		O	
CDN	M - -	MOO				M -			M - -							OO	OOOOO	OOO	O	O
ACP	M - -	MOO				M -			M - -											
REJ	M - -	MOO				M -			M - -											
PCM	M - -	MOO				M -	MMMOO		M - -					OO	OOO	OO		OOO	O	
PCA	M - -	MOO				M -			M -											
TRU	M - -	MOO				M -			M - -											M
TOC	M - -	MOO				M -			M - -											

Message	3 a b c	7 a b c	8 a b	9 a b c	10 a b	13 a b	14 a b c d e	15 a b c	16 a b c	18	19	20	21	22						
														8 a b	9 a b c	10 a b	14 a b c d e	15 a b c	18	Text
AOC	M - -	MOO				M -			M - -											
EMG	M - -	MOO								M										
MIS	M - -	MOO								M										
LAM	M - -																			
LRM	M - -									M										
ASM	M - -																			
FAN	M - -	MOO				M -			M - -											M
FCN	M - -	MOO				M -			M - -											M
ADS	M - -	MOO				M -			M - -											M

Legend:

M: Mandatory
O: Optional

Chapter 5: AIDC IMPLEMENTATION CONSIDERATIONS

5.1 Introduction

5.1.1 The effectiveness of AIDC functionality depends on many factors, including ATM automation systems, manufacturer of the equipment, Communication network, weather-related factors, operational and technical training, Airspace design, Coordination procedures between different ATSU's, etc. Some problems/difficulties observed during implementation/testing of AIDC procedures are of common nature irrespective of different OEM's and different States. Such problems, their possible cause and their solution evolved over time may be of great help to States in the process of implementing AIDC.

5.1.2 Every effort should be made to avoid common errors through sharing of experiences of ATSUs, who have successfully implemented AIDC.

5.1.3 All States/Administrations have been requested to designate a focal point for AIDC implementation. The updated list is available on ICAO APAC website. In case of any issues, support can be requested through these focal points.

5.2 Pre-implementation Checklist

5.2.1 Prior to the implementation of AIDC, following may have to be considered by ATSUs. ATSUs can choose to adopt these recommendations with their counterparts based on the local requirements.

No.	Considerations	Yes / No	Remarks, if any
i.	AIDC Version	N/A	Version of AIDC ICD adopted by ATSU
ii.	The communications network (e.g. AFTN, etc.) is able to support AIDC operations effectively without overloading the existing infrastructure.		
iii.	List of AIDC messages applicable between the two ATSUs (ABI, EST, CPL, etc.) and parameters are agreed.		AIDC parameters to be included in the LOAs.
iv.	AIDC parameters of ATM automation systems have been configured for the AIDC connection (e.g. parameters for Coordination messages, Enable/Disable AIDC etc.).		
v.	ATM automation systems and associated sub-systems are time synchronized (GPS / UTC).		

No.	Considerations	Yes / No	Remarks, if any
vi.	Comprehensive tests with AIDC use cases completed with pairing ATSUs to ensure correct implementation and avoid unexpected responses.		
vii.	Check and ensure that the Change Over Point (COP) is consistent between the two ATSUs.		
viii.	Procedures to revert to Voice coordination have been defined by ATSUs in cases where deviations from COP cannot be handled by ATM automation systems.		
ix.	Contingency procedures have been published to cover AIDC failures. This procedure shall also address any increase in additional workload as a result of AIDC failure.		
x.	Operational and technical personnel are trained to handle AIDC.		
xi.	Communication network performance latency is monitored and recorded.		
xii.	Standard Operating Procedures (SOPs) for AIDC operations are published. Special cases where AIDC is not applicable have been identified (e.g. VVIP movements).		
xiii.	A Safety Assessment for the implementation of AIDC is carried out.		

5.3 Human Machine Interfaces

5.3.1 ANSPs should clearly specify requirements regarding Human Machine Interface (HMI) for a new ATM automation system or an upgrade. Generally, the following points may be considered:

i. *User friendliness*: choice of presentation in harmony with intended operators' environment (ATC centre), homogeneous and systematic presentation of interactions (similar actions required for similar inputs and similar feedbacks given, in all sub-elements/windows of the displays) ;

ii. *Ergonomics*: fatigue due to postural or musculoskeletal discomfort and eye focal length discomfort should be minimized, and adequate colours, font size, symbols, contrasts and brightness configured;

iii. *Efficiency*: efficient dialogues and guidance for inputs provided by the system, timely and appropriate feedback regarding operators' inputs and errors, efficient and appropriate alert and warning management avoiding unnecessary overload of the operator or the system (the latter due to non-acknowledged alerts/warnings);

iv. *Ease of Learning*: consistency and homogeneity of operators' actions through HMI.

5.3.2 With regard to AIDC, most interactions should be conducted through the label (air situation display) or electronic flight strip. It should not be done via a dedicated message box or flight plan presentation where actions to take/feedbacks/alerts could be overlooked and mis-association of the messages for flights could occur. The AIDC coordination status should also be displayed in Electronic Flight Progress Strips to increase situational awareness regarding the status of flight coordination. Any need to revert to voice communications should be clearly indicated.

5.4 Handling Implementation Issues

5.4.1 Over a period of time during testing and implementation of AIDC across ICAO-APAC region, several error messages and issues were encountered by different concerned ATSUs. Some of these issues are of common nature and some of them may be unique for a particular ATSU. Such messages compiled from various ATSUs are provided in Table 5-1 below, with a brief description of the errors, possible causes and recommended actions. These AIDC issues are not exhaustive and listed as reference only.

Table 5-1: Table of Common AIDC Issues

No.	Fault Category	Fault Description	Cause	Recommended Actions
i.	ATM Automation system	Rejection of AIDC messages by receiving system due to Error message 61, Cyclic Redundancy Check (CRC) Error.	Error is likely because sending ATM automation system is generating extra undesirable spaces	This error can be overcome by making changes in sender ATM automation system so as not to generate any extra spaces while transmitting AIDC messages.
ii.	ATM Automation/AFTN system	Coordination protocol dialogue timeout	Likely non-synchronization of time in the pairing ATM automation/AFTN systems	Automatic time synchronization through GPS servers in ATM automation/AFTN systems at both receiving and sending system is required to be done for smooth exchange of AIDC messages.
iii.	Communication Network	a) Latency in communication network (AFTN link), resulting in	If due to network latency, no automatic system response is received by the sender system in a fixed time, then	Expand the bandwidth of existing AFTN link or increase the message time-out parameter for all

No.	Fault Category	Fault Description	Cause	Recommended Actions
		message time-out errors b) Message timeout errors due to possible re-routing of messages in case of failure of direct AFTN link.	the sender system generates a LTO (time out response).	messages to avoid generation of time ou response.
iv.	Airspace Design/ Procedures	ABI messages of some of the aircrafts are not correlated with Flight plan available in ATM automation system	Rejection of ABI messages exchanged between system due to route error and mismatch in coordination timing. ATM automation system may reject the incoming ABI message because of unrecognised route portion (depends on how common airways are defined in the pairing systems - Some airways may be defined up to a certain extent in next FIR, while others may be defined only up to the FIR boundary)	Modification in airways (like imaginary points) may be considered in the database of both pairing ATSUs ATM systems for effective acceptance of AIDC messages.
v.	AIDC message format	AIDC messages in pre-2012 format		ATM system to be modified to support ICAO FPL 2012 format
vi.	AIDC message format	Some ATM automation systems rejected latitude/longitude represented up to seconds (041627N0733138E).	As per AIDC-ICD seconds is not part of the standard LAT/LONG format	ATM automation system may conform to AIDC ICD
vii.	AIDC message format /training	Incorrect route truncation. Truncated routes are not getting accepted by receiving ATSU.	ICAO route truncation indicator is not supported by many receiving ATSUs. The Asia/Pacific ICD clearly states the rules required for truncating a route after the last known significant route	Manufacturer and States must ensure that ATM automation system must be designed/ changed as per APAC ICD mandated by ICAO. To avoid human errors, a

No.	Fault Category	Fault Description	Cause	Recommended Actions
			point. If these rules are not followed there are significant risks associated with the transmission of incorrect route information to the receiving ATSU. While the majority of instances investigated are the result of human error, there have been occasions when the ATM automation system behaved unexpectedly. With the increasing use of route modifications, the accuracy of route handling and transmission between automated systems need to be ensured.	comprehensive training backed up by regular refresher training is required to be imparted to controllers/system operators.
viii.	AIDC message flow	Non-receipt of ACP messages within designated time span results in unnecessary LRM messages	In some of the ATM automation systems, there is no provision of automatic acceptance of EST messages and messages are accepted manually at receiving ATSU.	It is recommended that AIDC messages like EST are accepted automatically to avoid frequent LRM messages.
ix.	AIDC message flow	Even after sending a rejection (REJ) or counter coordination message (CDN) by receiving ATSU, the transmitting ATSU continues to send the CDN message	Unnecessary/ multiple generation of automatic CDN messages by transmitting ATSU, without waiting for an acknowledgement, might be due to system getting into some loop or may be due to some other system problem	As per PAN-ICD protocol, transmitting system must wait to receive response for a CDN message. This response may be ACP, REJ or CDN. The temporary solution may be to stop automatic generation of CDN messages by the system.

5.5 HMI Considerations

ATSUs should consider the following recommendations for configuration of the ATM automation systems for AIDC HMI presentation:

i. AIDC HMI should allow some flexibility to initiate or respond to AIDC messages (if required).

ii. The ATM automation system should allow to define the mode of ~~Message~~ message exchange off-line for AIDC i.e. fully automatic or manual. For example, automatic/manual responses for the messages like EST, CPL, PAC, CDN, etc.

iii. The ATM automation system should allow users to specify which optional amendment fields of an AIDC message are to be exchanged.

iv. Dedicated AIDC message exchange window to display readily the current status and actual content of messages exchanged should be considered. In addition, AIDC message exchange status may preferably be considered to be displayed via the data block of individual aircraft on the Air Situation Display.

v. ATM automation system should allow the creation of flight data record on receipt of an ABI message, if a flight data record is not available to minimize the possibility of LRM messages in case flight plan is not available in the receiving ATSU.

vi. The use of colour to distinguish the various states of AIDC process may be considered.

Chapter 6: HARMONIZATION FRAMEWORK FOR AIDC IMPLEMENTATION

6.1 Introduction

6.1.1 This chapter describes the steps that should be taken to harmonize AIDC implementation between ATSUs. As the successful transmission and reception of AIDC messages are dependent on various external factors, the need to harmonize implementation plans and timelines if AIDC implementation is to be successful.

6.1.2 AIDC messages can be transmitted through existing AFTN networks or by the use of dedicated data channels between ATSUs. There may be a need to upgrade existing infrastructure to cater for sufficient bandwidth for handling AIDC messages.

6.1.3 The framework details and template are described in greater detail in the next section.

6.2 Harmonization Framework

The various items that will require harmonization between ATSUs are listed below. These are the minimum required and individual ATSUs may choose to include additional items as required. A coordinated approach to implementing AIDC is crucial to allow ATSUs to improve on coordination efficiency and remove associated errors that could arise with manual voice coordination.

6.2.1 Bilateral Agreements

6.2.1.1 The use of AIDC messages in the provision of ATC services will usually require harmonization of ATC procedures to allow ATSUs to take advantage of the message automation. This will require an update to existing bilateral agreements between ATSUs with regards to the coordination process and the various AIDC-related arrangements.

