



*International Civil Aviation Organization*

**The Sixth Meeting of ICAO Asia/Pacific Air Traffic Flow Management  
Steering Group (ATFM/SG/6)**

Bangkok, Thailand, 06 – 10 June 2016

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**Agenda Item 6: Development of Regional ATFM Framework**

**PROGRESS OF THE DISTRIBUTED MULTI-NODAL ATFM OPERATIONAL TRIAL  
PROJECT**

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

**SUMMARY**

This paper provides an update on the Distributed Multi-Nodal ATFM Operational Trial Project, a collaborative effort among several States and international organizations to conduct an operational trial of a viable regional cross-border ATFM concept aiming to enhance operational efficiency and optimize capacity through Demand-Capacity Balancing and greater predictability for stakeholders.

The paper focuses on the result from recent demonstration flight activities and the upcoming Limited-Scope Operational Service, crucial steps in introducing the concept in operational environment.

**1. INTRODUCTION**

1.1 As often discussed at ATFM Steering Group meetings, States have acknowledged the rapid and sustained increase in air traffic demand within the Asia-Pacific region over the past few years with the trend continuing to grow in the foreseeable future. Traditional flow restrictions to regulate air traffic flow and ensure safety by independently imposing minimum border-crossing interval / Miles-in-Trail / Minutes-in-Trail requirements to ANSP upstream have not been the most effective way to collaboratively smooth the flow of traffic while minimizing negative on stakeholders' operations. It was thus recognized that the Asia-Pacific region needs a more viable means to collaboratively achieve Demand-Capacity Balancing (DCB) at various constrained resources. One such concept – the Distributed Multi-Nodal ATFM Network, conceived through the collaborative research project among Asia-Pacific States/Administrations and International Organizations with operational inputs from other stakeholders, was presented and endorsed as a viable foundation for Asia-Pacific Cross-Border ATFM solution at ATFM/SG/3 (Decision 3/1).

1.2 Since then, the Distributed Multi-Nodal ATFM Operational Trial has collaboratively initiated to further refine and validate the concept, especially under operational environment. Over the previous two ATFM/SG meetings (ATFM/SG/4 and ATFM/SG/5), States/Administrations involved in the trial had presented progress of the work that was started in June 2015. Thus far, the project has progressed with the first phase, focusing on achieving DCB at constrained arrival airports through implementation of Ground Delay Program (GDP) issuing Calculated Take-Off Time (CTOT) for flights prior to departures. This paper provides the update with the result from the demonstration flight activities and plan for the upcoming Limited-Scope Operational Service.

## 2. DISCUSSION

2.1 Since ATFM/SG/5 (March 2015), the project has since progressed through a number of meetings and many activities aiming to incrementally validate the concept until it can be fully implemented in operational environment. The Operational Trial officially began in June 2015 with Phase 1 of the work focusing on achieving DCB at constrained arrival airports through issuance of CTOT for flights prior to departures. The amount of work cut out in front of the Core Project Team was large and thus needed to be further divided into Stages. The work plan has been through many revisions, but has been finalized as the following:

<b>Phase 1 – DCB for Constrained Arrival Airports</b>		
<b>Stage 1</b>	<b>Stage 2</b>	<b>Stage 3</b>
<ul style="list-style-type: none"> <li>✓ Communication Linkage and Protocols</li> <li>✓ Information Dissemination</li> </ul>	<ul style="list-style-type: none"> <li>✓ Demand Prediction Validation</li> <li>✓ Local Table-Top Exercises</li> <li>✓ Cross-Border ATFM Procedure Development and Validation through Demonstration Flights</li> </ul>	<ul style="list-style-type: none"> <li>➤ Limited-Scope Operational Service: Providing ATFM service for planned and ad-hoc events; introduction of Combined ATFM Measure</li> </ul>
<b>Phase 2 – DCB for Constrained Airspace</b>		
TBD		

2.2 The following subsections summarize activities done and their associated results in each Stage during Phase 1 of the Operational Trial, as well as the project plan for the upcoming year.

### Stage 1 – Communication Linkage

2.3 Stage 1 focused on setting up various communication channels between stakeholders and compilation of Points of Contacts. This ensures that ATFM-related information are disseminated to relevant stakeholders in a timely manner, thus enabling appropriate actions on their part when ATFM measures are put in place. Communication methods tested consist of e-mails, telephone, fax, AFTN, and web-conference. Additionally, stakeholders also had opportunities to interact with ATFM support systems from each of the Level-3 ANSPs (China, Hong Kong China, Singapore, and Thailand). The testing went smoothly, with stakeholders able to communicate through all channels in timely manners. However, the involvement of operational personnel was limited as there was no actual ATFM measure during this stage, and the activities did not affect normal flight and air traffic control operations.

