International Civil Aviation Organization

Thirteenth Meeting of the Air Traffic Management Sub-Group (ATM/SG/13) of APANPIRG

Singapore, 25 – 29 August 2025

Agenda Item 5: ATM Systems (Modernization, Seamless ATM, CNS, ATFM)

DIFFERENT APPROACHES FOR CROSS-BORDER AIR TRAFFIC MANAGEMENT

(Presented by the United States of America)

SUMMARY

This paper presents an overview of operational structures and challenges in cross-border Air Traffic Flow Management (ATFM), including a select set of examples of existing organizations for, and categories of, cross-border ATFM as implemented in States/Administrations around the globe. The authors have compiled this information in support of the ICAO APAC ATFM Concept Design Ad-Hoc Group's efforts to update the current *Asia/Pacific Regional ATFM Concept of Operations* and agree on priorities for improving cross-border flow management practices and capabilities, and a regional timeline for ATFM modernization.

1. INTRODUCTION

1.1. Over the last decade, the Asia-Pacific Multi-Nodal ATFM Collaboration (AMNAC) has built a foundation and established procedures for regional ATFM under the *Distributed Multi-Nodal (DMN) ATFM Network* concept. With a primary focus on the Ground Delay Program as a traffic management measure (TMM), participating Air Navigation Service Providers (ANSPs) built rudimentary tools for balancing demand and capacity within their areas of responsibility and worked together on addressing flow constraints and cross-border impacts. However, these practices and tools are already struggling to meet the demands of ever-increasing traffic levels and the complexity of operations in Asia-Pacific.

1.2. At the fifteenth meeting of the Asia/Pacific ATFM Steering Group in April 2025, the ICAO Asia/Pacific Regional Office established an ATFM Concept Design Ad-Hoc Group to develop a new version of the *Asia/Pacific Regional ATFM Concept of Operations*. The new concept will consider ATFM challenges observed in the current operations, along with the advent of new capabilities and procedures in the coming years and will present agreed-upon priorities for improved cross-border ATFM modernization.

1.3. To facilitate discussions of the ATFM Concept Design Ad-Hoc Group, this paper reviews different ATFM organizations found across the globe. It also explores global approaches for cross-border ATFM.

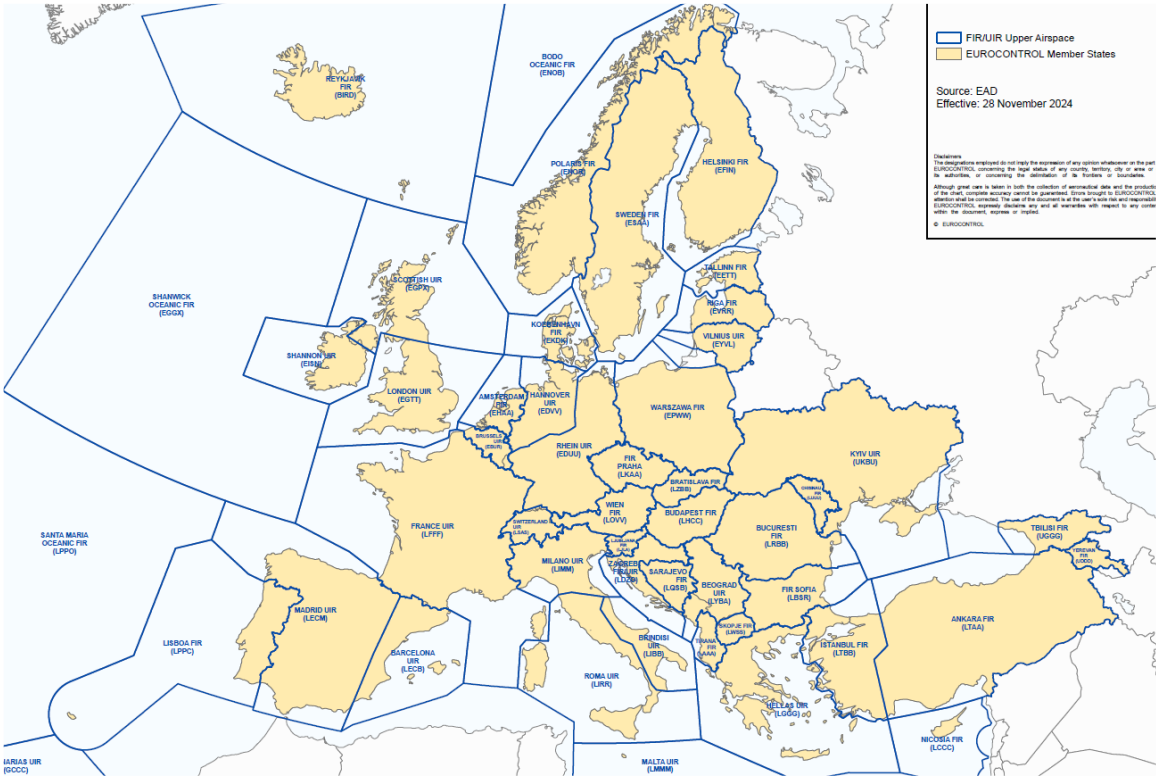
1.4. The organizational structure of the ATFM function varies based on the needs of the State(s) and/or ANSP(s). Various examples are shown below, which reflect the diversity found globally. There are advantages and disadvantages inherent in each structure. Section 2.1 focuses on ATFM internal to the organization, and Section 2.2 on cross-border ATFM for each type.