6.2.2 ATC Procedures

6.2.2.1 With the introduction of AIDC messages for use in the provision of ATC services, existing ATC procedures may need to be reviewed or modified to incorporate these AIDC messages as part of the ATC procedures. E.g.: the use of EST for coordination may reduce the need for voice coordination between ATSUs.

6.2.3 ATS Routes

6.2.3.1 AIDC messages are used to improve the coordination processes between ATSUs. These messages can be used selectively on specific ATS routes/waypoints as agreed by the ATSUs involved. The various ATS routes and coordination waypoints will need to be defined and agreed between the ATSUs to facilitate AIDC implementation.

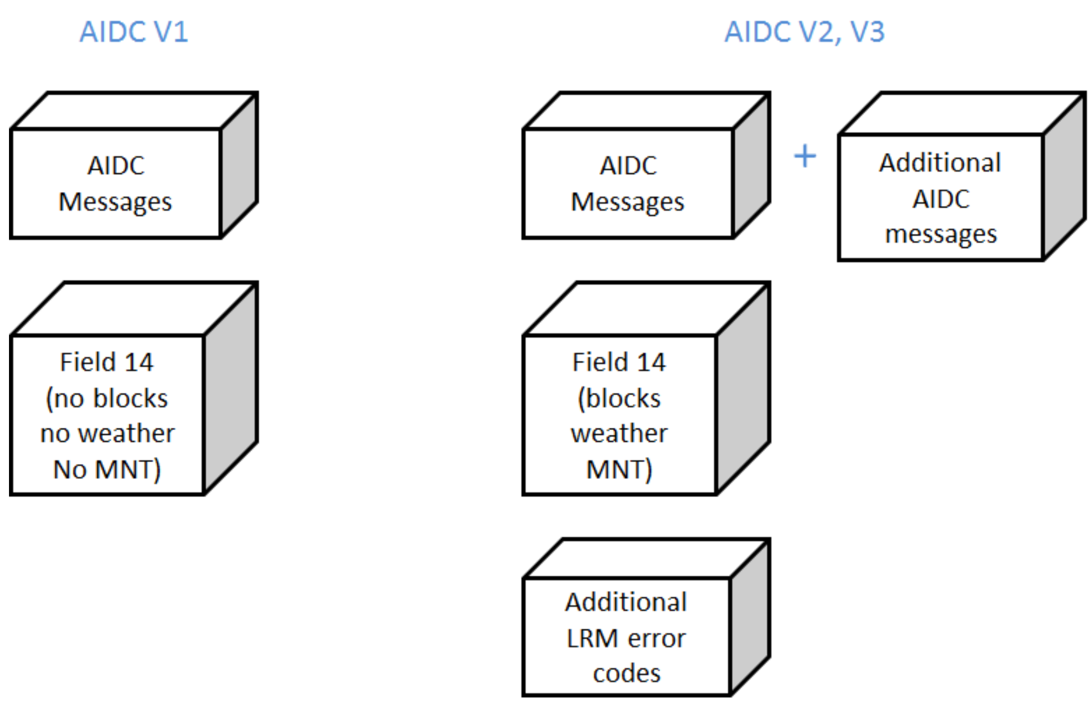
6.2.4 AIDC Version

6.2.4.1 Even though the latest AIDC version is backward compatible to a large extent, there may be instances where certain version-specific messages may result in errors between two ATM automation systems. Ideally both ATSUs should use the same AIDC version. If however different versions are deployed, the ATSUs should coordinate closely and reach an agreement for operating AIDC using a common set of messages.

6.2.4.2 The enhancements introduced during the development of AIDC ICD Version 2 and 3 were designed to permit continued interoperability with AIDC ICD Version 1. For example, when a block level format was defined for Field 14, it was explicitly stated that this was an optional format only to be used with agreement between the two ATSUs.

6.2.4.3 The following diagram depicts the significant differences between AIDC Version 1 and the subsequent AIDC versions. Compatibility of AIDC versions is covered in PAN ICD Version 1.0.

Figure 6-1: Differences between Versions of AIDC



6.2.4.4 The diagram shows that AIDC messages supported in AIDC Version 1 is included in AIDC V2 and V3. As such, an AIDC V1 ATSU is interoperable with an AIDC V2 or 3 ATSU. The additional messages in AIDC V2 and V3 are not supported by AIDC V1. However, this could easily be controlled procedurally by simply not sending these messages.

6.2.5 AIDC Messages

6.2.5.1 The implementation of AIDC does not require the use of all the defined AIDC messages. ATSUs will need to define the specific AIDC messages to be used for ATC services and also the related parameters that will be configured for these messages

6.2.6 Communication Network

6.2.6.1 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.

6.3 Template of Harmonization Framework for AIDC Implementation

Table 6-1: Harmonization Framework for AIDC Implementation between ATSU1 and ATSU2

No.	Harmonization items	Description	Remarks
1	Bilateral agreements	• Date of implementation to be stated in bilateral agreement e.g. LOA or MOU between ATSUs. • AIDC messages and parameters to be implemented • ATS routes /coordination points to be determined • Agreed fallback procedures in the event of unsuccessful message exchanges • AIDC suspension conditions • Communication network for AIDC messaging (e.g. AFTN, dedicated line, etc.)	Sample LOA/MOU are available in Appendix A
2	ATC Procedures	• Agreed AIDC message parameters and activation conditions by both ATSUs. • Fallback procedures in the event of AIDC failure.	
3	ATS Routes	• ATS routes • Coordination points	

No.	Harmonization items	Description	Remarks
4	AIDC Version	• AIDC version to be used by ATSUs	If different versions are deployed, the ATSUs should coordinate closely and reach an agreement for operating AIDC using a common set of messages.
5	AIDC Messages	• List of AIDC messages to be exchanged	List of core messages
6	Communication Network	• Infrastructure required (e.g. communications connection) • Alternate/backup links in the event of failure of primary transmission channel.	

Chapter 7: AIDC PERFORMANCE MONITORING AND VALIDATION

7.1 Introduction

7.1.1 AIDC is recognized as an effective tool to foster better collaborative air traffic management between concerned ATSUs of adjacent FIRs, supporting the ICAO ASBU Module B0-FICE, identified as one of the regional priority modules under the ICAO Asia/Pacific Seamless ATM Plan.

7.1.2 In addition, safety issues relating to human errors in ATS transfer were identified by the 18th and 20th Meetings of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/18 and RASMAG/20 meetings) where AIDC was considered as an important means of mitigating Large Height Deviation (LHD*[Note 1]).

7.1.3 The procedures described in this section aim to ensure system performance by validation, reporting and tracking of possible problems revealed during system monitoring with appropriate follow-up actions.
**Note 1*: Large Height Deviation (LHD) means any vertical deviation of 90m/300ft or more from the flight level expected to be occupied by the flight.

7.2 AIDC Performance Criteria

7.2.1 The efficiency gained by adopting AIDC is significant. With continued growth in ATC traffic, higher efficiency and benefits from the introduction of AIDC can be anticipated.

7.2.2 However, if AIDC messages are not transmitted and received in a timely manner between ATM automation systems, potentially there will be increased risk if AIDC does not meet the performance criteria as aircraft might cross boundaries without coordination or transfer of control responsibility taking place.

7.2.3 In order to effectively use the AIDC application for the interchange of ATC coordination data, performance requirements need to be specified. These specified performance requirements need to be mutually agreed between neighbouring ATSUs implementing AIDC. The following are recommended performance parameters for application response time and operational response time

7.2.4 Application Response

7.2.4.1 Every AIDC message received by an ATSU, except a LAM or LRM, shall be responded to with a LAM or LRM. While no LAM is generated for a valid LRM, an ATSU may choose to respond to an invalid LRM with an LRM. Such a response is termed an Application Response, and is generated automatically by the ATM automation system. A LAM shall be transmitted when the receiving ATM automation system found the received message to be syntactically correct and the message data was accepted for further processing or presentation. Otherwise, an LRM message shall be transmitted.

7.2.4.2 The timeout value T_{alarm} associated with an application response should typically be less than 180 seconds measured from the transmission time of the original message and may be specified by bilateral agreement, corresponding to the nominal value associated with the accountability timer.

7.2.4.3 The transmission of an application response should be triggered after the semantic and syntactic checks have been performed on the incoming message. This is because the purpose of an application response is to indicate that a received AIDC message has both been received and is semantically and syntactically correct. Failure to receive an expected application response (i.e. a LAM or LRM) within Tr seconds ($\leq T_{alarm}$) shall result in a re-transmission (up to a maximum number Nr) of the original message. The timeout timer Tr shall be reset upon re-transmission. Failure to receive an application response within T_{alarm} seconds from the original transmission of the message shall result in a warning being issued.

7.2.4.4 The transmission of a LAM or LRM shall be triggered by the ATC application process, not the communications process. This is because an application response indicates that the received message was examined by the ATC application process(s), not just the communications functions. Note the distinction between an ATC application process, which implements a critical ATC function such as Coordination or Transfer of Control, and a communications process, which is responsible for the reliable delivery of data, but not data interpretation.

7.2.4.5 Receipt of an LRM should cause the ATSU to take a corrective action before re-transmitting the rejected message with a new message identification number. This corrective action may be automatic or manual.

7.2.5 Operational Response

7.2.5.1 Several AIDC messages require a response, in addition to the normal application response, by another AIDC message. Such a response is termed an Operational Response.

Table 7-1 below indicates the required response to a received message. AIDC messages not listed in Table 7-1 have no operational response.

Table 7-1: Required Operational Response

Received Message	**Required Operational Response**
CPL	ACP or CDN[Note]
EST	ACP
PAC	ACP
CDN	ACP,CDN, or REJ[Note]
PCM	PCA
TOC	AOC

Note.: An REJ is not available in an Initial Coordination Dialogue initiated by a CPL, EST or PAC. An REJ is only available in a CDN dialogue while an REJ is not a valid response to a CDN message within an Initial Coordination Dialogue.

7.2.5.2 Failure to receive a response within an adapted operational response timeout period T_{op} shall result in a warning being issued.

7.2.5.3 The value of T_{op} is dependent on whether manual processing is required to generate the operational response. In general, T_{op} should be less than a value when a manual action is required to trigger the operational response.

7.2.5.4 For example, the performance requirements specified in Asia/Pacific Regional Interface Control Document (ICD) v3.0 are as follow:

Table 7-2: Performance Figures

T_{alarm}	180 seconds
T_{op}	≤600 seconds

7.2.5.5 The performance of the AIDC will also rely on the performance of the communication network: AMHS/AFTN, and communication layer such as Common IP-based networks. In this connection, the following end-to-end communication requirements based on Common aeRonautical Virtual Private Network (CRV) may be considered between any two AIDC peers:

Maximum One-Way Latency (ms): 300 ms

Maximum Round Trip Time (ms): 600 ms

Normally, the latency of the communication network (in msec) is sufficient to support to the application of AIDC (in second), for example, each AIDC message sent will result in at least one technical response (LAM or LRM), and where necessary an operational response (e.g. EST/ACP, TOC/AOC). Some AIDC application timeout with reference to the agreed ICD as mentioned above is required to be set based on performance of the communications circuit.

