International Civil Aviation Organization

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

INTERNAL COLLABORATIVE OPERATION MODE OF CROSS-BORDER ATFM

(Presented by CHINA)

SUMMARY

This paper presents the CONOPS of "two-level conduction and one–level collaboration" for internal collaborative operation of cross-border ATFM in China, and the release and acceptance procedures of cross-border ATFM measures. National Traffic Flow Management system (NTFM) divides the capacity of originating ATFM measures into domestic traffic flow capacity and international traffic flow capacity, and cross-border ATFMU implement cross-border ATFM measures according to international traffic flow capacity.

1. INTRODUCTION

1.1 The ICAO Asia and Pacific region started the distributed multi-nodal air traffic flow management network as the Regional ATFM Concept of Operations, which effectively organize air navigation service provider (ANSP) respectively by node, and form the net of cross-border ATFM in Asia-Pacific region. The operating mechanism between node and node is becoming increasingly mature in the way of continuous perfection in framework on collaborative ATFM and the application of Asia Pacific Multi-Nodal ATFM Collaboration (AMNAC) in practice. However, the inner part of node, although it formed by single ANSP respectively, it also facing many challenges in practice than expected for the States and Administrations which with mass flight volume and complicated environment due to lack of reference and guidance.

1.2 Cross-border ATFM not only to some extent differ with domestic ATFM at the aspect of concept, measure, procedure, language and coordination and so on, but also focus on the difficulties that more problems found in practice on overall planning of domestic and international ATFM, how to coordinate and concentrate more domestic disperse ATFM requirement to Node Leader, establish overall situational awareness, reduce operational procedure and promote operational efficiency. Take Ground Delay Program (GDP) as an example, apply GDP to domestic flights and international flights without distinction, though CTOT can meet the capacity better, but it can't realize high efficiency information exchange, conflict coordination and cross-border collaboration and so on in complicated environment or multiple restrictions.

1.3 Same method has different effect in different situation and different environment, so China participates in cooperation of Asia-Pacific Multi-Nodal ATFM Collaboration with relentless research and exploration, and gradually form a set of well-adapted cross-border ATFM model - "two-level conduction and one–level collaboration" in complicated node interior, which based on some auxiliary methods about theory and practice such as fast simulation of NTFM and Human In The Loop (HITL) experiment and so on.

2. DISCUSSION

The origin of "two-level conduction and one–level collaboration" operational concept

2.1 The origin of "two-level conduction and one–level collaboration" operation conception went through three stages：

a) *The first stage*： since 2015, at the beginning of common implementation between China and AMNAC partners in distributed multi-nodal ATFM Network collaboration, due to lack of the amount of cross-border ATFM measures, and China has high exemption to international flights, this problem is not obvious. But with the continuous increasing Asia-Pacific regional flights, China node's interior and exterior all face new challenges, ANSP node's interior traditional mode can no longer satisfied the new situation which accompanied by increasing flights and complicated operation environment. Therefore, China starts the specialized research on the optimization of node's interior operation mode.

b) *The second stage*： In 2020, NTFM online helps to realize the national wide common situational awareness of information and situation in ATFM, and through the perfection of operation system, it able to realize that act as an transit center about information and cooperation through node leader in commencing the cross-border ATFM. However, close communications need to be maintained between ATFM operational phase and single constraint ATC unit, but keep close multi-party communication seems not practical in present phase between node leader and all ATFM units as well as ATC. So, node leader not only needs to undertake the function of information and cooperation, but also take part in the decision making of ATFM measure, this can help to promote overall operation efficiency by promoting decision-making power largely.

c) *The third stage*： Since 2023, node leader is further clear on node's interior functional position, based on this, it needs to be involved into the decision making of constraint unit's cross-border ATFM, but it not supposed to much involved into the decision making of constraint unit's domestic ATFM, and for one constraint unit, domestic and cross-border ATFM cannot be separated. Therefore, based on NTFM, China achieves constraint unit's senseless division for domestic and international traffic stream under the same constraints through "two-level conduction and one–level collaboration" operational concept.

"two-level conduction and one–level collaboration" operational concept

2.2 When need to take ATFM measures to domestic and international flights simultaneously within one constraint airspace unit, if calculate these two at the same time, when predictability of partial flights lower or adjust often, the efficiency of ATFM measures which based on GDP will decrease largely. Meanwhile, the flight far from constraint airspace unit will unable adopted into the scope of ATFM measure due to the restriction of distance and range. Moreover, Node Leader specialized in cooperation rather than decision-making in the part of cooperation and so on, for an ANSP with complicated environment, efficiency will decrease largely.