2. DISCUSSION

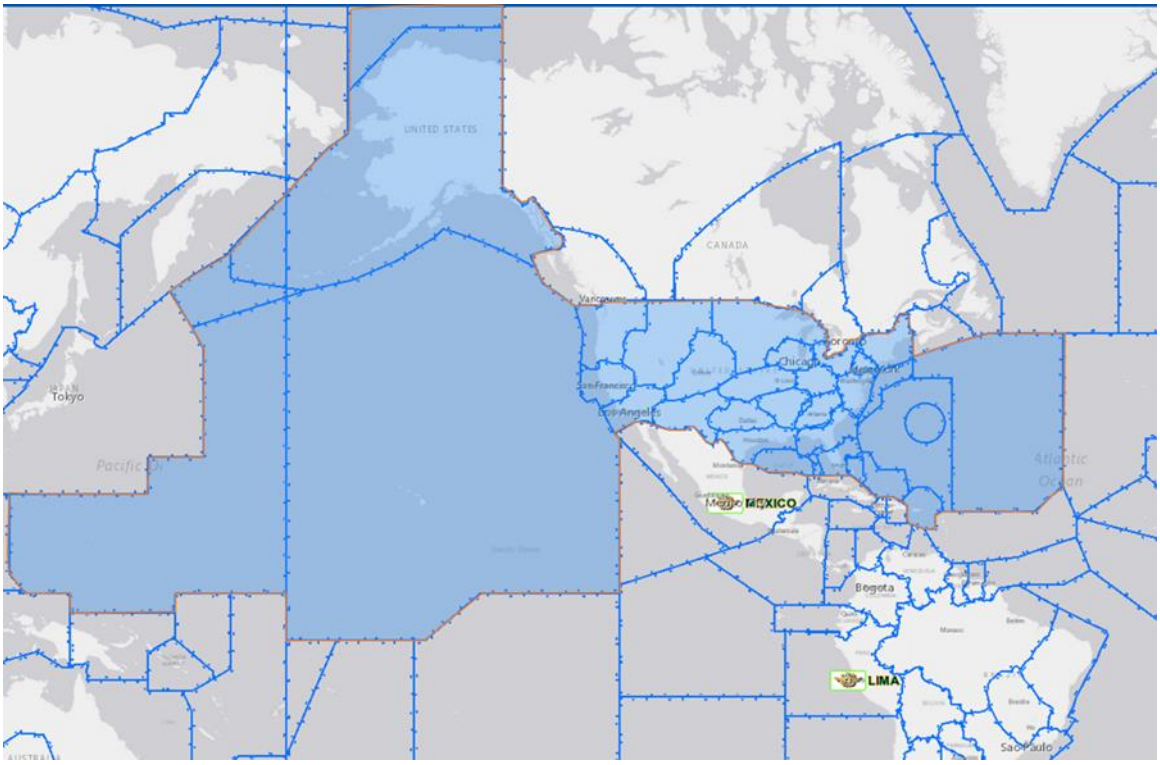
Different Types of ATFM Organizations

2.1. ***Hierarchical ATFM Organization***. Typically implemented when multiple FIRs are under the jurisdiction of a single ANSP (USA) or the jurisdiction of a single overlying ATM entity (Europe), Hierarchical Organization provides multiple layers of management as needed for large airspace and complex ATM situations: distributed ATFM layer at the ATC facility level (ACC and Terminal) that report to and coordinate with an overlying ATFM layer and entity that maintains awareness of the larger situational picture. The overlying ATFM entity implements large-scale measures that impact multiple FIRs. Examples of ANSPs with Hierarchical ATFM Organizations include:

a) Eurocontrol, European Union with 54 FIRs, including both Upper and Lower Airspace, overseen by the Network Manager in Brussels. Eurocontrol Network Manager does not have the authority to implement TMMs when consensus is not reached.



b) FAA, United States with 25 FIRs overseen by the Air Traffic Control Command Center in Warrenton Virginia. The FAA Command Center has the authority to implement TMMs when consensus is not reached.



c) Since the FAA Command Center FIRs all fall under a single ANSP, the timeframe of planning windows can be reduced, and the system can be nimbler as last minute constraints appear. Eurocontrol must reach consensus with many ANSPs, and this requires planning window timeframes to be further in the future, and the system is less nimble when last minute constraints develop.

d) Due to the different planning windows and coordination required, this leads to differing philosophies between the two largest ATFM implementations: the FAA tends to maximize throughput, while Eurocontrol tends to maximize predictability.

