

**54th CONFERENCE OF
DIRECTORS GENERAL OF CIVIL AVIATION
ASIA AND PACIFIC REGIONS**

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**AGENDA ITEM 3: AVIATION SAFETY AND
AIR NAVIGATION**

**OPERATIONAL AND INFORMATION MANAGEMENT
FRAMEWORK TO SUPPORT CROSS-BORDER ATFM
IMPLEMENTATION IN THE ASIA PACIFIC REGION**

(Presented by Australia, Cambodia, China, Hong Kong China, Indonesia, Malaysia, Philippines, Singapore, Thailand, CANSO and IATA)

SUMMARY

This paper updates the progress made by several States/Administrations in implementing cross border ATFM using the Distributed Multi-Nodal ATFM Network concept along with recent operational trials to regulate air traffic flow to balance demand and capacity. The operational trials yielded positive results, which demonstrated the potential of cross-border ATFM implementation in the region. As the cross-border ATFM initiative progresses into subsequent phase of operations to address airspace constraints, it would also need greater harmonization in the areas of both operational procedures and information management. The harmonized approach to implement cross-border ATFM in the region is in line with the vision of the Asia Pacific Seamless ATM Plan.

The Conference is invited to:

- a) note the information contained in this paper;
- b) encourage States/Administrations to participate in the Distributed Multi-Nodal ATFM Network project and commit the necessary resources to support cross-border ATFM operations;
- c) encourage States/Administrations to participate actively in the ICAO Asia Pacific ATFM Steering Group with a view to contribute towards the harmonization of ATFM information exchange requirements and interface control document to support ATFM system-to-system communication; and
- d) encourage States/Administrations developing ATFM implementation plans, to harmonize the processes in line with the ICAO Asia Pacific Regional Framework for Collaborative ATFM.

OPERATIONAL AND INFORMATION MANAGEMENT FRAMEWORK TO SUPPORT CROSS-BORDER ATFM IMPLEMENTATION IN THE ASIA PACIFIC REGION

1. INTRODUCTION

1.1 Air traffic demand in the Asia Pacific (APAC) Region has been constantly increasing. States/Administrations recognize the trend and have been developing their CNS capabilities to handle the surge in air traffic demand. In the meantime, cross-border Air traffic Flow Management (ATFM) solution that addresses the demand-capacity imbalance issue is needed to ensure optimized flight and ATM operations. Since 2014, several States/Administrations have been participating in the development of one such solution – the Distributed Multi-Nodal ATFM Network – and have been progressively conducting operational trials and moving towards the implementation of the concept in the region.

1.2 Currently, 10 States/Administrations and with airlines and airport partners participate in the ATFM operational trials that have been on-going since 2016. The results of the operational trials have been encouraging and have demonstrated the potential for implementation among the participating States/Administrations. While the project group seeks to expand the participation for Multi-Nodal ATFM further throughout the APAC region, there are also other on-going efforts in other parts of the region to embark on implementing cross border ATFM. There will be a need to harmonize these different developments through collaboration to ensure interoperability between the various efforts. Harmonization of the operational concepts and interconnectivity of ATFM systems are key enablers to achieve the linkage across regions, paving way toward global interoperability.

2. DISCUSSION

Phased and Tiered Approach for Distributed Multi-Nodal ATFM Operational Trial

2.1 The States/Administrations involved in the project had adopted a phased approach to roll out cross-border ATFM. The project was mapped into 2 phases and subdivided into stages to ensure deliberate planning and incremental achievable milestones. This also keeps the momentum and interest of the project participants going. Phase 1 focuses on addressing air traffic Demand-Capacity Balancing (DCB) at individual airports by regulating arriving flights through Ground Delay Program (GDP) at departure airports with the issuance of Calculated Take-Off Time (CTOT). Subsequently, Phase 2 aims to apply similar concept to address DCB within airspace sectors managed by participating Air Navigation Service Providers (ANSPs) and paving way towards inclusion of long-haul international flights. The project also adopted a tiered-approach to allow greater participation by ANSPs. Participation were tiered into different levels to cater for the varying levels of readiness for the participants to perform their roles as ATFM node in the network. A Level 3 ANSP participates as an ATFM node capable of implementing an ATFM measure while a Level 2 ANSP participates as an ATFM node supporting the ATFM measures. Provisions are also made for ANSPs to participate as observers, as Level 1 participants.