2.4 However, the testing also highlighted differences in user experience among various ATFM Nodes' ATFM support systems. With the systems developed or procured independently, the information available in each system is limited to that originated from the system owner only; e.g. a Singapore-bound flight departing from Bangkok must obtain CTOT through Singapore ATFMU's support system while the Bangkok-bound flight must obtain CTOT through Bangkok ATFMU's support system which has different user experience. Airspace Users recognized that this would pose a major roadblock to being able to scale the ATFM Network due to the large amount of workload in accessing information from different sources for all of their flights. Airspace Users (and other stakeholders) require a 'single point' of access and interface for network information – the acknowledgment of this critical challenge resulted in the formation of Technical Sub-Group of the Project Core Team to address this work. More information on the Technical Subgroup will be presented to the Meeting under WP/10 – *Progress of the Technical Sub-Group of the Distributed Multi-Nodal ATFM Operational Trial*.

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## Stage 2 – Procedure Development and Demonstration Flight Activities

2.5 With the communication linkage tested, the project progressed to Stage 2 which focused on the development of harmonized cross-border ATFM procedures under different scenarios. Prior to that, States had begun the work in Stage 2 with analyses of ANSPs' demand prediction capabilities. The objective of the analysis was to ensure that Level-3 ANSPs (ANSPs who are currently able to issue CTOTs) are appropriately equipped and able to accurately predict air traffic demand; a prerequisite to implementing effective ATFM program. Flight schedules obtained either through Slot Coordination process or airline schedules forms the baseline for demand prediction. The tradeoff for using schedules, however, is the inaccuracy of flight attributes such as Estimated En-route Time that would be included in the ATFM measure calculation. Demand prediction accuracy improves significantly when supplemented by flight plan data and most ANSPs showed fairly satisfactory demand prediction accuracy based on advance submission of flight plans. ***Thus it is pertinent that States recognize the importance of advance flight intent information on the part of Airspace Users, as it has direct impact on the quality of ATFM program put in place by ANSPs.*** WP/06 – *Submission of Flight Plans and Transmission of ATS Messages for an Effective ATFM Services* addresses this issue in further detail.

2.6 Development of harmonized Cross-Border ATFM procedures under different scenarios was undertaken by core member States through project meetings and engagement with local stakeholders, resulting in a starting set of procedure that formed the foundation of how Cross-Border ATFM measure such as CTOT should be disseminated and managed under the Distributed Multi-Nodal ATFM Network concept. In the current setting, ATFM Daily Plan (ADP) and CTOT information are distributed mainly via e-mail and web service provided by the ANSP that issue the measure and subsequent management of the measure is done through voice or e-mail coordination between stakeholders and the responsible Flow Management Position (FMP). This was the basis on which States conducted the Demonstration Flight Activities between March to June 2016.

2.7 Demonstration Flight Activities aimed at introducing the procedures developed to wider operational personnel from all stakeholders – ANSPs, Airspace Users, and Airport Operators alike – while testing their viability without affecting normal flight operations. States testing the procedures through issuance of “zero-delay CTOT” or CTOT that would not induce unnecessary delay on flights involved. CTOT issued was then disseminated to relevant stakeholders as per procedure developed, with the intension to include the confirmation of CTOT between pilot and ATC during the Clearance Delivery process in the second round of Demonstration Flight Activities as a step to gradually refine the procedures that involves operational personnel. CTOT adherence was measured during the activities but no punitive measure was taken against flights that did not adhere to their CTOT, but rather the result discussed for analytical purpose.

2.8 The first round of Demonstration Flight Activities, taking place between 28 March – 12 April 2016, covered flights from 15 airlines and 19 airports including 2 flights from Vientiane and Phnom Penh (Lao PDR and Cambodia are both currently participating in the project as observers, but kindly assisted in the activities to ensure widest scope of airlines involved). The activities proved fruitful in assisting stakeholders to familiarize their operational personnel such as pilots, dispatchers, and FMPs with the concept and practice of cross-border ATFM as well as highlighting several challenges that the project need to further discuss and refine. Some of the key issues are as followed:

1. *Management of CTOT in case of delayed flight* – Since the current setup requires Airspace User to coordinate directly with ATFMU responsible for issuing the measure when changes to departure times are needed, the communication protocol involved needs to be clearly defined; taking into account the workload of personnel involved and the fact that personnel may not be in the same physical location. In the long run, higher level of automation will be required.

2. *CTOT adherence on departure* – During the activities, several flights could not adhere to CTOTs and departed either later or earlier than the windows given. While this could be due to the activities being a demonstration and no impact on real operation was required, in the subsequent Stage 3 where flights will be subjected to ATFM measures under real scenarios, a strict adherence to CTOT will be required. This would necessitate issuance of awareness document in the form of AIP Supplement and NOTAM combination.
3. *Potentially conflicting ATFM measures* – During the activities, one of the flights was given both demonstration CTOT and actual en-route constraint. While the two constraints did not conflict and the CTOT situation was only for demonstration purpose, this could become an issue when implementing in real scenario during Stage 3 and beyond. A clearly defined protocol in handling the conflicting ATFM measures will be necessary.

