International Civil Aviation Organization

Thirteenth Meeting of the Asia/Pacific Air Traffic Flow Management Steering Group (ATFM/SG/13)

Bangkok, Thailand, 03 – 07 April 2023

Agenda Item 4: Review of Current ATFM Operations and Problem Areas

NATIONAL TRAFFIC FLOW MANAGEMENT SYSTEM

(Presented by CHINA)

SUMMARY

This paper presents and shares the concept and functions of National Traffic Flow Management system (NTFM) built in China. Air traffic flow management (ATFM) in the Asia-Pacific region develops from cognitive consistency, system interconnection, then network interconnection to cultural fusion. States and Administrations may learn from each other and reach an agreement to some extent in the development stage, which is not only beneficial to their own ATFM system construction, but also the overall development of ATFM in the Asia-Pacific region. Meanwhile, all stakeholders are welcome to test system interconnection with NTFM.

1. INTRODUCTION

1.1 There are four development stages of ATFM system in China: auxiliary tools, the scattered regional ATFM system, the unified national traffic flow management system, and the gradually upgraded ATFM system, keeping in step with the process that China ranges from finding solutions to seek the best solution of ATFM. ATFM system is not a necessary condition for ATFM work, however, with the increasing complexity of running environment about ATFM, ATFM system greatly enhances the efficiency and quality of ATFM through more efficient methods.

1.2 Since 2013, operation management center (OMC) and eight regional ATFM units of ATMB have created their own ATFM system supported by four civil aviation enterprises, forming the first generation of ATFM system that deals with the complex running environment of ATFM. However, with the double increase of flight volume of China in 2017, the nationwide information interaction, decision synchronization and integrated operation are increasingly urgent. Therefore, the second generation of ATFM system is designed and developed. The ATFM concept, methods and procedures have realized the nationwide integrated operation since the second generation of ATFM system has been officially launched in 2020.

1.3 The new generation of NTFM cites the ATFM concept and combines the operation of ATM and is supported by modern technology. Based on this system, a powerful ATFM network is built, forming the foundation of running environment about collaborative ATFM. ATFM in the Asia-Pacific region has experienced the stage of cognitive consistency with years of run-in period. It will gradually transit to the stage of system interconnection and move to the interconnection between ATFM network and operation environment, and finally move to the overall combination of ATFM culture.

1.4 ATFM system is considered as a part of ATFM construction in some States and

Administrations in the Asia-Pacific region, if ATFM system can learn from each other and share experience in construction, methods and procedures, it not only helps ANSPs to gain experience and promote their own construction in terms of ATFM system, but also contributes to the interconnection of future ATFM system in the Asia-Pacific region, and is more beneficial to Asia-Pacific region as a whole to highly develop ATFM.

2. DISCUSSION

Concept of NTFM

2.1 Based on the concept of internet of everything (IOE), NTFM realizes the internet of information, system and even operation. With the assistance of NTFM construction, China not only realizes the internet of ATM information, but also achieves the interaction of various systems. The merging and opening state of all control sectors in the country can be seen by NTFM in real time. NTFM provides the suggestion of mid-air delay, which will also have an influence on AMAN. Based on the concept of IOE, the operation network of ATFM is created by the interconnection of NTFM and air traffic control, airlines, airports as well as other stakeholders.

2.2 NTFM is not only a system, but also a network connecting various information related to ATFM in China. All users are one of nodes in this network, regardless of centralized operation, distributed operation or remote operation, all actions are shared and interacted. Meanwhile, this network is greatly elastic and can revise in time to achieve optimal results, for example, if there are some problems or improper use in a node in the network, the efficiency of the node will be decreased, then the system will automatically adjust other resources so as to ensure the optimality of whole network.

2.3 If a flight does not take off as scheduled, the system will automatically adjust other flights, for example, solving local problems by finding the ability to hold in the air. The complementarity of network is regarded as a basic principle to elastic ATFM network which links all resources in the whole network, therefore, all resources will make a supplement if a problem occurs in a node. At the same time, the results will not only be pass to ATFM participants including airlines, airports and tower electronic flight strips and so on, but also be reflected in the post operation analysis module of the system.

