



FOURTEENTH AIR NAVIGATION CONFERENCE

Montréal, Canada, 26 August to 6 September 2024

Agenda Item 3: Air Navigation System Performance Improvement

3.1: Proposals to improve the efficiency of air navigation services contributing to LTAG

DEVELOPMENT OF ASIA-PACIFIC CROSS-BORDER MULTI-NODAL AIR TRAFFIC FLOW MANAGEMENT COLLABORATION (AMNAC)

(Presented by China, Singapore and Thailand)

EXECUTIVE SUMMARY

The paper mainly presents the Asia-Pacific cross-border multi-nodal air traffic flow management collaboration (AMNAC) and its significant impact on improving air traffic flow efficiency in the Asia/Pacific Region. The collaborative framework of AMNAC, based on the distributed multi-nodal air traffic flow management (ATFM) network concept, enables effective demand-capacity balance while enhancing predictability and safety. Additionally, the paper outlines the latest development and upcoming initiatives of AMNAC, including bi-weekly web meetings, multiple ATFM measures, and transition to system-wide information management (SWIM) for enhanced ATFM operation. The paper acknowledges the challenges anticipated from multiple ATFM measures, emphasizes the need for collaborative research among stakeholders. Additionally, it involves discussions on technical advancements in SWIM infrastructure for ATFM in the Asia/Pacific Region and proposes that ICAO integrates flight information exchange model (FIXM) 4.2 extension specifications into SWIM, advocating for its broader adoption globally.

1. INTRODUCTION

1.1 Asia-Pacific cross-border multi-nodal air traffic flow management collaboration (AMNAC) is a regional initiative aimed at optimizing air traffic flow in the Asia/Pacific Region. The initiative is grounded in the distributed multi-nodal air traffic flow management (ATFM) network concept and establishes a network of ATFM Nodes. Each node is responsible for maintaining a balance between capacity and flow within its domain. These nodes are interconnected through a shared information exchange infrastructure and operate in line with regionally agreed principles and high-level operating procedures.

1.2 In the Asia/Pacific Region, ground delay programme (GDP) is the primary cross-border ATFM measure, utilizing calculated take-off time (CTOT) distributed to aircraft. This process relies on the principle of common agreement and an information exchange platform, fostering efficient information

¹ Chinese and English versions provided by China.

sharing and inclusive collaborative decision making (CDM). The distributed multi-nodal ATFM network offers the most viable solution for managing cross-border traffic in this region.

1.3 Since its inception in 2015, AMNAC has made remarkable strides in its implementation. As of 2024, the participation of the Republic of Korea as a Level 3 Member State has expanded the program to encompass 12 participating air navigation services providers (ANSPs), with support from Civil Air Navigation Services Organisation (CANSO) and International Air Transport Association (IATA). To date, the program has convened 21 meetings and initiated over 1,500 rounds of GDPs. The common operating procedure has been upgraded to version 5.4, marking the ongoing enhancement and evolution of the program.

2. DISCUSSION

Concept of Operations

2.1 The distributed multi-nodal ATFM network concept is predicated on a network of ANSPs performing independent ATFM operations within their respective jurisdictions. These ANSPs are interconnected with other ANSPs and stakeholders through an effective information sharing mechanism, facilitating collaborative decision-making. This is realized through two operational bases:

- a) *Common Operating Procedures*: It includes shared ATFM operational guidelines and procedures, delineating the responsibilities of involved ANSPs and stakeholders; and
- b) *Interconnected Information Sharing Framework*: It is a comprehensive information sharing mechanism or protocol between stakeholders, ensuring efficient communication of ATFM information. It can realize information sharing through various methods from traditional ones like emails and AFTN messages to automated system-to-system information sharing based on the system-wide information management (SWIM) concept.

2.2 Through these operational bases, an ANSP can independently implement ATFM measures to manage both domestic and international constrained traffic flow. Meanwhile, other ANSPs and stakeholders in the network can effectively comply with the measure by adhering to the developed common operating procedure. An effective communication and information sharing framework will enable stakeholders to participate in the decision-making process at every stage.

2.3 In this operational environment, an initiating ATFM unit, responsible for the constrained resources, would implement and publish ATFM measures. Concurrently, the facilitating ATFM unit and relevant stakeholders would subscribe to or receive the information and adjust their operations accordingly. The information sharing network also facilitates a CDM process among all relevant parties during operations. This approach marks a significant milestone in the region's ATFM capabilities.