Phase 1 – Demand Capacity Balancing (DCB) for Aerodrome Constraints

2.2 Phase 1 of the Distributed Multi-Nodal ATFM Operational Trial culminated in live trials with actual ATFM measures implemented for planned aerodrome closures during events such as the Singapore's National Day Parade aerial fly past and Royal Thai Air Force's special air display mission. Operational trials for Phase 1 were subsequently extended through March 2017 and had gained validation from project members as a viable and efficient method of providing traffic flow regulation and management. The success of the operational trial in Phase 1 led to the adoption of an operationally-ready ATFM service for Singapore and Thailand on 1 April 2017 onwards. From this period, ATFM measures could be put in place as required, to regulate traffic flow into aerodromes suffering from demand-capacity imbalance due to unforeseen events such as adverse weather and runway outage.

2.3 The ATFM measures implemented during the Phase 1 period yielded promising benefits. Singapore had implemented ATFM measures on 13 occasions and recorded an approximate airborne delay reduction of 3,400 minutes. Thailand implemented ATFM measure for the special air display over Bangkok Don Mueang International Airport and recorded an average airborne delay reduction of 12 minutes over the 3-hour period. In addition to reduction of delays and CO₂ emission, the use of GDP/CTOT also provided increased predictability to stakeholders. There were also positive feedbacks by ATC with respect to decrease in operational complexity during demand-capacity imbalance events when compared to previous occurrences without ATFM measures. While ATFM strives to provide an efficient and predictable operation environment for stakeholders, it also enables a safer operating environment where air traffic demand are regulated and ATC and airport capacity are not stretched beyond a safe operating level.

Phase 2 – DCB for Airspace Constraint

2.4 The discussions for Phase 2 to address DCB for constrained airspace began in 2017. The group was presented with an opportunity to experiment with implementing GDP for an airspace constraint during large scale multilateral military exercise in Thailand. Exercises Cobra Gold and Cope Tiger 2017 utilized large portion of the airspace in the north-eastern portion of the country, resulting in congestion points north and northeast of Bangkok TMA due to limited ATS route availability. To address this, Thailand implemented ATFM measures to regulate the traffic flow over the congestion points. The lessons learnt from the events set the baseline for subsequent project discussion in which four key focus areas were identified for the upcoming work:

- 1) ***Airspace Capacity Assessment*** – To build capability for airspace capacity assessment as part of strategic and pre-tactical ATFM operations; and to assess traffic demand prediction, including trajectory modelling, accuracy;
- 2) ***Demand-Capacity Balancing for Airspace Constraints*** – To develop procedures and build capability in conducting GDP/CTOT based on airspace constraints;
- 3) ***Multi-Constraint ATFM Measure(s)*** – To develop procedures in facilitating and balancing multiple concurrent ATFM measures; and
- 4) ***ATFM System Information Linkage*** – To continue the work of Technical Subgroup in developing framework for ATFM system-to-system information linkage.

Stakeholder Engagement and Post Operation Analysis Framework

2.5 Concurrent with four areas of focus in Phase 2, a continuous stakeholder engagement program was also identified as an integral aspect to the success of cross border ATFM operations. Due to the highly collaborative environment required to support cross border ATFM operations, high level of commitment and cooperation from all stakeholders are necessary. In particular, Level 2 ANSPs supporting ATFM operations need to ensure coherence with GDP/CTOT to enable effective cross-border ATFM operations.

2.6 Post operations analysis is also an essential part of ATFM operations. An open reporting system and transparency in ATFM post operation analysis along with a common set of performance matrices would ensure that outcomes from each ATFM program could be used to improve subsequent ones. States/Administration participating in this project had proposed a recommended framework for the conduct of ATFM post operations analysis at the recent 7th Meeting of the ICAO Asia Pacific ATFM Steering Group (ATFM/SG/7 – May 2017), to be included as part of the ICAO Asia Pacific Regional Framework for Collaborative ATFM. The framework will include several key performance indicators to measure effectiveness of the ATFM program as well as a workflow guideline to ensure effective collaboration between ATFM unit and stakeholders following the operations.

Information Management for ATFM System-to-System Communication

2.7 States/Administrations involved in the Distributed Multi-Nodal ATFM Operational Trial project have also established a Technical Sub-Group to produce the technical requirements roadmap and Interface Control Document (ICD) for ATFM system-to-system information linkage. Effective sharing of ATFM information is critical to the Distributed Multi-Nodal ATFM Network concept due to its decentralized nature. System-level exchange of information would enable airspace users to readily access ATFM information throughout the network from any of the connected system. To ensure harmonization of ATFM information attributes across different ATFM systems, the sub-group had also formalized a Common Minimum User Interface Requirements to be adopted by network participants.