2.4 The development of civil aviation is closely associated with modern technology improvement, so is the NTFM. Limited by restrictions such as system hardware support, processing ability, network bandwidth and intelligence level, the operation concept of ATFM is unable to be fully presented through the system by the first generation ATFM system. With the improvement of modern technology, the NTFM is highly supported by modern technology. The work of traditional ATFM personnel is widely replaced by the powerful computing capability and intelligence of the system, shifting the work focus of ATFM personnel from making ATFM measures to select the best solution of ATFM and so on, the optimal solution and CTOT can be found by the system. The great improvement of automation enhances work efficiency and reduce workload, what's more, it can provide stakeholders with ATFM service through better ATFM solutions.

Functions of NTFM

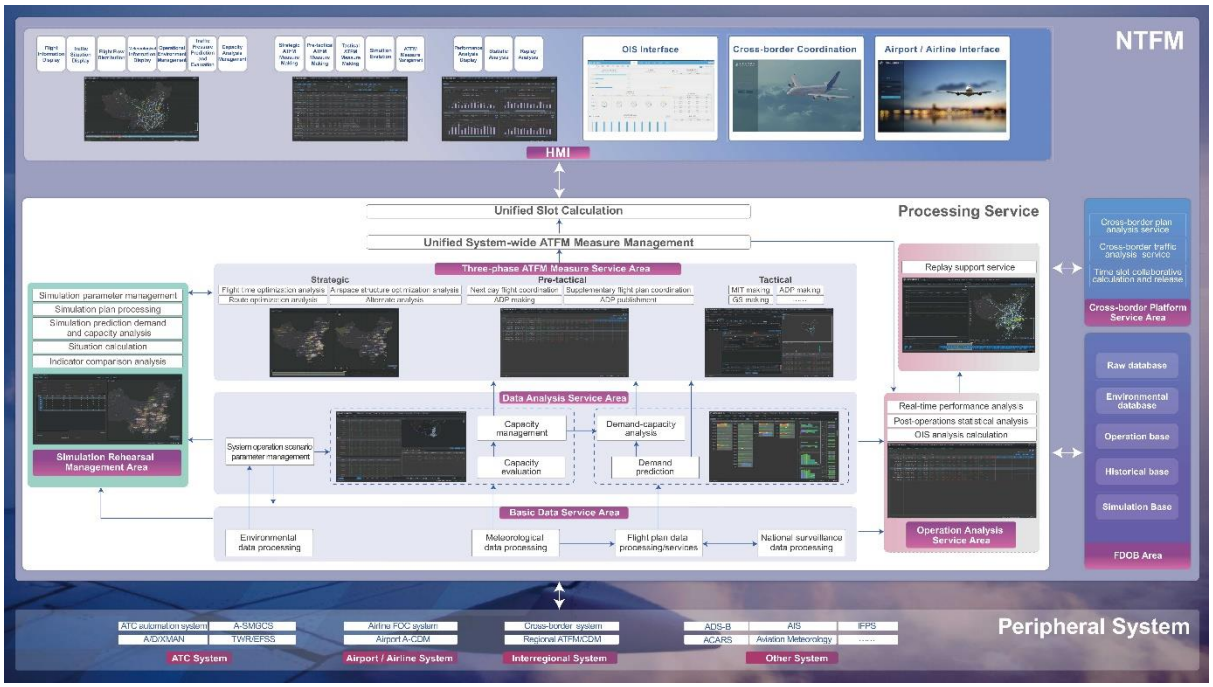
2.5 NTFM is a unified ATFM system developed based on concept of ATFM in China and deployed in the operation management center (OMC), 8 regional ATFM units and 36 ATM sub-bureaus and stations which cover the entire ATM system with the OMC as the hub, supported by regional ATFM units, and extended by the ATFM units located in the ACC, APP and TWR. NTFM has formed an ATFM coordination linkage system covering the civil aviation system with stakeholders, and will also effectively connect with cross-border ATFM in the Asia-Pacific region.