7.2.6 Reliability

7.2.6.1 Reliability is a measure of how often a system fails and is usually measured as Mean MTBF expressed in hours. Continuity is a measure equivalent to reliability, but expressed as the probability of system failure over a defined period. In the context of this document, failure means inability to deliver AIDC messages to the adjacent ATSUs. This includes the failure of AIDC functions only. For the other factors such as the failures of communication link and the counterpart AIDC functions are not counted in this document. The reliability performance requirement of AIDC is given in ICAO Doc 9694 “Manual for Air Traffic Services Data Link Applications” (99.9%).

7.2.7 Availability

7.2.7.1 Availability is a measure of how often the system is available for operational use. It is usually expressed as a percentage of the time that the system is available.

7.2.7.2 Planned outages are often included as outages because the efficiencies provided to the Industry are lost, no matter what the cause of the outage. However, some organisations do not include planned outages because it is assumed that planned outages only occur when the facility is not required.

7.2.7.3 Availability is calculated as

Availability (Ao) = MTBF/(MTBF+MDT)

where MTBF= Mean Time Between SYSTEM Failure
MDT = Mean Down Time for the SYSTEM

The MDT includes Mean Time To Repair (MTTR), Turn Around Time (TAT) for spares, and Mean Logistic Delay Time (MLDT)
NB: This relates to the failure of the system to provide a service, rather than the time between individual equipment failures. Some organizations use Mean Time Between Outage (MTBO) rather than MTBF.

7.2.7.4 Availability is directly a function of how quickly the SYSTEM can be repaired, that is directly a function of MDT. Thus availability is highly dependent on the ability & speed of the support organisation to get the system back on-line. The availability performance requirement of AIDC is given in ICAO Doc 9694 “Manual for Air Traffic Services Data Link Applications” (99.996%).

7.3 AIDC Performance Monitoring

States/Administrations are encouraged to submit identified issues using the AIDC issues form to the ICAO Regional Office for consolidation.

7.3.1 The Monitoring Process

7.3.1.1 When problems/issues are discovered, the initial analysis should be performed by the organization(s) identifying the problem/issues. In addition, the problem/issue should be logged in the AIDC issues table. As some problems or abnormalities may involve more than one organization, the originator should be responsible for follow-up action to rectify the problem and take lead to record the information in the AIDC issues table. It is essential that all information relating to the problem/issue is documented and recorded and resolved in a timely manner.

7.3.1.2 The following groups should be involved in the monitoring process and problem/issue tracking to ensure a comprehensive review and analysis of the collected data:

i. ATS Providers;
ii. Organizations responsible for ATS system maintenance (where different from the ATS provider);
iii. Relevant State regulatory authorities; and
iv. Communication Service Providers being used (if appropriate).

7.3.1.3 To quantify the safety benefits of AIDC implementation, number of LHDs prior to and post AIDC implementation should be noted and recorded for analysis.

7.4 AIDC Validation

7.4.1 Validation Guidelines

7.4.1.1 ATSUs should conduct a validation process before introduction of their new AIDC functionality and procedures. Such processes shall include before and during implementation:

i. A system safety assessment for new implementations is the basis for defining system performance requirements. Where existing systems are being modified to utilize additional services, the assessment shall demonstrate that the ATS Provider's system will meet safety objectives;
ii. Integration test results confirming interoperability for operational use of AIDC messages; and
iii. Establishment of the Operational Instruction (OI)/ Letter of Agreement (LOA) or Memorandum of Understanding (MOU) between ATSUs and mutual agreement on the associated parameters for the set of AIDC messages to be implemented.

7.4.2 Safety assessment

7.4.2.1 In accordance with the provisions of ICAO SMS manual (Doc9859), the objective of the system safety assessment is to ensure the ATSUs that the introduction and operation of AIDC is safe. The safety assessment should be conducted for initial implementation as well as any future enhancements and should include:

i. Identifying failure conditions;
ii. Assigning levels of criticality;
iii. Determining risks/ probabilities for occurrence;
iv. Identifying mitigating measures and fall back arrangements;
v. Categorizing the degree of acceptability of risks; and
vi. Operational hazard ID process
vii. HMI verification

7.4.2.2 Following the safety assessment, ATSUs should institute measures to offset any identified failure conditions that are not already categorized as acceptable. This should be done to reduce the probability of their occurrence to a level as low as reasonably practicable. This could be accomplished through system automation or manual procedures.

7.4.3 Integration test

7.4.2.3 ATSUs should conduct AIDC trials (both operational and technical) with adjacent ATSUs to ensure they meet the operational and technical requirements stated in the agreed test procedure. Examples of Interoperability tests and Technical trials are provided in Appendix A and B respectively.

7.4.3 Agreement for Validation

7.4.3.1 States should coordinate with pairing ATSUs to confirm that their tests procedures ensure harmonization of procedures during testing.

7.4.4 Distribution of information

7.4.4.1 It is important that information that may have an operational impact on other parties be shared by States/Administrations and distributed by the ICAO Regional Office, as soon as possible. In this way, each party is made aware of problems already encountered by others, and may be able to contribute further information to aid in the solution of these problems.

Chapter 8: AIDC TRAINING

8.1 Introduction

8.1.1 Training is one of the key elements for preparing operators on AIDC and to provide guidance on both AIDC technical and operational procedures. A comprehensive training program will ensure operational and technical personnel have a better understanding on how AIDC works, interface between AIDC and ATS system and skills required to operate AIDC. Training program should be reviewed and updated when changes are planned.

8.1.2 Air traffic controller training is defined with specified regulations, international and domestic, that prescribe minimum requirements for organizations certified for such a training. These requirements include creation of the:

i. Implementation Plan
ii. Operations Manual
iii. Technical Manual
iv. Training Program

8.1.3 In order to provide safe, orderly and efficient flow of air traffic and to ensure harmonized training process, each country needs to provide a sufficient AIDC training. This training should increase the performance of operational and technical personnel and improve overall air traffic safety and efficiency.

8.2 Training Objectives

8.2.1 Taking into consideration that operational and technical trainees come from various backgrounds and different levels of competency, a structured training program/module is recommended incorporating AIDC objectives. This would enable operational and technical personnel to have the acceptable level of understanding on how AIDC work. The objectives would be:

i. To instil knowledge by imparting AIDC concepts, , skills and techniques. To educate trainees on the benefits of AIDC and how it can reduce controller's workload.
ii. To increase efficiency and reduce human errors by incorporating AIDC automation.

8.3 Training Principles and Techniques

8.3.1 The following should be taken into consideration prior to conducting AIDC training:

i. Operational and technical personnel may come with different levels of experience, knowledge, skill, attitude and age.
ii. AIDC training includes theoretical and practical training.
iii. Participant evaluation/feedback for each training session is important to ensure trainees fully understand the principles and objectives of AIDC.

8.4 Training Procedure

8.4.1 It is recommended that following training procedure should be used as a guidance for AIDC training:

i. Instructor should be competent in AIDC as well as instructional techniques. On the basis of AIDC analysis and description, progressive lesson plan should be prepared.
ii. Human factors with regard to introduction of AIDC should be covered during the training. Trainees should be prepared to accept changes in their working environment. The loss of cognitive functions with the introduction of AIDC automation as compared to voice coordination should be emphasized.
iii. The training program with respect to structure, flow and sequence of AIDC functions should be clearly presented.
iv. All relevant documents such as appropriate version of AIDC ICD, local AIDC procedures, AIDC technical manuals etc., should be made available before conducting AIDC training session.
v. During the AIDC training, assessment of operational and technical personnel's competency in AIDC should be conducted.

8.5 Scope of Training

8.5.1 The scope of training would depend upon the categories of personnel to be trained. Training is a continuous process and not only needed for operational personnel but also for technical personnel involved in AIDC. The level of training will differ as operational personnel will focus more on operational aspects and technical personnel will focus more on technical aspects of AIDC.

8.5.2 Basic cross learning of operational and technical elements of AIDC will help both operational and technical personnel to identify and respond to any abnormality that may arise during AIDC operations.

Table 8-1: Scope of Operational and Technical Training

No	Scope of training	Operational Personnel		Technical Personnel	
		Theory	**Practical**	**Theory**	**Practical**
i	Introduction to AIDC	Essential	Essential	Essential	Essential
ii	AIDC phases, message flow and functions	Essential	Desirable	Recommended	Essential
iii	Communication network	Recommended	Desirable	Essential	Essential
iv	AIDC parameters	Essential	Desirable	Essential	Essential
v	AIDC outages.	Recommended	Desirable	Essential	Essential
vi	Contingency procedures	Essential	Essential	Essential	Essential

8.5.3 AIDC operations training should normally cover the following for both Theory and Practical. Practical training on AIDC HMI and message flow may be conducted on ATM automation system simulator or procedure trainer.

8.5.3.1 Introduction to AIDC:

i. AIDC reference documentation should be made available in advance prior to the training.
ii. Highlight the benefits of introduction of AIDC.
iii. Human factors with regard to introduction of AIDC.
iv. Highlight the contingency procedures in the event of AIDC failure/suspension..

8.5.3.2 AIDC phases, message flow and functions:

AIDC is divided into three different phases:

i. Notification phase (including pre-notification),
ii. Coordination phase and
iii. Transfer phase and each phase will operate with different AIDC messages.

Understanding of these phases will help operational and technical personnel to differentiate the usage of each AIDC message. Appropriate versions of ICDs may be referred to for detailed description of different AIDC phases and message flow. Practical training of AIDC functions on a simulator may be considered as appropriate.

8.5.3.3 Communication Network:

ATSUs use ATS Message Handling System (AMHS), Aeronautical Fixed Telecommunication Networks (AFTN) and/or any other medium as appropriate for exchanging data. Accordingly, the structure and routing details of the communication network should be made available during training for better understanding for both operational and technical personnel.

8.5.3.4 AIDC parameters:

Each AIDC message has its own parameters which will be based on mutual agreement between the participating ATSUs. Operational personnel should know the relevant AIDC message parameters to be configured. . Technical personnel should be able to understand and configure these parameters.

8.5.3.5 AIDC outages:

Reasons of common AIDC outages should be highlighted. Operational personnel should be able to recognize and react to the issue appropriately. Problems may be caused by hardware and/or software. Once AIDC issue is reported, technical personnel should follow recommended procedures to resolve the issue. Appropriate flow chart for fault isolation and resolution needs to be developed by the individual ATSUs.

8.5.3.6 Contingency procedures:

AIDC recovery and contingency procedures shall be the part of AIDC training program. Contingency procedures should be applied when any of the following conditions are faced:

i. ATM automation system outages
ii. AIDC connection issues,
iii. Adverse weather conditions,
iv. Any other conditions as agreed in the LOA.

Voice coordination is required if there is a tactical requirement to a particular aircraft such as 10 minutes separation with no closing speed, imposed Mach number to a particular aircraft etc.

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Appendix A

Sample Letter of Agreement (LOA) /Memorandum of Understanding (MOU)

Auckland Oceanic – Brisbane ATS Centre

Letter of Agreement

Coordination – General

Transfer of Control Point	The Transfer of Control Point (TCP) should be either on receipt of an Acceptance of Control (AOC) to a Transfer of Control (TOC) or the common FIR boundary, whichever occurs first. The TCP should also be the point of acceptance of primary guard. All ATS units should coordinate an estimate for the FIR boundary at least thirty (30) minutes prior to the boundary. Such coordination constitutes an offer of transfer of responsibility. After the estimate for the FIR boundary has been sent, units should coordinate any revised estimate that varies by 3 minutes or more.
Communication Systems	Use of communications systems coordination between adjacent units should be in the following order of priority: a. ATS Interfacility Data Communication (AIDC) b. AIDC messages and procedures are specified in the following sections; c. ATS direct speech circuits; d. International telephone system; e. Any other means of communication available.
AIDC Messages	AIDC message format will be in accordance with the Pan Regional Interface Control Document (PAN ICD) for AIDC, as amended from time to time, unless described otherwise in the LOA. Successful coordination via AIDC occurs on receipt of an ACP message in response to an EST message. Each centre should advise the other of any known equipment outage that affects AIDC.
AIDC Message Parameters	The following table details the AIDC parameters and message to be used.