2.8 System Wide Information Management (SWIM) will be a key enabler for ATM innovation and performance improvement while Flight Information Exchange Model (FIXM) has been identified as one of the information exchange model in the SWIM Global Interoperability Framework. The Sub-Group is exploring the use of FIXM for the exchange of flight data attributes between ATFM systems in order to support cross border ATFM operations and may contribute to the development of additional FIXM data attributes as an extension.

2.9 Concurrently, the Sub-group had identified several basic use cases to aid in the development of the ICD with the draft preliminary ICD presented at the 7th Meeting of ICAO Asia/Pacific ATFM/ Steering Group. The work of the Technical Sub-Group would lay the foundation for the harmonization of ATFM information exchange under the Multi-Nodal ATFM network concept.

Harmonising the developments of cross border ATFM

2.10 As cross-border ATFM operations further progresses across regions toward global implementation, it will require a robust Collaborative Decision Making (CDM) platform taking into account all stakeholders' priorities. The ability to provide efficient and effective air traffic flow regulation from departure to destination requires a high level of commitment and participation from all stakeholders. When viewed from the perspective of the overall phase-of-flight for cross-border ATFM operations, there will be a greater need to harmonize variations in ATFM operational concepts and processes. This will eliminate potential contradictory instructions and ATFM restrictions. Furthermore, it will also ease aircraft operators and other airspace users when interfacing with ATFM procedures over various parts of the region.

2.11 Around the world, the execution of ATFM can be achieved through various means such as, ground delay program, minutes in trail/miles in trail, minimum departure interval, etc. While these various ATFM measures can be used in combination to ensure traffic demand is compatible with available capacity, it should be recognized that some ATFM measures provide more predictability and efficacy over others. As such, States/Administration should work towards deploying ATFM measures in ways that increases the predictability of affected stakeholders and provide common situational awareness of constrained ATM resource to enable reconciliation of conflicting ATFM measures (if any), while effectively regulating traffic demand. This would be in line with principles in the ICAO Asia Pacific Regional Framework for Collaborative ATFM.

2.12 The need for updated flight data and trajectory information is crucial for the formulation of accurate demand prediction, which is the cornerstone to any ATFM operations. While the technology may be available now for seamless interconnectivity among ANSPs and stakeholders, a collective effort to reconcile the different formats and protocols unique to each ATFM system is still required. The Technical Sub-Group of the Distributed Multi-Nodal ATFM Operational Trial project is currently working on the appropriate information management requirements along with the ATFM system-to-system ICD. The output from this will also support the work undertaken by the ATFM Information Requirement Small Working Group (ATFM-IR/SWG) of the ICAO Asia Pacific ATFM Steering Group. These efforts aim to harmonise information requirements to ensure seamless interconnectivity between ATFM Nodes in this region.

2.13 The effort to harmonise the development of cross border ATFM would be a step towards the vision of a cohesive global ATFM environment consisting of interconnected ATFM nodes with efficient flow of data and information. States/Administrations will need to work together and commit resources to progress with implementation of cross border ATFM. Collaboration of such magnitude will also bring about the gathering of a substantial pool of subject matter experts, and the mitigation of duplicative efforts.

Conclusion

2.14 The Distributed Multi-Nodal ATFM Operational Trial project has seen validation of its concepts and methodology through successful trials in operational environments, and recognition through endorsement by the ICAO Asia Pacific ATFM Steering Group. The project would now focus on levelling up the capabilities of participating ANSPs for the next phase of the project.

2.15 Concurrently, the States/Administrations involved in this project will continue to promote and raise awareness to the benefits of cross-border ATFM using the Distributed Multi-Nodal ATFM Network concept. Recognizing the development of ATFM implementation in other parts of the APAC region, there will be a greater need for this region to work towards harmonizing the development. This could be achieved through collaboration and coordination between States/Administration involved in the development of ATFM implementation. It will ensure that the cross-border ATFM implementation in APAC region not only fulfils the vision of the ICAO Asia Pacific Seamless ATM Plan but would also collectively bring this region one step closer towards achieving a globally interoperable and connected ATFM in line with the ICAO Global Air Navigation Plan.

3. ACTION BY THE CONFERENCE

3.1 The Conference is invited to:

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- b) encourage States/Administrations to participate in the Distributed Multi-Nodal ATFM Network project and commit the necessary resources to support cross-border ATFM operations;
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