



*International Civil Aviation Organization*

**The Second Meeting of ICAO Asia/Pacific Air Traffic Flow Management Steering Group (ATFM/SG/2)**

Bangkok, Thailand, 1 – 4 October 2013

**Agenda Item 5: Development of Regional ATFM Framework**

**Concept Development for a Distributed ATFM Network for the Region**

(Presented by Hong Kong China, Singapore and Thailand)

**SUMMARY**

This paper presents an update on the on-going collaboration between Hong Kong China, Singapore and Thailand to develop a concept of ATFM based on Collaborative Decision Making (CDM), through sub-regional cooperation. The concept involves the development of a distributed regional ATFM network, which could potentially manage both international and domestic air traffic flows in this region. Supported by an industry partner, the concept development involves concept engineering process which includes several stakeholder sessions culminating to the human in the loop simulation. In the meantime, a common set of agreed principles among the participating ANSPs and airports will need to be established to further this concept.

This paper relates to –

**Strategic Objectives:**

A: *Safety – Enhance global civil aviation safety*

C: *Environmental Protection and Sustainable Development of Air Transport – Foster harmonized and economically viable development of international civil aviation that does not unduly harm the environment*

**Global Plan Initiatives:**

GPI-6 Air traffic flow management

GPI-9 Situational awareness

GPI-16 Decision support systems and alerting systems

**1. INTRODUCTION**

1.1 At the 50<sup>th</sup> Conference of Directors General of Civil Aviation Asia and Pacific Regions held in Bangkok in July 2013, Hong Kong China, Singapore and Thailand presented an update to the on-going tripartite collaboration to develop an ATFM concept for this region. Unlike ATFM solutions based on centralised systems such as those found in Europe and North America, the proposed concept for this region will be a distributed multi-nodal ATFM network. Such interconnected ATFM nodes residing within individual ANSPs in the region could form the larger virtual ATFM for the region.

### Concept Overview

1.2 The concept involves each ANSP operating an independent, virtual CDM/ATFM node supported by an interconnected information sharing framework. Where possible, Airport-CDM mechanisms, especially at busy airports can aid the collaborative decision making process between the ANSPs. The flows of air traffic will then be managed effectively based on a common set of agreed principles among the participating ANSPs and airports. A node comprising an ANSP with associated airports within a defined catchment area will be able to manage the demand and capacity through adjustments in aircraft Target Landing Times (TLDT) which will in turn influence the issuance of Calculated Takeoff Times (CTOT) for aircraft at the participating airports within that catchment area.

1.3 The coordination resulting from the shared awareness of this information within this node will further enable the assignment of Target Start-up Approval Times (TSAT) for aircraft with the aid of A-CDM. The relevant information is in turn shared with other participating nodes in the network, where this cycle of information-sharing and decisions is replicated among similar combinations of ANSPs and airports in their own defined catchment areas in the Asia and Pacific Regions. The linking up of the multiple nodes will create a larger network that can eventually connect the Asia and Pacific Regions with other existing ATFM nodes elsewhere beyond these Regions (see Figure 1).

1.4 This concept can potentially be applied to both international and domestic air traffic. The concept will benefit not only the ANSPs that manage hubs with predominant international air traffic but can also work for ANSPs that handle domestic air traffic. For instance, Bangkok ATFM Unit will be able to manage both international and domestic air traffic, expanding CDM/ATFM coverage from the 30-percent domestic traffic within Thailand. Furthermore, this concept can complement existing established ATFM units and any other developing ATFM units that manage domestic air traffic.

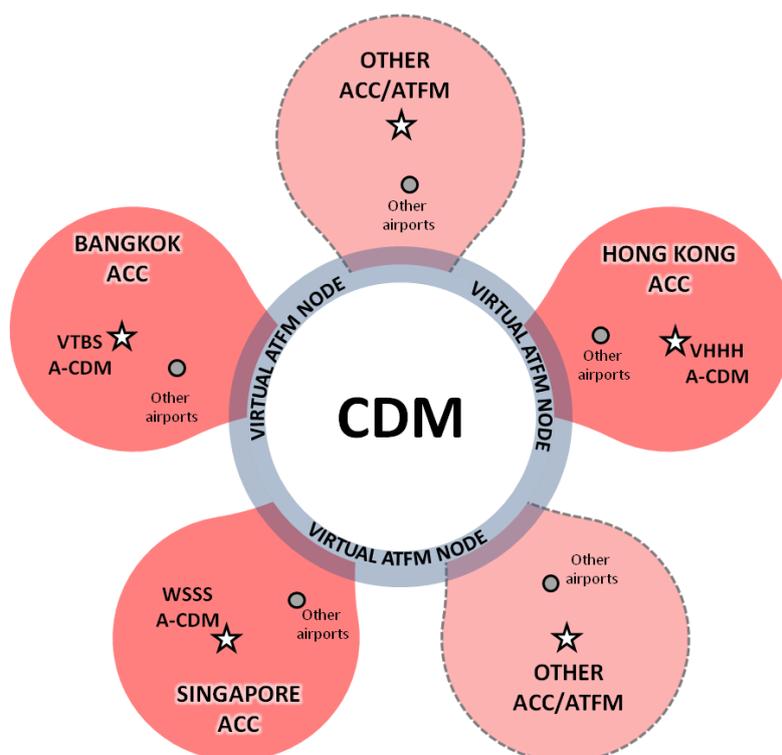


Figure 1. Distributed Multi-Nodal ATFM Network

## 2. DISCUSSION

2.1 It is recognized that a lengthy and challenging endeavour may be inevitable for such a multi-nodal virtual ATFM/CDM concept to materialize and mature in this region. The concept will need to be tested to ensure that it is not only workable but also robust for widespread adoption. It is with this view that the tripartite adopted a two-part approach in this endeavour.