2.9 Member States and Project Core Team will continue to work closely together to address the raised issues and further refine the procedures to ensure the most effective protocols in cross-border ATFM. The initial round of review and discussion on the topic took place during the 10<sup>th</sup> Distributed Multi-Nodal ATFM Operational Trial Core Team Meeting (26 – 28 April 2016, Singapore), resulting in the initial draft of the ***Common Operating Procedure*** that clarifies some of the processes and addresses some of the challenges; the draft is prepared to be presented with this paper at the ATFM/SG/6 meeting.

2.10 The second round of the Demonstration Flight Activities is currently taking place (23 May – 24 June 2016) and will proceed in similar manner to the first round, covering flights from airlines and airports that have yet to be involved previously. The objective of the second round of the activities is to further widen the scope of awareness and further refine the procedure, using lessons learned from the first round. Project Core Team and States will continue to engage with stakeholders in preparation for and review of the activities' results. Alongside the activities, States will also continue the preparation for Stage 3 – Limited-Scope Operational Service period of the project which is planned for commencement in July 2016.

#### Stage 3 – Limited-Scope Operational Service

2.11 With the successful completion of the first round of Demonstration Flight Activities and the second round ongoing, the project is at a crucial junction with the commencement of ***Stage 3 – Limited-Scope Operational Service***; the last Stage in the first phase of this project where real ATFM measures will be applied and enforced under real situations. This is a key step in moving toward the implementation of cross-border ATFM to achieve DCB at constrained arrival airports.

2.12 In this Stage, implementation and enforcement of ATFM measures to achieve DCB at constrained arrival airports under actual situations will be carried out. The project will progress incrementally through this implementation, beginning with planned chosen in advance on limited number of days to allow stakeholders to properly prepare and methodically widen the scope to eventually enable ATFM measures to be implemented on an ad-hoc basis when needed.

2.13 Amongst the Level-3 ANSPs, Singapore will kick-start this stage in July 2016 allowing ATFM measures to be put in place during the closure of Changi Airport for the National Day Parade 2016 (NDP16) rehearsals and the actual NDP16 event on 9 August 2016. Although strategic demand-capacity adjustment through airport slots has been put in place, ATFM measures will be used to smooth out the demand-capacity imbalance prior to and after the closure. To implement the ATFM measure, Singapore ATFMU will issue ATFM Measure (GDP / CTOT) to flights scheduled to arrive at Singapore Changi Airport (WSSS) during the affected period. Stakeholders involved are expected to adhere to the CTOTs given as per procedure developed and demonstrated during Stage 2. Singapore will publish an AIP Supplement and associated NOTAMs in due course. Members of the

Multi-Nodal project have agreed to support Singapore in carrying out ATFM measure for affected flights during these periods.

2.14 This is an ideal platform to conduct Stage 3 as it is a recurring annual event that stakeholders are familiar with, and the impact of additional ATFM measure through CTOT issuance should be minimal with the strategic airport schedule adjustments, allowing stakeholders to test processes in actual operations. Subsequent to 9 August 2016, the other Level-3 ANSPs may similarly carry out Limited Scope Operational ATFM Service, as necessary, throughout the second half of 2016.

2.15 It should be recognized, though, that CTOT alone may not be fully effective in achieving DCB at constrained arrival airports, especially those with a large proportion of long-haul flights. CTOT issuance is a pre-tactical ATFM measure and needs to be disseminated to the flights prior to their departure; this may not be possible with long-haul flights from outside the region due to limitation in advance capacity prediction. Thus, the project has started to explore the concept of combining GDP/CTOT with other conventional ATFM measures such as Miles-in-Trail, Minutes-in-Trail, Minimum Departures Interval and Ground Stop to allow States to capture more flights under ATFM program, thereby increasing the effectiveness of the program and more evenly spread out the impact of ATFM measures. WP11 – *Combined ATFM Measures* discusses this concept in further detail and the project will continue to assess the viability of introducing such concept operationally during Stage 3.

#### Minimum Requirements and Readiness Checklist to Participate in the Network

2.16 In leading up to Stage 3 – Limited-Scope Operational Service, the project recognize that States – both those currently involved at various levels and those looking to participate – need guidance in making appropriate preparation in terms of operational personnel and procedure, support system, and stakeholder awareness. To aid States interested in making such preparation, the Project Core Team has prepared the *Minimum Requirements and Readiness Checklist* for presentation with this paper at ATFM/SG/6 meeting.

#### Conclusion and Moving Forward

2.17 Since June 2015, the Distributed Multi-Nodal ATFM Operational Trial Project has made significant progress to validate the concept that has been endorsed as viable foundation to the Asia-Pacific regional cross-border ATFM implementation. The project is now at a crucial juncture where the concept and procedures developed will be tested under real situations. While the road ahead will be challenging, Project Member States are committed and will continue to work collaboratively and ensure the success of this project; thus paving way toward a more harmonized and efficient air traffic operations for the region.

### **3. ACTION BY THE MEETING**

3.1 The meeting is invited to:

- a) note the information contained in this paper;
- b) consider participating in the project, perusing the Minimum Requirement and Readiness Checklist and the draft Common Operating Procedure documents as guidelines in making appropriate preparations; and
- c) discuss any relevant matters as appropriate