Message	Parameter	Notes
ABI	EUROCAT: 5-60 minutes prior to COP (Note: An updated ABI will	ABI is sent automatically and is transparent to controller. ABI automatically updates flight plan.

Message	Parameter	Notes
	not be sent once an EST has been sent) OCS: 40 minutes prior 50nm expanded boundary	
EST	EUROCAT: 40 minutes prior to COP OCS: 40 minutes prior 50mn expanded boundary	Any changes to EST level or estimate conditions as detailed in LOA to be notified by voice after initial coordination completed. See notes below on voice procedures. EST is required to track generation in EUROCAT.
ACP	EUROCAT: Sends automatic ACP on receipt of EST OCS: Sends automatic ACP on receipt of EST	EUROCAT: If ACP not received within 4 minutes the sending controller is alerted. Sending controller will initiate voice coordination if ACP is not received within 4 minutes of sending EST. Receiving controller will initiate voice coordination if proposed EST conditions are not acceptable. OCS: If ACP is not received within 5 minutes the sending controller is alerted. Sending controller will not initiate voice coordination if ACP is not received within 5 minutes of sending EST. Receiving controller will initiate voice coordination if proposed EST conditions are not acceptable.
TOC	EUROCAT: Sent automatically 5 minutes prior to boundary OCS: Sent automatically 2 minutes prior to boundary	
AOC	EUROCAT: Sent automatically on controller acceptance of a TOC OCS: Sent automatically on receipt of a TOC	
CDN	EUROCAT: Manually by the controller when required	• Responses to the CDN should be ACP or REJ only – there will be no CDN negotiations. • CDN messages will be sent by Brisbane only to revise coordination on eastbound flights. • CDN messages may be used to coordinate changes to estimate or assigned altitude only.

Message	Parameter	Notes
		• Only on CDN dialogue may be open per aircraft at any time. • Not to be used if the aircraft will not be maintaining the assigned altitude 10 minutes prior to the TCP.
MAC	As per ICD	
LRM	As per ICD. Controller alerted on receipt	
LAM	As per ICD. Controller alerted on non-receipt	

Amendment to Flight Data Record

Route amendment – routes/waypoints may be added/deleted as long as they do not change the original intent or integrity of the flight plan information.

Truncation – where route amendment outside the FIR unavoidable:

a. Terminate the route details at the farthest possible 'flight planned' point of the flight outside the FIR and enter "T" immediately following this.

b. If insufficient 'flight planned' point exist outside the FIR for truncation, insert the first 'defined' point in the adjoining FIR and enter "T" immediately following this.

c. The minimum acceptable truncation point must be at least the first point in the adjoining FIR.

d. Every effort is to be made to truncate the route at a minimum of one point beyond the adjacent international FIR to provide an entry track in to that FIR.

Address Forwarding and Next Data Authority

Brisbane ATSC and Auckland OAC should send automatic Next Data Authority (NDA) and Address Forwarding (CAD) for data link aircraft as per the following table:

Brisbane ATSC	Auto NDA sent 22 minutes prior to the FIR boundary Auto CAD sent 20 minutes prior to the FIR boundary
Auckland OAC	Auto NDA sent 40 minutes prior to the FIR boundary Auto CAD sent 35 minutes prior to the FIR boundary

Voice Coordination

Voice coordination is not required when AIDC messaging has been successful to offer and accepts transfer of control.

However, the receiving controller will initiate voice coordination if the proposed AIDC EST conditions are not acceptable.

If AIDC messaging is not to be sent following voice coordination, it should be stated as part of the voice coordination by use of the phrase "AIDC messaging will not be sent". A read back is required.

Voice Coordination is required for aircraft operating under any of the following conditions:

- block level clearance;
- weather deviations;
- offset track; or
- Mach Number technique.

Read backs should comprise all elements of the voice coordination passed by the transferring controller. Read back by the receiving unit confirms acceptance of the offer of transfer of control subject to any other conditions negotiated.

Hemstitch Flights

A hemstitch flight is any flight that will remain within the New Zealand FIR for less time than the NDA VSP (40 minutes) prior to the flight entering the Brisbane FIR.

Auckland AOC should voice coordinate any hemstitch flight.

Near Boundary Operations

ATS units should relay significant details of any flight which is, or intends operating within fifty nautical miles (50NM) of the common FIR boundary.

HF Frequencies

Brisbane ATC and Auckland ATC should update each other as to the current voice backup frequency for use by ATC data link equipped aircraft.

Appendix B

Sample of AIDC Interoperability Tests

Between Hong Kong New ATMS and Manila ATMS

1. Background

The Hong Kong new ATM System (ATMS) comes with fully integrated AIDC functionality. Hong Kong would like to arrange with Manila ACC to conduct AIDC technical and interoperability test prior to the new ATMS being put into live operation.

Subject to test result and mutual agreement, a plan for the commissioning of AIDC operations between Hong Kong and Manila can be formulated.

2. Scope

AIDC interoperability test for Hong Kong new ATMS with Manila ATMS is to be conducted. Selected AIDC messages (EST, ACP, LAM and LRM) are to be tested, using live or pseudo data, matching with both ACC's concept of operation.

3. Prerequisite

Technical test between Hong Kong new ATMS and Manila ATMS has been completed to ensure CRC algorithm is matched and connection is established. The full set of AIDC messages supported by the ATMS/Manila ATMS other than those selected for operation use will also be covered in the technical test.

4. Test Configuration

<u>AFTN Address for AIDC Test</u>

Hong Kong ATMS **VHHH**[redacted]

Manila ATMS **RPHI**[redacted]

<u>CRC-CCITT Scheme</u>

XMODEM (NULL_INIT)

<u>Protocol and Message Type</u>

AIDC Version: Version 3.0

Message Type: **EST, ACP, LAM, LRM**

Note: Block Level and Speed should not be used in EST

Figure 1 below summaries the AIDC interoperability test configuration:

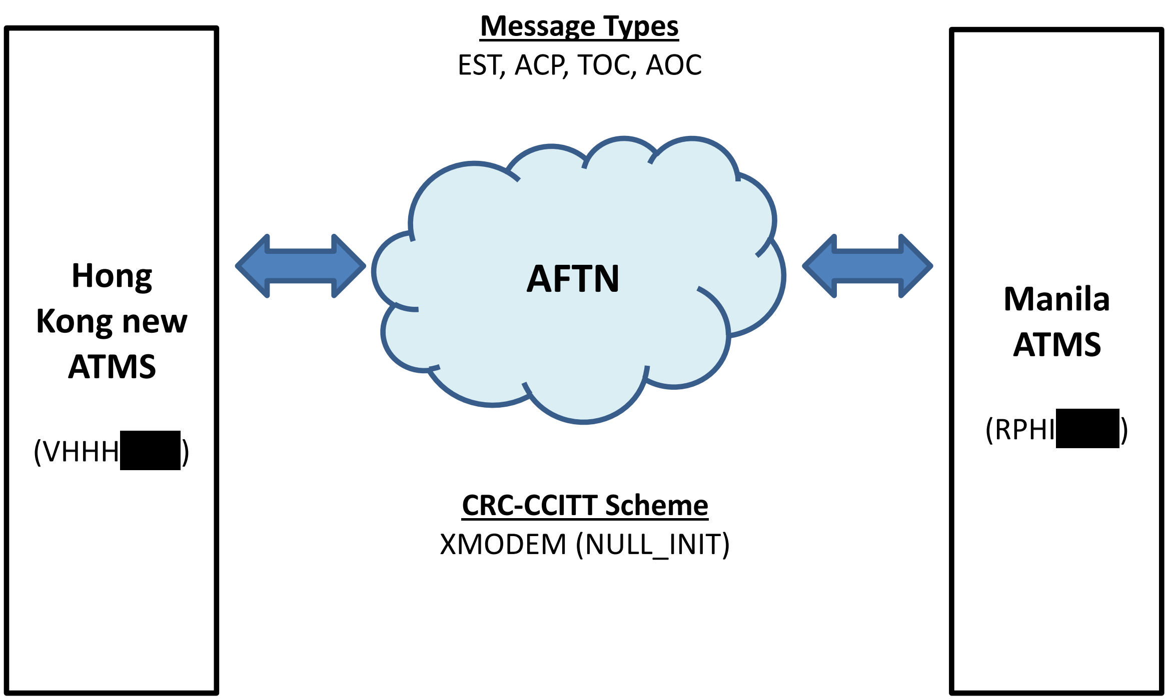

Figure 1 – AIDC Interoperability Test Configuration

5. Hong Kong New ATMS AIDC Operation and Parameters

- Accountability Timer (Application Response Time Out): 45 seconds
- No. of Retransmission upon Application Time Out: 2
- EST is sent automatically, at an adaptable time prior to Estimate Time Over (ETO) the FIR boundary fix for the flight. For test purposes, this adaptable time will be set to 16 minutes and the system check cycle is 1 minute , therefore it can be expected that the EST will be sent between 15 to 16 minutes prior to the flight's ETO the transfer fix.
- Upon receiving an EST, the system will respond with an ACP if the details match with a valid flight plan, otherwise a LRM will be sent.
- 'Revision' and coordination (such as weather deviation, non-FLAS/non-standard level requests etc.) are expected to be conducted verbally through the IASC circuit as per the current practice.

- Hong Kong would like to bring up the following scenarios and the corresponding proposed procedures for discussion. The aim is to reach consensus between Hong Kong and Manila for a mutually agreed operation procedure which could match both systems capability and mode of operation.

  (a) For a flight towards Manila ACC, if prior coordination is required (e.g. HK requests to use a non-standard level) before an EST is sent to Manila, HK will coordinate with Manila using IASC. If the request is approved by Manila, HK prefers to 'transfer' the flight to Manila verbally and no EST would be sent. Would this proposed workflow be acceptable to Manila?

  (b) In reverse, for a flight towards HK ACC, if prior coordination is required before an EST is sent to HK, if the request is approved by HK, HK prefers Manila to 'transfer' the flight to HK verbally and HK would manually enter the 'transfer' information into HK's new ATMS. Is it feasible for Manila not to send any EST to HK in this case?

6. Propose Test Schedule

Technical Test: 28 December 2015

Interoperability Test: 29 December 2015 (also as a backup for Technical Test)

7. Contact Points

Interoperability Test

	Hong Kong
Name	[redacted]
Telephone	[redacted]
Mobile	[redacted]
Email	[redacted]

	Manila	
Name	[redacted]	[redacted]
Telephone	[redacted]	[redacted]
Mobile	[redacted]	[redacted]
Email	[redacted]	[redacted]

Technical

	Manila
Name	[redacted]

Telephone	[redacted]
Mobile	[redacted]
Email	[redacted]

	Hong Kong	
Name	[redacted]	[redacted]
Telephone	[redacted]	[redacted]
Mobile	[redacted]	[redacted]
Email	[redacted]	[redacted]

8. Interoperability Test Procedure

- The test scenarios include inbound, outbound and overflights via NOMAN, SABNO and ASOBA under various situations.