2.3 Through the CONOPS of "two-level conduction and one–level collaboration", domestic and international flights are adopted into the same ATFM solution, in order to overall plan the balance of capacity and demand and realize the demand-capacity balancing. At the same time, split domestic and international flights when adopting ATFM measure, it will transfer the demand, management and authority of international flights to cross-border ATFM unit, and reduce flight's fluctuation effectively and increase the flexibility of ATFM network. Appropriate ATFM measure should be adopted in cross-border ATFM unit accordingly, in order to realize the function of undertaking external coordination uniformly and simultaneously owing certain authority of decision-making, so as to promote integral operation efficiency.

2.4 Looking from a virtual setting, when capacity decrease rapidly in Beijing, Shanghai and Guangzhou, lead to the imbalance of demand and capacity, cause the application of ATFM measure in international flights, flights overflying Sanya from Southeast Asia, Beijing, Shanghai and Guangzhou will transfer this capacity requirement for international flight to Sanya, and Sanya make detailed ATFM measure according to international cooperation circumstance. Due to ATFM work for international flights agented to Sanya, Beijing, Shanghai and Guangzhou will promote the efficiency of entire ATFM network by reducing the workload greatly.

Issuing procedure of ATFM measure

2.5 According to "two-level conduction and one–level collaboration" operational concept, first stage of ATFM measure is issued by originating ATFMU (O-ATFMU), also call constraint ATFM unit, issuing originating ATFM measure; Second stage is issued by cross-border ATFMU (C-ATFMU), making cross-border ATFM measure according to the split and restriction on international flights.

2.6 Level 1 procedure (originating ATFM measure issuing procedure)

a) Step 1: **Ensure whether the international flights are regulated in ATFM**: originating ATFMU will decide whether partial or whole international flights are regulated in ATFM measure according to own demand and capacity imbalance situation;

b) Step 2: **Choosing confined range of international flights in ATFM measure making:** originating ATFM personnel choose the range of confined international flights when originating ATFMU need to implement ATFM measure in NTFM;

c) Step 3: **NTFM will automatically transfer the capacity of originating ATFM measures to cross-border ATFMU:** NTFM divides originating ATFM measures into domestic traffic flow restriction and international traffic flow restriction， and change the restriction of international traffic flow to capacity or restriction to cross-border ATFMU.

2.7 Level 2 procedure（cross-border ATFM measure issuing procedure）

a) Step 1: **Acknowledge originating ATFMU's capacity and restriction requirement in NTFM**: cross-border ATFMU confirm and receive originating ATFMU's capacity and restriction requirement in NTFM;

b) Step 2: **Make cross-border ATFM measure:** cross-border ATFMU take into account already taken off international flights, adjacent area maneuver capability, constraint traffic flow characteristics, special requirement in confined area and so on when making cross-border ATFM measure. Cross-border ATFM measure usually issue ground delay based cross-border ATFM measure according to international ATFMU (I-ATFMU also known as overseas ATFMU) capability, such as GDP/AFP/CTO/CMCP and so on, or issue traditional ATFM measure such as MIT and so on.

c) Step 3: **Input cross-border ATFM measure in NTFM:** cross-border ATFMU input cross-border ATFM measure in NTFM, NTFM will deliver ATFM measure and related CTOTs message automatically according to the ways of interaction with international ATFMU (such as AFTN, E-mail, FIXM format based on CRV)

Receiving procedure of ATFM measure

2.8 If international ATFMU issuing ATFM measures or CTOTs by AFTN or CRV, NTFM will automatically receive and transfer ATFM measures or CTOTs which is issued by approved AFTN or CRV to single national ATFM unit, and further send it to electronic flight strips (EFS) and so on.

2.9 If international ATFMU issuing ATFM measures or CTOTs by internet, e-mail and phone call and so on, cross-border ATFMU will gather the information and input it into NTFM manually.

2.10 If international ATFMU issuing traditional ATFM measures, the measure will be directed, exchanged or adjusted by cross-border ATFMU and enter NTFM, then calculate CTOT automatically with traditional ATFM measure MIT and so on.

Cross-border ATFM measure agent

2.11 Due to China has coordinated relationship with many potential cross-border ATFMUs. So that China will take the mode of agency in work functions, to ensure that related States and Administrations implement ATFM focus on one cross-border ATFMU of China in alone traffic flow as much as possible.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this paper;

b) perfect this CONOPS for internal operation of cross-border ATFM together;

c) encourage that regard complicated node take this CONOPS as reference sample in node interior ATFM operation; and

d) discuss any relevant matters as appropriate.

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