### CDM Information Sharing Trial

2.2 The first part focuses on the objective of building the foundation for a simple but robust information-sharing framework, to enable effective exchange of relevant operational information between the three parties. This is essential for the collaborative decision making process between the three ANSPs. This information-sharing aims to impart predictability and confidence into operations through enabling common situational awareness between the three ANSPs of any expected air traffic congestion due to daily capacity reducing events, such as adverse MET forecast resulting in reduced airport acceptance rate or airway capacity. Plans for the development of a web-based portal to enhance information-sharing between the ANSPs are being considered. An operational trial, utilizing existing communication resources, has commenced since early September 2013. A post-trial analysis will be conducted at the end of 2013, to enable further fine-tuning of the procedures to support the overall concept of ATFM in this region.

### Regional ATFM Concept Development

2.3 The second part of the project, which runs concurrently focuses on concept development and exploring the potential for implementation at a sub-regional scale. The proof of concept involves concept analysis, exploration and development to deliver an eventual Concept of Operation (ConOp). This process is supported by Airbus Prosky.

2.4 Several stakeholder engagement meetings were held which included airline operators, airport operators, ground handling agents and also the tripartite members. Such stakeholder engagement sessions form the basis for the development of concept and procedures for various scenarios in ATFM. Some of the scenarios that support the concept includes;

- Activation of generic ATFM Measures (or Traffic Management Initiatives: TMI) to balance demand and capacity which include information that will be disseminated and actions by airline operators realise such ATFM Measures.
- Methods for airline operator to state their intent of consuming delay to meet the objectives of the ATFM Measures
- Flight substitutions during ATFM Measures to optimise the overall airline operations network. Ability to substitute flights within same airline to meet business objectives. This will reduce the delay of high priority flights or substitute a flight into a slot it can comply with.
- Principles of compliance recognising that non-compliant flights will disrupt the smooth flow of traffic to constrained resource, handling of non-compliance and various compliance measurements.
- Establishing maximum delay parameters at departure airports and airspace where necessary to minimise spill-over effect from ATFM Measures.

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- Data communication framework identifying the necessary information that will need to be exchanged and strategies to harmonise ATFM based messages across nodes.
  - Post operations metrics and establishing operational baseline to determine the efficacy and benefits of ATFM Measures.

2.5 The various scenarios and procedures highlighted above will form the foundation of the concept. The concept exploration will be carried out on an integrated test bed facility that has been set-up at the Singapore Aviation Academy. Using fast time and Human in the Loop (HITL) simulation, the various scenarios will be tested out which will involve the various stakeholders that have participated since the concept development stage.

2.6 Output from the research of this concept will also include a benefit analysis to strengthen the business case for such a concept. It is anticipated that the research of this concept will be completed by December 2013 and the findings will be presented at the subsequent ATFM Steering Group meetings in 2014.

#### Convergence of ATFM Efforts

2.7 While Hong Kong China, Singapore and Thailand are pursuing to establish best practices for CDM and develop a viable concept for ATFM in this region, there are other on-going efforts that are running in parallel to bring ATFM into realisation in this region.

2.8 Under the Asia Pacific Economic Cooperation (APEC) framework, Thailand and Malaysia are working with the United States and Indonesia on the APEC Air Traffic Management Emissions Reduction Project to optimize air traffic flow and manage flow rates through common choke points which will consider methods to achieve demand/capacity balancing with focus on air traffic between Bangkok and Kuala Lumpur. The project is supported by Metron Aviation.

2.9 Under ASEAN Air Transport Integration Project (AATIP), a consultancy study supported by European Union (EU) aviation experts is currently on-going. The project will look at pan-ASEAN seamless ATM, which includes developing regionalised cross-border air traffic management systems and ATFM in ASEAN as well as analysis of airport and airspace capacity through airspace modelling and simulation, which can also be used to evaluate benefits of changes in ATM procedure and supporting infrastructure.

2.10 Recognising the various developments that are running parallel, Hong Kong China, Singapore and Thailand had invited Malaysia, the EU consultant for AATIP, FAA and also IATA for the recent tripartite meetings. Their valuable insights and inputs to the discussions helped to enrich the development of the ATFM concept for the region.

2.11 In order to avoid duplication of efforts especially with the limited resource that we have, there will be a need for a convergence of effort and for States to collaborate towards a common goal of implementing a sustainable ATFM framework for the region. It is the view of Hong Kong China; Singapore and Thailand that a distributed multi-nodal ATFM network may help to bind the efforts of various ATFM initiatives in this region.

**3. ACTION BY THE MEETING**

3.1 The meeting is invited to:

- a) note the on-going collaboration between the three States to develop a concept of ATFM based on CDM through sub-regional cooperation;
- b) consider the concept of a distributed multi-nodal ATFM network as a potential option for ATFM implementation in this region;
- c) discuss the need for convergence of various on-going ATFM initiatives to avoid duplication of efforts and optimize resources; and
- d) discuss any relevant matters as appropriate.

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