- The proposed test scenarios use pseudo flight plans. Hong Kong new ATMS has live flight plan and surveillance data feeds and would prefer to use target of opportunity at the time of testing. If target of opportunity is not available, Hong Kong can still use pseudo flight plans as detailed in the test cases below.

- The Test Conductor / Point of Contact (POC) of Manila and Hong Kong shall log in the remarks box the time (HHMMSS in UTC) of each message being sent or received for AIDC messages latency checking.

- Effective and instantaneous communication is required during the AIDC test.

- Hong Kong suggests using generally available instant message applications such as Whatsapp (most prefer), Line, WeChat, Skype etc. between the POCs during the AIDC test for communication. As per Manila's suggestion, viber will be used.

8.1 Departure from VHHH to RPLL via NOMAN

Event Triggered by VHHH ACC	Event Triggered by Manila ACC	Confirmation	Remarks/Result
(FPL-TEST1-IS-A333/H-SDE3GHIJ4J5RWYZ/HB1-VHHH0200 -N0483F370 OCEAN V4 NOMAN A461 AVMUP W16 OLIVA OLI1A-RPLL0131 RPLC -PBN/A1B1C1D1O1S1 NAV/GBAS COM/CPDLC DOF/xxxxxx REG/RPC3343 EET/RPHI0029 SEL/LQEG PER/C)			
8.1.1 EST sent to MNL ACC		Coordinate with MNL's POC if **EST** message was received.	
	8.1.2 LAM sent to VHHH.	Coordinate with VHHH's POC if **LAM** message was received.	
	8.1.3 ACP sent to VHHH ACC	Coordinate with VHHH's POC if **ACP** message was received.	
8.1.4 LAM sent to MNL ACC		Coordinate with MNL's POC if **LAM** message was received.	

8.2 Departure from RPLL to VHHH via NOMAN

Event Triggered by VHHH ACC	Event Triggered by MNL ACC	Confirmation	Remarks/Result
(FPL-TEST2-IS-A320/M-SDFGHIRWY/H-RPLL0200 -N0451F340 CAB1A CAB A461 NOMAN V531 BETTY-VHHH0152 VMMC -PBN/A1B1C1D1O1S2 NAV/GBAS SBAS DOF/xxxxxx REG/RPC3271 EET/VHHK0103 SEL/LSJP PER/C RMK/TCAS EQUIPPED)			
	8.2.1 EST sent to VHHH ACC	Coordinate with VHHH's POC if **EST** message was received.	
8.2.2 LAM sent to MNL ACC		Coordinate with MNL's POC if **LAM** message was received.	
8.2.3 ACP sent to MNL ACC		Coordinate with MNL's POC if **ACP** message was received.	
	8.2.4 LAM sent to VHHH ACC	Coordinate with MNL's POC if **LAM** message was received.	

8.3 Overflight Transiting VHHK and RPHI via SABNO

Event Triggered by VHHH ACC	Event Triggered by MNL ACC	Confirmation	Remarks/Result
(FPL-TEST3-IS-A320/M-SDFGHIRWYZ/LB1-ZGSZ0200 -N0465F350 SIERA DCT ROCCA DCT SKATE V5 SABNO/N0461F370 A583 AKOTA M754 VINIK M522 NODIN DCT ALBIT DCT KAPRI DCT UBMIK DCT VJN DCT-WBKK0249 WBKL WBKS -PBN/A1B1C1D1O1T1 NAV/ABAS COM/AMDS DOF/xxxxxx REG/9MAQN EET/VHHK0004 ZGZU0005 VHHK0010 RPHI0049 WSJC0212 WBFC0215 SEL/ELQR CODE/7502AD PER/C RMK/TCAS EQUIPPED)			
8.3.1 EST sent to MNL ACC		Coordinate with MNL's POC if **EST** message was received.	
	8.3.2 LAM sent to VHHH.	Coordinate with VHHH's POC if **LAM** message was received.	
	8.3.3 ACP sent to VHHH ACC	Coordinate with VHHH's POC if **ACP** message was received.	
8.3.4 LAM sent to MNL ACC		Coordinate with MNL's POC if **LAM** message was received.	

8.4 Overflight Transiting RPHI and VHHK via ASOBA

Event Triggered by VHHH ACC	Event Triggered by MNL ACC	Confirmation	Remarks/Result
(FPL-TEST4-IS-A332/H-SDE2E3FGHIJ2J4M1RWXYZ/LB1-WIII0100 -N0477F360 AMBOY P648 OSUKA/N0471F300 M772 ASISU/M077F300 M772 ASOBA/N0464F300 M772 DULOP/N0451F260 M771 DUMOL J103 PICTA DCT CH B330 TAMOT/K0837S0790 W68 IDUMA IDUO1A-ZGGG0422 ZSAM -PBN/A1B1D1L1 NAV/AUSEP DOF/xxxxxx REG/PKGPJ EET/WBFC0114 WSJC0156 RPHI0228 VHHK0325 ZGZU0406 SEL/GMCL OPR/GARUDA PER/C RMK/TCAS EQUIPPED)			
	8.4.1 EST sent to VHHH ACC	Coordinate with VHHH's POC if **EST** message was received.	
8.4.2 LAM sent to MNL ACC		Coordinate with MNL's POC if **LAM** message was received.	
8.4.3 ACP sent to MNL ACC		Coordinate with MNL's POC if **ACP** message was received.	
	8.4.4 LAM sent to VHHH ACC	Coordinate with VHHH's POC if **LAM** message was received.	

8.5 Departure from RPLL to VHHH, EST sent by Manila, HK has no FPL and returns LRM.

Event Triggered by VHHH ACC	Event Triggered by MNL ACC	Confirmation	Remarks/Result
(FPL-TEST5-IS-A320/M-SDFGHIRWY/H-RPLL0200 -N0451F340 CAB1A CAB A461 NOMAN V531 BETTY-VHHH0152 VMMC -PBN/A1B1C1D1O1S2 NAV/GBAS SBAS DOF/xxxxxx REG/RPC3271 EET/VHHK0103 SEL/LSJP PER/C RMK/TCAS EQUIPPED)			
	8.5.1 EST sent to VHHH ACC	Coordinate with VHHH's POC if **EST** message was received.	
8.5.2 LRM sent to MNL ACC		Coordinate with MNL's POC if **LRM** message was received.	

8.6 Departure from VHHH to RPLL, RPLL has no FPL and returns LRM.

Event Triggered by VHHH ACC	Event Triggered by MNL ACC	Confirmation	Remarks/Result
(FPL-TEST6-IS-A333/H-SDE3GHIJ4J5RWYZ/HB1-VHHH0200 -N0483F370 OCEAN V4 NOMAN A461 AVMUP W16 OLIVA OLI1A-RPLL0131 RPLC -PBN/A1B1C1D1O1S1 NAV/GBAS COM/CPDLC DOF/xxxxxx REG/RPC3343 EET/RPHI0029 SEL/LQEG PER/C)			
8.6.1 EST sent to MNL ACC		Coordinate with MNL's POC if **EST** message was received.	
	8.6.2 LRM sent to VHHH.	Coordinate with VHHH's POC if **LRM** message was received.	

8.7 Departure from RPLL to VHHH via NOMAN, Manila sends EST with a SSR code duplicates with a SSR code in-use in HK. [HK will accept the EST and assign another SSR to the flight concerned internally.]

Event Triggered by VHHH ACC	Event Triggered by MNL ACC	Confirmation	Remarks/Result
(FPL-TEST7-IS-A320/M-SDFGHIRWY/H-RPLL0200 -N0451F340 CAB1A CAB A461 NOMAN V531 BETTY-VHHH0152 VMMC -PBN/A1B1C1D1O1S2 NAV/GBAS SBAS DOF/xxxxxx REG/RPC3271 EET/VHHK0103 SEL/LSJP PER/C RMK/TCAS EQUIPPED)			
	8.7.1 Request a SSR code in-use by HK	Coordinate with HK's POC to obtain a SSR code in-use by HK	

Event Triggered by VHHH ACC	Event Triggered by MNL ACC	Confirmation	Remarks/Result
	8.7.2 EST (with a SSR code in-use by HK) sent to VHHH ACC	Coordinate with VHHH's POC if **EST** message was received.	
8.7.3 LAM sent to MNL ACC		Coordinate with MNL's POC if **LAM** message was received.	
8.7.4 ACP sent to MNL ACC		Coordinate with MNL's POC if **ACP** message was received.	(HK to check internally for duplicate SSR code alert and SSR code assigns to the flight)
	8.7.5 LAM sent to VHHH ACC	Coordinate with VHHH's POC if **LAM** message was received.	

8.8 Departure from VHHH to RPLL, HK sends EST with a SSR code duplicates with a SSR code in-use in Manila [*For Manila to consider whether this test case is deemed necessary and match with Manila's concept of operation. In this case, would Manila return a LRM or LAM+ACP?]*

Event Triggered by VHHH ACC	Event Triggered by MNL ACC	Confirmation	Remarks/Result
(FPL-TEST8-IS-A333/H-SDE3GHIJ4J5RWYZ/HB1-VHHH0200 -N0483F370 OCEAN V4 NOMAN A461 AVMUP W16 OLIVA OLI1A-RPLL0131 RPLC -PBN/A1B1C1D1O1S1 NAV/GBAS COM/CPDLC DOF/xxxxxx REG/RPC3343 EET/RPHI0029 SEL/LQEG PER/C)			
8.8.1 Request a SSR code in-use by MNL		Coordinate with MNL's POC to obtain a SSR code in-use by MNL	
8.8.2 EST (with a SSR code in-use by MNL) sent to MNL ACC		Coordinate with MNL's POC if **EST** message was received.	
	8.8.3 LAM sent to VHHH.	Coordinate with VHHH's POC if **LAM** message was received.	Or would MNL return a LRM instead?
	8.8.4 ACP sent to VHHH ACC	Coordinate with VHHH's POC if **ACP** message was received.	Should skip this step if MNL returns a LRM in step 8.8.3
8.8.5 LAM sent to MNL ACC		Coordinate with MNL's POC if **LAM** message was received.	Should skip this step if MNL returns a LRM in step 8.8.3

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	Interface Status (Operational, Testing, Planned,	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,	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	Thales ATM system (TopSky ATC)	Kolkata ACC /India	Intraregional	AMHS	7				~~4Q2023~~ 4Q2025	Testing	ICD V.1.0	ABI, SEP, EST, LAM	Voice	Automatic	yes	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.~~ in last quarter of 2025
				Yangon ACC /Myanmar	Intraregional	AMHS	7				~~4Q2023~~ 4Q2025	Testing	~~ICD V.2.0~~ ICD V.1.0	ABI, SEP, EST, LAM	Voice	Automatic	yes	
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~~ Testing						
		Sanya ACC	~~NUMEN~~ BEST/AirNet	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~~ Operational		EST, ACP, TOC, AOC, LRM, LAM				
				Ho Chi Minh ACC /Vietnam	Intraregional	AFTN					Dec 2023	~~Operational~~ No plan	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	
				Hanoi ACC/Vietnam	Intraregional	AFTN						Testing	ICD V.3.0	ABI, EST, ACP, TOC, AOC, LRM, LAM		Automatic	yes	
				Yangon ACC /Myanmar	Intraregional	AFTN						~~Testing~~ Planned		EST, ACP, TOC, AOC, LRM, LAM				
		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												