2.6 Flight plan processing center (FPPC) of ATMB CAAC has provided flight plan information for NTFM. AIS, MET, ATC automation system, tower electronic flight strips (EFS), surface movement radar (SMR), as well as other information have been introduced to provide information for the support of NTFM. At the same time, as an important link in the ATFM system, NTFM also interacts with A-CDM, A/DMAN and other related systems. CTOTs of the regulated flights can be automatically released to airspace users, airport operators and EFS through the interconnection of related systems to achieve automatic information sharing related to ATFM.

2.7 NTFM covers the strategic, pre-tactical and tactical stages from the ATFM execution phase, as well as the ATFM post-operation analysis, and can also provide reasonable suggestions for the ATM planning phase. NTFM provides automatic evaluation recommendations for operational capacity based on the measures of similar days and simulations and provides cross-border ATFM cooperation platform. It also provides the operational information system (OIS) services as the support for those who can't achieve System to System.

2.8 Based on NTFM, ATFM measures in China has transited from separation-based to capacity-based ATFM measures. When it is impossible to increase capacity and need to manage demand, NTFM provides FMPs with a series of optional ATFM measures such as GDP, AFP, GS, Flexible use of MIT , Cherry Picking, Collaborative Reroute and Level Capping, etc. which ATFM personnel can simulate the measures and their possible influences. Then, one or a set of measures are selected to form a ATFM solution. It is worth mentioning that when a flight is subject to multiple constraints, the slot calculation of NTFM could fully consider the requirements of each constraint by on the concept of One CTOT Solution proposed by China to generate a CTOT that meets multiple constraints.

2.9 While building NTFM, China also pays attention to the construction of the whole ATFM system. China has deployed A-CDM at airports with a passenger throughput of more than 10 million. China has also strengthened the construction of AMAN and DMAN responding to a complete ATFM related system. Meanwhile, China also issued the "Collaborative ATFM Business Rules" and the "Collaborative ATFM Operation Procedures" to standardize ATFM operations and gradually create an efficient ATFM collaborative operation environment.



Interconnection of Cross-Border ATFM System

2.10 ATMB CAAC has been positively getting involved in cross-border ATFM cooperation. In October and November 2021, Mainland China, Hong Kong China and Macau China held a meeting of the ATFM operations team and tripartite senior leadership meeting, and reached a consensus on further cooperation. Macau China plans to join a unified coordination platform based on NTFM to achieve information sharing. It is expected to access NTFM this year. Mainland China and Hong Kong China successfully conducted the AFTN-based ATFM information interactive test on 29 June and 29 November 2022, and planned to discuss the normalized operation mode of both sides after the test in March 2023 to promote ATFM system interconnection. In addition, ATMB CAAC successfully conducted AFTN-based ATFM information interactive tests with AEROTHAI on 8 March 2023. ATMB CAAC also plans to conduct a GDP test on Da Nang, Viet Nam landing flights with MOLIT.

2.11 NTFM integrating mass ATFM information is not isolated, which is also a part of the Asia-Pacific even the global ATFM network. Therefore, ATMB CAAC is willing to proceed the internet of ATFM information with the States and Administrations in the Asia-Pacific region under the framework and standards of ICAO. With the further development of cross-border ATFM cooperation, the internet of cross-border ATFM system can not only expand the information interaction, but also sharply promote running efficiency. Thus, all stakeholders are welcome to test the interconnection of ATFM system with China.

2.12 ATFM as one of the efficiency ways to improve the capability of ATM will play a key role on the implementation of cross-border ATFM. In recent years, the development of ATFM in China not only focus on the domestic ATFM but also highlight the harmonization development between cross-border and domestic ATFM under the Asia/Pacific Regional Framework for Collaborative ATFM. In respect to the harmonized ATFM development plan in Asia-Pacific region, China will be along with partners and relevant stakeholders to promote the development of cross-border ATFM under the ICAO ATFM Framework in Asia-Pacific region.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this paper;

b) research and perfect the construction about ATFM system together in the Asia-Pacific region;

c) all stakeholders are welcome to test the system interconnection with NTFM; and

d) discuss any relevant matters as appropriate.

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