2.2. ***Centralized ATFM Organization***. Typically implemented by ANSPs with several ACCs or FIRs and a centralized ATFM unit implementing measures for the member FIRs. There tends to be enough internal traffic to effectively implement TMMs within the airspace overseen by the ATFM organization, though cross-border ATFM needs are greater than in large organizations. Examples of ANSPs with Centralized Organizations include:

a) Nav Canada, with 7 FIRs and 7 ACCs overseen by the National Traffic Management Unit (NTMU) in Toronto and developing a Network Manager style unit in Ottawa.

b) SENEAM, the ANSP of Mexico, with 2 FIRs and 4 ACCs overseen by SMARTMEX ATFM in Mexico City.

c) Airservices Australia, with 2 FIRs with 2 ACCs overseen by the Airservices National Operations Management Centre.

d) DECEA, the Department of Airspace Control of Brazil, with 5 FIRs and 5 ACCs overseen by Centro de Gerenciamento de Navegação Aérea (CGNA) ATFM Unit.

e) EANA, the ANSP of Argentina, with 9 FIRs overseen by EANA FMU.

2.3. ***Collaborative ATFM Organization***. Typically implemented by ANSPs with a single FIR, or ANSPs with multiple FIRs, but with a need for regional coordination for effective ATFM. A Collaborative ATFM Organization focuses on collaboration with neighboring FIRs to coordinate ATFM on a regional basis because they do not regularly encounter enough controllable flights for effective TMMs on their own. Typically, such ANSPs' traffic flows are significantly affected by developments in upstream airspace that are managed by other ANSPs, and the shape or the size of their airspace limits their ability to effectively support absorption of cross-border uncertainties. AMNAC is a great example of ANSPs with Collaborative ATFM Organization, with the highest capability members including:

a) AEROTHAI, Thailand.

b) Air Traffic Management Bureau, China.

c) Cambodia Air Traffic Services Company Limited, Cambodia.

d) Civil Aviation Authority Singapore, Singapore.

e) Civil Aviation Department of Hong Kong, China.

f) Office of Civil Aviation, Republic of Korea.

g) Vietnam ATM Corporation, Viet Nam.

Major Categories of Cross-border ATFM

2.4. Cross-border ATFM can be accomplished through shared automation systems that combine and consolidate ANSPs' data, or through standards-based data sharing between disparate automation systems.

2.5. ***Shared automation systems*** across ANSPs, with common automation systems, or ATFM as a service. The United States, Canada, and Mexico all share a common ATFM automation solution, and that automation system provides airport and airspace demand versus capacity visualizations, analysis tools, real-time weather, short-term convective forecasts, real-time aircraft positions, as well as tools to implement TMMs between the ANSPs (CTOTs, Ground Stops, Required Routes, etc.). Better Skies for Asia trial is an example of ATFM as a service serving multiple ANSPs.

2.6. ***Separate automation systems but shared data*** through standards-based data exchange. EUROCONTROL uses this model. Network Manager exchanges data with many underlying ANSPs' automation systems. This data exchange includes demand and capacity, TMMs, and even flight plans, as all flight plans are received by Network Manager and then distributed to each ANSP within the Network Manager domain.

2.7. ***Shared TMMs, through AFTN messaging*****.** The current APAC Multi-Nodal model, where TMMs needed from neighboring ANSPs are sent as ATFN messages. Limited to the capabilities of AFTN messaging, and does not include demand, capacity, and more data exchange than simple CTOTs.

2.8. ***Asymmetrical data exchange***. An advanced regional ANSP can consume and then share demand with less-advanced ANSPs. The FAA, through its robust data feeds, provides Caribbean ANSPs with three times a day, airspace and airport demand data via email. This will evolve in the future with more robust solutions.

2.9. ***Regional ATFM accomplished through communication channels without data*** for weather/contingency/special events. The CANSO ATFM Data Exchange Network for the Americas (CADENA) and CANSO ATFM Data Exchange Network for Cooperative Excellence (CADENCE) provide a way for collaboration and management of contingency events for regional ATFM as needed. Current uses include:

a) Hurricane/Typhoon/Cyclone/Earthquake events.

b) Civil disturbances.

c) Equipment outages or failures.

d) Special events.

e) Space launch and re-entry activities.

3. ACTION BY THE MEETING

3.1. The meeting is invited to:

a) note the information contained in this paper;

b) consider the information to further the task of the ICAO APAC ATFM Concept Design Ad-Hoc Group; and

c) discuss any relevant matters as appropriate.

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