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	Interface Status (Operational, Testing, Planned,	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,	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	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~~ No plan						
			NUMEN	Alma-Ata/Kazakhstan								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~~ Testing						
		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 CRV	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 CRV	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 CRV	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 CRV	1	May 2024	Operational	ICD V.3.0	EST, ACP, LAM, LRM	Voice	Automatic	yes	
MACAO, CHINA	non-implemented	Macao ATZ										No plan						Not applicable because Macao, China has ATZ only
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					
				Kathmandu ACC /Nepal	Intraregional	AFTN												
				Karachi ACC /Pakistan	Intraregional	AMHS					1Q2019	Planned						

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	Interface Status (Operational, Testing, Planned,	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,	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
		Mumbai ACC	Raytheon Auto track III	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		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	
	Implemented	Kobe ACC	JCAB/ADEX-19	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~~ Jan-2025	Operational	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~~ 1Q2026	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~~ 3Q2025	Planned	ICD V.2.0	ABI, EST, ACP, TOC, AOC, LAM, LRM				
MALAYSIA	Implemented	Kuala Lumpur ACC	LEONARDO	Bangkok ACC /Thailand	Intraregional	AMHS	7	Main	9600	7	Mar 2020	Operational	ICD V.3.0	EST, ACP, LAM, LRM	Voice	Automatic	yes	
				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~~ 2026	Planned	ICD V.3.0	EST, ACP, LAM, LRM, TOC, AOC	Voice	Automatic	yes	
				Jakarta ACC /Indonesia	Intraregional	AMHS	7	Main	TBA	TBA	~~3Q2024~~ 2026	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~~ 2025	Testing	ICD V.3.0	EST, ACP, LAM, LRM, TOC, AOC	Voice	Automatic	yes	
				Manila ACC /Philippines	Intraregional	AMHS	7	Main	TBA	TBA	~~3Q2024~~ 2024	Operational	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~~ 2025	Testing	ICD V.3.0	TOC, AOC	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
				Jakarta ACC /Indonesia	Intraregional	AMHS	7	Main	TBA	TBA	~~3Q2024~~ 2026	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~~ N/A	No plan	ICD V.3.0	EST, ACP, LAM, LRM	Voice	Automatic	yes	No longer applicable due to the Jakarta FIR realignment
											~~2Q2024~~ N/A	No plan	ICD V.3.0	TOC, AOC	Voice	Automatic	yes	No longer applicable due to the Jakarta FIR realignment
				Jakarta ACC /Indonesia	Intraregional	AMHS	7	Main	TBA	TBA	~~3Q2024~~ 2026	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												
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		
				Mumbai ACC /India	Intraregional	AMHS	7	Main	128 & 64Kbps		~~Jun 2025~~ Jun 2027	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
				Muscat ACC /Oman	Interregional	AFTN	7	Main	64Kbps		~~Jun 2025~~ Jun 2027	No Plan	ICD Version 2.0	ABI, EST, ACP, TOC, AOC, LAM, LRM, PAC, CDN, CPL, REJ, MAC	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
PAKISTAN	Testing	Karachi ACC	Indra AIRCON 2100	Tehran ACC /Iran	Interregional	AFTN	7	Main	1 Mbps		~~Jun 2025~~ Jun 2027	No Plan	ICD Version 2.0	ABI, EST, ACP, TOC, AOC, LAM, LRM, PAC, CDN, CPL, REJ, MAC	Voice	Automatic	Yes	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 genenerate 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, 2027*** after replacement of ATM System at Karachi & Lahore ACCs.
				Ahmadabad ACC /India	Intraregional	AMHS	7	Main	Via Mumbai AMHS		~~Jun 2025~~ Jun 2027	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~~ Jun 2027	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~~ Jun 2027	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~~ Jun 2027	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 GUINEA	Implemented	Port Moresby	Thales (TopSky-ATC)	Brisbane ACC/Australia	Intraregional	AMHS						Operational	ICD V.3.0					
				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	7	Main		74ms/15ms	May 2019	Operational		EST, ACP, LAM, LRM	Voice	Automatic		
				Singapore ACC /Singapore	Intraregional	AMHS	7	Main		25ms/18ms	Dec 2020	Operational		EST, ACP, TOC, AOC, LAM, LRM	Voice	Automatic		
				Taibei ACC/China	~~Intraregional~~	~~AFTN~~												
					Intraregional	AMHS	7	Main		21ms/17ms	Dec 2019	Operational		EST, ACP, TOC, AOC, LAM, LRM	Voice	Automatic		
				Kota Kinabalu ACC /Malaysia	Intraregional	AMHS	7	Main		24ms/19ms	2Q2024	Operational		EST, ACP, TOC, AOC, LAM, LRM	Voice	Automatic		
				Ho Chi Minh ACC /Viet Nam	Intraregional	AMHS						Planned						
				Oakland ARTCC /USA	Intraregional	AMHS	7	Main		194ms/17ms	Dec 2022	Operational		ABI, EST, ACP, TOC, AOC, LAM, LRM	Voice	Automatic		
				Fukoka ATMC /Japan	Intraregional	AMHS						Planned						
				Ujung Pandang ACC /Indonesia	Intraregional	AMHS	7	Main		22ms/18ms	4Q 2020	Operational		EST, ACP, TOC, AOC, LAM, LRM	Voice	Automatic		
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																	
				Ho Chi Minh ACC /Vietnam	Intraregional	AMHS	7	Main	9600	1	Jul 2014	Operational	ICD V.1.0	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
SINGAPORE	Implemented	Singapore ACC	THALES	Manila ACC /Philippines	Intraregional	AMHS	7	Main	9600	1	Nov 2019	Operational	ICD V.3.0	EST,ACP,LAM,LRM,TOC,AOC	Voice	Automatic	yes	
				Jakarta ACC /Indonesia	Intraregional	AMHS	0	Main	9600	1		Planned	ICD V.3.0					
				Kuala Lumpur ACC /Malaysia	Intraregional	AMHS	7	Main	9600	1	Nov 2019	Operational	ICD V.3.0	EST,ACP,LAM,LRM	Voice	Automatic	yes	
				Kota Kinabalu ACC /Malaysia	Intraregional	AMHS	7	Main	9600	1	Jul 2021	Operational	ICD V.3.0	EST,ACP,LAM,LRM	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~~ 204800		SEP ~~2023~~ 2025	Testing	ICD V.3.0		Voice	Manual	yes	ABI message is not working during trials.
				Jakarta ACC / Indonesia	Intraregional	AMHS			2048000		SEP ~~2023~~ 2026	Planned	ICD V.3.0		Voice	Manual	yes	
				Melbourne ACC /Australia	Intraregional	AMHS			2048000		~~SEP 2023~~ Mar 2026	Planned	ICD V.3.0		Voice	Manual	yes	
				Chennai ACC /India	Intraregional	AMHS			2048000		SEP ~~2023~~ 2025	Testing	ICD V.3.0		Voice	Manual	yes	~~ABI message is not working during trials.~~
THAILAND	Implemented	Bangkok ACC	THALES	Kuala Lumpur ACC /Malaysia	Intraregional	AMHS	7	Main	1Mbps (CRV)	8	Mar 2020	Operational	~~ICD V.3.0~~ PAN AIDC ICD V.1.0	EST, ACP, LAM, LRM	Voice	Automatic	yes	CRV shared bandwidth
				Phnom Penh ACC /Cambodia	Intraregional	AMHS	7	Main	1Mbps (CRV)	6	Feb 2021	Operational	~~ICD V.3.0~~ PAN AIDC ICD V.1.0	ABI, EST, ACP, LAM, LRM	Voice	Automatic	yes	CRV shared bandwidth
				Vientiane ACC /Lao PDR	Intraregional	AMHS	7	Main	64000	7	Jul 2020	Operational	~~ICD V.3.0~~ PAN AIDC ICD V.1.0	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(Testing on August 2019)
TIMOR LESTE	non-implemented																	
TONGA	non-implemented																	
UNITED STATES	Implemented	Oakland ARTCC	Liedos, ATOP System	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	
				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	
TUVALU	non-implemented																	
VANUATU	non-implemented																	
				Sanya ACC /China	Intraregional	AFTN					2023	Testing	ICD V.1.0	EST, ACP, TOC, AOC, 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
VIET NAM	Implemented	Ho Chi Minh ACC	THALES	Phnom Penh ACC /Cambodia	Intraregional	AFTN					2021	Testing	ICD V.1.0	ABI, EST, ACP, TOC, AOC, LAM, LRM, PAC, CDN	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					2021	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	7				JAN 2025	Operational	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	
				KUMING ACC/ CHINA	Intraregional	AFTN		Main	9600		JAN 2025	Testing	ICD V.3.0	ABI, EST, ACP, LAM, LRM, TOC, AOC	Voice	Automatic	yes	

State/Administration	Last updated	Meeting	History
Afghanistan			
Australia	1/30/2023	AP135/22(CNS)	
Bangladesh	6/2/2025	ATMAS TF/6	
Brunei Darussalam			
Bhutan			
Cambodia	6/29/2023	ATMAS TF/4	
China	4/6/2025	ATMAS TF/6	12/6/2022 3/21/2024-ACSICG/11
Hong Kong, China	6/18/2024	ATMAS TF/5	1/30/2023
Macau China	3/25/2025	ACSICG/12	
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	3/27/2025	ACSICG/12	1/24/2023 6/6/2024 - ATMAS TF/5
Japan	3/29/2024	ACSICG/11	1/16/2023 8/25/2023
Kiribati			
Malaysia	3/26/2025	ACSICG/12	1/9/2023 4/3/2023 4/13/2023 6/29/2023 - ATMAS TF/4
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	3/25/2025	ACSICG/12	11/29/2022 - AP135/22(CNS)
Papua New Guinea			
Palau			
Philippines	4/6/2025	ATMAS TF/6	3/20/2025 - ACSICG/12
Republic of Korea	1/31/2023	AP135/22(CNS)	
Samoa			
Solomon Islands			
Singapore	3/27/2025	ACSICG/12	1/6/2023 6/6/2024 - ATMAS TF/5
Sri Lanka	4/6/2025	ATMAS TF/6	2/14/2023 - AP135/22 (CNS)
Tonga			
Thailand	4/6/2025	ATMAS TF/6	1/16/2023- AP135/22 (CNS)
Tuvalu			
Timor LESTE			
United States	12/21/2022	AP135/22(CNS)	
Vanuatu			
Viet Nam	4/6/2025	ATMAS TF/6	3/21/2024 - ACSICG/11

LIST OF FOCAL POINT FOR AIDC IMPLEMENTATION

No.	States	Name/Title/Address	Tel/Fax/E-mail
1.	**Afghanistan**		
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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
7.	**China**	~~Ms. Cao Susu~~ ~~Senior Electronics Engineer, CNS~~ ~~Division of Air Traffic Management Bureau, CAAC~~ ~~No.12 East Sanhuan Road~~ ~~Chaoyang District~~ ~~Beijing~~ Mr. Chen Yukun Senior Electronics Engineer, CNS Division of Air Traffic Management Bureau, CAAC No.12 East Sanhuan Road Chaoyang District Beijing	~~Tel: +(86) 10877 86969~~ ~~Mobile: +(86) 15801 682063~~ ~~Email: caosusu_atmb@qq.com~~ Tel: +(86) 10877 86974 Mobile: +(86) 18811588863 Email: cykjason0@gmail.com
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8.	**Hong Kong, China**	Mr. Michael Chu Senior Electronics Engineer (Technical Support)	Tel: +852 2910 6528 Fax: +852 2845 7160 E-mail: mmhchu@cad.gov.hk