AMNAC Collaboration

2.4 AMNAC has implemented a tiered participation model to accommodate Member States/Administrative Regions at different stages of readiness. The tiers are structured as follows:

- a) **Level 3**: This level includes Member States/Administrative Regions capable of generating, transmitting, and receiving CTOTs and complying with all procedures of Level-3 ATFM nodes. Current Level 3 participants include Cambodia (CATS), the mainland of China (ATMB CAAC), Hong Kong SAR, China (Hong Kong CAD), Republic of Korea (MOLIT), Singapore (CAAS), and Thailand (AEROTHAI);

- b) **Level 2:** Member States at this level are capable of complying with CTOTs from all Level-3 ATFM nodes. This includes Indonesia (AirNav Indonesia), Malaysia (CAAM), Myanmar (DCA Myanmar), the Philippines (CAAP), and Viet Nam (VATM); and
- c) **Level 1:** This level is for Member States that are observing and participating in the program's progress. Currently, Lao PDR (LANS) is participating at this level.

2.5 This kind of tiered model allows for a flexible approach, accommodating the varying capabilities and readiness levels of different Member States/Administrative Regions. It ensures that all participants can contribute to and benefit from the program, regardless of their current ATFM capabilities. This approach fosters a collaborative environment, promoting shared learning and progress. It also allows for the gradual and sustainable development of ATFM capabilities across the region.

Multiple ATFM Measures

2.6 In the realm of ATFM, handling flights subjected to multiple ATFM measures is a complex task. Three primary strategies have been identified to address this issue:

- a) **Prevention:** The first strategy aims to prevent the occurrences of multiple ATFM measures by increasing capacity and enhancing coordination among different stakeholders;
- b) **Identifying Hotspots:** The second strategy involves identifying hotspots in the region, such as specific routes and waypoints that are frequently subjected to constraints. This information can be used to better manage traffic flow and reduce the need for multiple ATFM measures; and
- c) **One CTOT Solution (OCS):** The third strategy, known as “One CTOT Solution,” consolidates all ATFM measures along the same flow into a single CTOT through the most upstream ATFM unit (ATFMU). This approach aims to simplify the management of flights subjected to multiple ATFM measures.

2.7 *Trial Operation of “One CTOT Solution” Principle:* A trial operation of the “One CTOT” principle will be carried out among the mainland of China and Hong Kong SAR, and the Republic of Korea. This trial will provide valuable insights into the effectiveness of the “One CTOT Solution” principle in managing flights subjected to multiple ATFM measures. The findings will be considered as a part of improving the concept of operations (CONOPS) of AMNAC, contributing to the ongoing efforts to enhance ATFM in the Asia/Pacific Region.

Transition to SWIM for Enhanced ATFM Operations

2.8 Distributed multi-nodal ATFM operation relies heavily on effective information exchange. To enhance the effectiveness of AMNAC cross-border ATFM information exchange and communication, the Core Team of AMNAC had established a Technical Subgroup to drive the studies on the development of SWIM-based information exchange, which would enable “ATFM-on-SWIM” operations in the region. The Technical Subgroup has been supporting the work of ICAO Asia-Pacific SWIM Task Force (SWIM TF) in this field, with the most notable recent accomplishment being the development of an extension to the flight information exchange model v4.2 (FIXM v4.2 Extension) that would support cross-border ATFM, A-CDM, ATFM/A-CDM integration as well as the future concept of traffic synchronization and flight and flow — information for a collaborative environment/ trajectory-based operation (FF-ICE/TBO).

2.9 In late 2023, an ATFM information exchange trial via SWIM over the region's Common Aeronautical Virtual Private Network (CRV) was conducted to illustrate how existing ATFM slot messages sent over AFTN could be done over SWIM and converted into FIXM format. The trial, while successful, highlighted

some problems relating to the formalization of FIXM version to be used in the region.

2.10 In addition to supporting the current ATFM operations, the Technical Subgroup has also begun to explore the evolution of ATFM in FF-ICE/TBO environment, taking into account the impending implementation of FF-ICE Release 1 (FF-ICE/R1) and experiences of AMNAC members that were engaged in demonstration programs such as the multi-regional TBO demonstration. This evolution toward FF-ICE will be explored further in future AMNAC meetings.

2.11 Additionally, the AMNAC Core Team has also been developing FLXM, which could potentially be a candidate information exchange model to support the exchange of ATFM daily plans (ADP). However, data elements contained in the AMNAC ADP template will still need to be reviewed to enable effective mapping of the elements with FLXM data attributes, a task which will be duly undertaken by the AMNAC Core Team.

3. ACTION BY THE CONFERENCE

3.1 The Conference is invited to:

- a) note the information contained in this paper,

To the related States and regions:

- b) consider the potential challenges posed by multiple air traffic flow management (ATFM) measures in future global air traffic management. It is suggested that all stakeholders collaborate on studying solutions to manage multiple ATFM measures effectively.
- c) note the technical development relating to SWIM-based infrastructure to support ATFM information exchange in the Asia/Pacific Region. The formalization of FIXM version will be further discussed and addressed;

To ICAO:

- d) incorporate the FIXM 4.2 extension specifications in the Asia/Pacific Region into SWIM, and promote its adoption in other regions as well.
- e) discuss any relevant matters as appropriate.

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