No.	States	Name/Title/Address	Tel/Fax/E-mail
		Civil Aviation Department of Hong Kong, China	
9.	**Macau China**		
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
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		Mr. Lanang Wibisono Manager of Planning system & Service Facility Requirement AIRNAV Indonesia. Support Building Jl. Ir. H. Juanda Tangerang 15121	Mobile: +62 817123124 E-mail: lanang.wibisono@airnavindonesia.co.id
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17	**Kiribati**		
18	**Lao PDR**	Mr. Maity Sylithammavoing 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
		Mr. Moukphamay Thammavongsa Dy. Director Air Navigation Standards Division, DCA. Souphanouvong Rd. Wattay International Airport Vientiane, Lao PDR P.O Box:119	Tel: +856 21 512163 Fax: +856 21 520237 Mobile: +856 2099649159 Email: moukth@msn.com

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22	**Micronesia (Federated States of)**		
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25	**Nauru**		
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30	**Papua New Guinea**		
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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
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35	**Solomon Islands**		
36	**Sri Lanka**	Mr.Thilina Sri Warnasinghe, Director Air Navigation Services, Civil Aviation Authority of Sri Lanka.	Tel : +94112358849 Email : dans@caa.lk

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		Miss Rachat Songcharoen Senior Air Traffic Systems Engineer Aeronautical Radio of Thailand Ltd 02 Ngamduplee Tungmahamek Bangkok 10120 Thailand	Tel: +66 (8) 324 86484 Fax: Email: rachat.ra@aerothai.co.th
38	**Timor Leste**		
39	**Tonga**		
40	**Tuvalu**		
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Presentation of the initial proposal:

1.The *Background* and *Comments* are provided in *italic text*.

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

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

REVISED TERMS OF REFERENCE OF

ASIA AND PACIFIC
ATM AUTOMATION SYSTEM TASK FORCE (ATMAS/TF)

Consists of objectives and deliverables as follows:

The Objectives of the APAC ATMAS/TF are to:

1) Keep abreast of the latest developments in ATM automation systems and associated technologies to cope with forthcoming development and implementation of ICAO SARPs, the Global Air Navigation Plan (GANP), the Global Aviation Safety Plan (GASP) and Asia/Pacific Seamless Air Navigation Service (ANS) Plan (APSAP);

2) Facilitate the implementation, enhancements, operation and maintenance of ATM automation systems and services identified in the Aviation System Block Upgrades (ASBU) elements and APSAP elements using the project management principles where appropriate;

3) Ensure continuous and coherent development of the ATM automation systems that is harmonized with adjacent regions to enhance systems robustness, resilience, interoperability and cybersecurity; and

4) Review, identify and address major issues in technical, operational, safety and regulatory aspects to facilitate the implementation or provision of safe, efficient and orderly ATM services.

5) Encourage collaboration among ANSPs in implementing ATM automation systems so as to reduce operating costs and enable quick implementation of new requirements to cope with new challenges.

6) Follow up, oversee and share experiences of the AIDC implementation and provide a coordination framework among States for wider and effective implementation of AIDC across the APAC region.

Deliverables to meet the Objectives:

1) To submit progress report to the ICAO CNS Sub-group while keeping ATM Sub-group informed of addressing the APAC ATMAS/TF deliverables (listed in 2 to 7 below);

2) 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 in relation to ATM automation systems;

3) To review outcome of the AN-Conf., DGCA Conference, APANPIRG, CNS Sub-group, ATM Sub-group, RASMAG, and SURICG related to ATM automation systems, revise and update a tasks list and action items for the ATMAS/WG;

4) To study and identify applicable applications, share experience, and recommend the best industry practice in the Asia and Pacific Regions considering:

- *Systems planning and design*
- *Open / Service Oriented Architecture*
- *HMI adaptation, data synchronization and operational enhancements*
- *Safety nets*
- *ICAO roadmap in the GANP / ASBU*
- *Systems interoperability*
- *Standardization of information exchange*
- *AIDC Implementation*
- *Operation and maintenance practice*
- *Acceptance and certification*
- *Flight inspection*
- *Cybersecurity*
- *Safety assessment*
- *Training*
- *Transition*

5) To encourage research and development, trials and demonstrations of applications and technologies, and, as necessary, steer for the sharing of this information and expertise between States/Administrations through organizing educational seminars and symposia to educate States/Administrations and airspace users;

6) To formulate draft Conclusions and Decisions relating to matters in the field of ATM automation systems that come within the scope of the APANPIRG, CNS Sub-group, ATM Sub-group, and RASMAG work plan; and

7) To collaborate with relevant international organization (such as EuroControl) for harmonisation of ATM system requirements.

Timeframe for Deliverables:

For deliverable item 2 on guidance materials, it is anticipated that a first draft could be made available in 3 years after establishment of the Task Force for seeking endorsement by CNS Sub-group, after which the guidance materials would be updated/enhanced on an on-going basis. For other deliverable items 3-7, they will be made available as appropriate subject to review by the Task Force. The life time of the Task Force would be subject to review after endorsement of the first edition of the guidance materials.

Meeting:

The APAC ATMAS/TF shall convene annually with at least one face-to-face meeting per year, which is supplemented by teleconference meetings (e.g. WebEx) as appropriate.

Membership:

All APAC member States/Administrations providing air navigation services in the Asia and Pacific Regions. APAC members should nominate Subject Matter Experts from Civil Aviation Authorities, ANSPs, and other organizations with strong background in engineering and operation in relation to ATM automation systems to participate into the Task Force. The Task Force would also invite representatives of International Organizations recognized by the ICAO Council as representing important civil aviation interests to participate in its work in a consultative capacity.

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Action Item	Subject	Forum Raised	Status / Target Date	Action Party	Status
1-1	Develop a table to list the current ATMAS status of all states	ATMAS TF/1	ATMAS TF/2	Member States, ICAO Secretariat	Closed
1-2	Develop check list for ATMAS project management from the scratch of planning, requirement definition, bidding, implementation to operational transition.	ATMAS TF/1	ATMAS TF/3	Member States, ICAO Secretariat	Closed
1-3	Develop APAC Office ATMAS IGD	ATMAS TF/1	ATMAS TF/2	Ad hoc group led by China. Members: Hong Kong China, India, Indonesia, Japan, Malaysia, Myanmar, Nepal, Philippines, Singapore, Thailand and Vietnam	Closed
1-4	Propose states to share the current interoperation technology or protocol applied between ATMAS of all states. (e.g. AIDC, OLDI, other protocol, etc.)	ATMAS TF/1	ATMAS TF/2	Member States, ICAO Secretariat	Closed
1-5	Propose states to share the current redundancy mechanism at ATMAS level in the same location, such as main, backup, and emergency system.	ATMAS TF/1	ATMAS TF/2	Member States, ICAO Secretariat	Closed
1-6	Propose states to elaborate the backup or contingency strategy of ATMAS in different location.	ATMAS TF/1	ATMAS TF/2	Member States, ICAO Secretariat	Closed
1-7	Study the feasibility to expand APRD function to cover ATM AS issues	ATMAS TF/1	ATMAS TF/2	Hong kong China	Closed
2-1	Host a webinar about ATM Automation System in 2022.	ATMAS TF/2	ATMAS TF/3	Member States, ICAO Secretariat	Closed
2-2	Consider the suggestions discussed in the meeting and work out a revised version of the table to list the current ATMAS status of all states in order to build the ATMAS regional repository	ATMAS TF/2	ATMAS TF/3	Ad-hoc group led by Indonesia Members: China, Hong Kong China, Republic of Korea, Singapore, ICAO Secretariat	Closed
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**

Action Item	Subject	Forum Raised	Status / Target Date	Action Party	Status
2-4	Translate the information on MH/T 4029.3 into English first for better understanding by other Member States/Administrations	ATMAS TF/2	ATMAS TF/3	China	Closed
2-5	State Letter to circulate the advanced draft of ATMAS IGD to seek further comments and inputs from States and the States/Administrations should provide feedback in one month after receiving the State Letter.	ATMAS TF/2	ATMAS TF/3	Member States, ICAO Secretariat	Closed
2-6	Consolidate APA/TF action item list into ATMAS/TF action item list in ATMAS TF/3	ATMAS TF/2	ATMAS TF/3	Member States, ICAO Secretariat	Closed
3-1	The ICAO Secretariat will issue a State Letter to circulate the table of the ATMAS Status in APAC region to collect information from Member States in order to build the repository of the ATM automation systems for APAC Region.	ATMAS TF/3	ATMAS TF/4	Member States, ICAO Secretariat	Closed
3-2	The ICAO Secretariat will issue a State Letter to circulate the table of AIDC Implementation Status in APAC region with the current status to States/Administrations for supplements and validation.	ATMAS TF/3	ATMAS TF/4	Member States, ICAO Secretariat	Closed
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
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
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	Closed
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	Closed
5-1	Nominate/recommend experts, engage industry for required expertise, and share experiences with ATMAS TF.	ATMAS TF/5		Member States, ICAO Secretariat	Closed
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	Closed
5-3	review and update the information contained in the ATMAS Repository	ATMAS TF/5		Member States, ICAO Secretariat	Closed
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		China, Hong Kong China, Malaysia, Pakistan, Philippines and Singapore(led)	Closed

Asia and Pacific Ministerial Declaration on Civil Aviation (Delhi)

1) We, the Ministers from the Asia and Pacific States responsible for Civil Aviation, met in New Delhi, India, from 11-12 September 2024, on the occasion of the 2nd Asia Pacific Ministerial Conference on Civil Aviation and the 80th anniversary of the Convention on International Civil Aviation (Chicago Convention), organized by the International Civil Aviation Organization (ICAO), to reaffirm the obligations as the Contracting States to the Chicago Convention signed on 7 December 1944 to ensure the safety, security, efficiency and continuity of civil aviation;

2) Recalling that Ministers met at the 1st Asia Pacific Ministerial Conference on Civil Aviation in Beijing, China, from 31 January to 1 February 2018, and endorsed a landmark declaration (Beijing Declaration) underpinning the importance of air transportation for social and economic development and the shared commitments and vision of Asia and Pacific Ministers to build Regional momentum to realize the implementation of Aviation Safety priorities and targets and Asia/Pacific Seamless Air Traffic Management (ATM) Plan (now renamed as the Asia/Pacific Seamless Air Navigation Service (ANS) Plan) with the collaboration of States/Administrations and active participation of the aviation industry;

3) Acknowledging the extraordinary circumstances during COVID-19 pandemic which impeded States/Administrations from effectively implementing the Beijing Declaration commitments while noting updated safety and air navigation targets have emerged to better support States/Administrations in the Asia and Pacific Region;

4) Recognizing that the recovery of air transportation is progressing and that passenger and freight demand in the Asia and Pacific Region is forecast to regain higher growth rates requiring a concerted effort of States/Administrations and the aviation industry to meet the increasing demand while enabling a safe, secure, efficient and a more resilient aviation sector, and minimizing the adverse effects of international civil aviation on the global climate, which supports the realization of United Nations 2030 Agenda for Sustainable Development;

5) Identifying that key priorities exist in the Asia and Pacific Region requiring collaboration and that States/Administrations need to develop capabilities to improve safety, security and building of additional capacity to address emerging Regional and global challenges to sustain the Regional civil aviation growth forecast;

6) Noting that over half of the States/Administrations in the Asia and Pacific Region which have had an ICAO audit under the Universal Safety Oversight Audit Programme – Continuous Monitoring Approach (USOAP – CMA) have an effective implementation (EI) of the critical elements (CEs) of a State safety oversight system lower than the global average;

7) Noting that over half of the States/Administrations in the Asia and Pacific Region which have had an ICAO audit under the Universal Security Audit Programme (USAP) have an EI of the CEs of a State aviation security oversight system lower than the global average;

8) Acknowledging that the ICAO Assembly 41st Session endorsed the Global Aviation Safety Plan (GASP) 2023 – 2025 edition and the Seventh Edition of the Global Air Navigation Plan (GANP) as the global strategic directions for safety and air navigation respectively, and urged Member States to demonstrate the political will necessary to implement remedial actions to resolve safety concerns and air navigation deficiencies in a timely manner as well as integrate aviation in the national development plans;

9) Appreciating that HR development strategies combined with adequately funded and quality assured training and accompanying investment in training infrastructure is essential for developing and maintaining a qualified and competent workforce to manage all aviation activities and to meet ICAO's strategic objectives;

10) Realizing the benefits of working in partnership with ICAO and aviation stakeholders through interactive platforms for closer coordination to identify opportunities for innovation and the adoption and integration of new technologies, such as Advanced Air Mobility (AAM) to keep pace with global advancement in information technology, artificial intelligence, etc. and future evolving technologies and sciences;

11) Recognizing that only universal participation in the international air law treaties adopted under the auspices of ICAO would secure and enhance the benefits of unification of the international rules which they embody, with particular priority to be given to the Protocols of Amendment to the Convention on International Civil Aviation which have not yet entered into force;

12) The Second Asia Pacific Ministerial Conference, therefore, agrees to the Asia and Pacific Ministerial Declaration on Civil Aviation (Delhi) and the Ministers commit to the following:

1.0 Reaffirming Asia and Pacific Ministerial Declaration on Civil Aviation (Beijing)

1.1 Support and continue efforts towards the realization of the Beijing Declaration commitments, especially pursuing cooperative progress on commitments relating to aviation safety oversight capability, State Safety Programme (SSP) implementation, certification of aerodromes used for international operations, the timely implementation of the Asia/Pacific Seamless Air Navigation Service (ANS) Plan, and supporting the establishment of independent accident investigation authorities.

2.0 Effective Implementation of ICAO Global Plans

2.1 Undertake to support the effective implementation of the ICAO Global Aviation Safety Plan (GASP), Global Air Navigation Plan (GANP) and Global Aviation Security Plan (GASeP) and associated Regional plans, which include detailed guidance to assist States/Administrations in complying with ICAO's Standards and Recommended Practices (SARPs).

3.0 Aviation Safety

3.1 Continue efforts and cooperation to uphold aviation safety as a key priority, carrying out effective safety oversight and safety management activities, joining forces to share safety information and fostering a strong and positive safety culture.

3.2 Strive to achieve the current GASP, in particular, prioritize and commit resources to achieve the following goals:

a) Improve scores for the effective implementation (EI) of the critical elements (CEs) of the States/Administrations safety oversight system;

b) Work towards an effective SSP;

c) Endeavour not to have any Significant Safety Concerns (SSCs) under the USOAP Continuous Monitoring Approach (CMA) and to resolve any future SSCs within the time frame agreed with ICAO;

d) Collaborate with States/Administrations and the aviation industry through the Regional Aviation Safety Group (RASG) to organize capability-building events for the Region and implement Safety Enhancement Initiatives (SEIs) as stipulated in the Regional Aviation Safety Plan (RASP); and

e) Develop and publish a National Aviation Safety Plan (NASP).

4.0 Air Navigation Services

4.1 Commit to resources in modernization and innovation in Air Navigation Services, in tandem with developments in the airport and airline capacity, to support recovery and meet future demand for air travel and new entrants.

4.2 Commit to implement the ICAO Standards and Procedures for Air Navigation Services (PANS), and the Asia/Pacific Seamless ANS Plan (including prioritized GANP elements) and its subsidiary plans to enhance ANS capacity and harmonization in the Asia and Pacific Region focusing on as a matter of priority:

a. Phase I, II and III of the Asia/Pacific Regional Aeronautical Information Management (AIM);

b. Improved Airspace Safety and Capacity through the implementation of more efficient Air Traffic Control (ATC) separation minima;

c. Performance Based Navigation (PBN) implementation in accordance with ICAO Assembly Resolution A37-11 on Global PBN Goals;

d. Common Ground/Ground Telecommunication Infrastructure to support ANS applications;

e. Expediting the implementation of ICAO provisions related to System Wide Information Management (SWIM);

f. Enhanced civil/military cooperation;

g. Enhanced Surveillance capability for improved Safety and Efficiency;

h. Air Traffic Flow Management (ATFM) and Airport Collaborative Decision Making (A-CDM) implementation;

i. Air Traffic Management (ATM) contingency planning, in coordination with neighbouring States/Administrations;

j. Air navigation in national planning frameworks such as National Development Plans (NDPs) supported by National Air Navigation Plans (NANP); and

k. Enhancement of safety risk assessment capability.

4.3 Share best practices, resources and capability in the provision of ANS, including Aeronautical Search and Rescue (SAR), Meteorological Services for International Air Navigation (MET) and Air Traffic Flow Management (ATFM) through Regional cooperation and enhanced coordination.

4.4 Work collaboratively through ICAO and Regional collaborative platforms towards Seamless ANS, including Flight and Flow Information for a Collaborative Environment (FF-ICE) and Trajectory-Based Operations (TBO) to support future traffic growth and sustainability.

5.0 Aviation Security

5.1 Commit to continuing efforts and cooperation to uphold aviation security as a key priority, carry out effective aviation security oversight, enhance compliance with relevant ICAO aviation security and security-related Standards, joining forces to share security information as appropriate and foster a positive security culture.

5.2 Strive to achieve the aspirational goal of the GASeP as established, in particular, prioritize and commit resources to achieve the following objectives:

a) Improve score for the effective implementation (EI) of the critical elements (CEs) of the States/Administrations security oversight system;

b) Endeavour not to have any Significant Security Concerns (SSeCs) under the USAP Continuous Monitoring Approach (CMA) and to resolve any future SSeCs within the time frame agreed with ICAO;

c) Collaborate through Regional multilateral Forums such as; the Regional Aviation Security Coordination Forum (RASCF) to assist States/Administrations to achieve compliance with the relevant aviation security and security-related Standards.

6.0 Facilitation

6.1 Consistent with the facilitation-related Decisions of the ICAO 41st Assembly Session in October 2022 and the outcomes of ICAO's High-Level Conference on COVID-19 in 2021, strive to ensure coordination between civil aviation and various stakeholders, including the health authorities, to allow seamless implementation of ICAO Annex 9 — *Facilitation* and the ICAO's Facilitation Programme, including relevant health related provisions and the five key elements of the ICAO Traveller Identification Programme Strategy, and taking into account a multi-layered risk-based approach to establish national health and other facilitation measures.

7.0 Gender Equality

7.1 Demonstrate States/Administrations commitment to promote and encourage the aviation sector to take the necessary measures to strengthen gender equality by supporting policies, as well as the establishment, development and improvement of strategies and programmes to further women's careers within the aviation sector.

8.0 Resourcing for Civil Aviation

8.1 Commit to providing Civil Aviation Authorities/Administrations in the Region with the necessary autonomy and powers, sustainable sources of funding and resources to carry out effective safety and security oversight and regulation of the aviation industry or alternatively, as may be appropriate, consider establishing and delegating responsibilities to an RSOO (Regional Safety Oversight Organization) that can effectively support regulatory oversight for aviation safety and security.

8.2 Urge Asia and Pacific States /Administrations, other ICAO Member States, international assistance and donor partners, as well as financial institutions to enhance cooperation and provide technical expertise, resources and funding support for technical assistance, capacity-building initiatives and the implementation of the above commitments/actions in the Asia and Pacific Region.

9.0 Aviation Environment Protection

9.1 Encourage Asia and Pacific States/Administrations to continue their efforts and work together to reduce emissions and other environmental impacts of aviation.

10.0 Ratification of International Air Law Treaties

10.1 Encourage Asia and Pacific States, which so far have not done so, to ratify the Amendments to the *Convention on International Civil Aviation*, in particular, the amendments to Articles 50 (a) and 56 adopted by the ICAO Assembly 39th Session in 2016, as soon as possible.

10.2 Encourage Asia and Pacific States to consider becoming parties to the international air law treaties that they have not yet ratified.

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LIST OF WORKING, INFORMATION PAPERS

WP/IP No.	Agenda	Subject	Presented by
WORKING PAPERS			
WP/01	1	Provisional Agenda	Secretariat
WP/02	3	Review of Relevant ICAO Meetings	Secretariat
WP/03	3	Outcomes of the Twelfth Meeting of Aeronautical Communication Services Implementation Coordination Group of APANPIRG (ACSICG/12)	Secretariat
WP/04	3	Outcomes of the Tenth Meeting of the Surveillance Implementation Coordination Group (SURICG/10)	Secretariat
WP/05	5	Repository of the ATMAS in APAC	Secretariat
WP/06	5	New Zealand Approach to ATMAS Development Resilience	New Zealand
WP/07	6	SWIM Implementation and ATMAS Integration	SWIM TF Chair
WP/08	8	Outcomes from AIDC Implementation and Operations Guidance Document (IGD) Ad-Hoc Review Group	Singapore
WP/09	7	Updates to the Guidance Material for the Implementation of the ATM Automation System	China, HK China, New Zealand
WP/10	8	Repository of AIDC Implementation Status in APAC	Secretariat
WP/11	9	Review of ToR and Task List	Secretariat
WP/12	10	Outcomes of the Second Asia Pacific Ministerial Conference on Civil Aviation	Secretariat
WP/13	10	CNS-related ASBU in Asia/Pacific Seamless ANS Plan	Secretariat
INFORMATION PAPERS			
IP/01	-	Meeting Bulletin	Secretariat
IP/02	5	ANS Architecture Design – Key to Flexibility and Interoperability	Singapore
IP/03	5	Optimization of STCA in Complex Airspace Environment	China

WP/IP No.	Agenda	Subject	Presented by
IP/04	5	Life Cycle Management of ATM Automation System	China
IP/05	5	Enhancements to ATM Automation System for Supporting IPA	China
IP/06	5	Application of AMDB in Tower ATM Automation System	China
IP/07	5	Research on AMAN Interconnection in ATM Automation System	China
IP/08	5	Research on Speech Recognition Technology in ATMAS	China
IP/09	5	Research on the Fusion of ADS-B and Approach Radar within Tower Range	China
IP/10	5	Experience Sharing on ATMAS Validation Platform in TBO Application	China
IP/11	5	Exploring AI Application in Intelligent O&M of ATMAS	China
IP/12	5	Incheon Airport A-CDM Related ARTS Development Status Update	Republic Of Korea
IP/13	5	Integration of a modern flight planning service into the ATMAS operation	New Zealand
LIST OF PRESENTATIONS			
SP/01	6	Regional Collaboration Platform- Launch of Beta Version	AIR Lab
SP/02	5	ANS Architecture Design – Key to Flexibility and Interoperability	Singapore
SP/03	5	Life Cycle Management of ATM Automation System	China

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