International Civil Aviation Organization

The First Meeting of Air Traffic Management Automation System Task Force of APANPIRG (ATMAS TF/1)

Web-conference, 28 – 30October2020

Agenda Item 5: Issues and Challenges in implementation

5.2 Systems interoperability
(Operational concepts and flight plan interoperability standards, such as OLDI, AIDC, FF-ICE, SWIM-IOP)

APPLICATION OF FLIGHT DATA EXCHANGE IN ATM AUTOMATION SYSTEM

（Present by China）

SUMMARY

This paper introduces the application of flight data exchange in China Air Traffic Management Automation System, especially the application of flight screen handover between different ATC centers, both of which is respectively independent and insatiable in AIDC protocol.

1. INTRODUCTION

1.1 In order to adapt to the rapid development of civil aviation in China and improve the safety assurance level of the Air Traffic Management automation system in 2015,the Civil Aviation Administration of China (CAAC) first issued the industry standard "Civil Aviation Air Traffic Control Automation System—Part 3: Flight data exchange , which is called MH/T4029.3

1.2 Combined with actual application and development requirements, Air Traffic Management Bureau (ATMB) of CAAC has continuously optimized the data synchronization between main and standby ATM automation systems, and promoted the efficient flight screen handover between ACC and the low-to-medium control area, and improved the current ATM automation system and the technical standards for flight data exchange between related systems. The revision of MH/T 4029.3 was completed in 2019, and CAAC released the second edition in August 2020.

1.3 China conducted the comparative analysis between AIDC and MH/T 4029.3 mostly on attention to screen handover, illustrated at the SURICG/4 meeting in April 2019, and presented the practical application of MH/T4029.3 screen handover at the APA TF/6 meeting in July 2020. This paper mainly puts emphasis on the application of MH/T 4029.3 messages in ATM automation system and the advantages of it.

2. THE INTRODUCE OF HM/T 4029.3

2.1 MH/T 4029.3 defines three types of messages based on the actual requirements of China's air traffic management operations, namely the basic flight data exchange messages (FDEXM), the prime and standby air traffic management automation system data synchronization messages

(PSEXM), and the flight data exchange coordination message between ATC centers(FDECM).The standard adopts a semi-structured and open messages defined method, which has the advantages of strong readabilityand scalability, open structure, good modifiability, and data combination on demand.

2.2 The FDEXM and PSEXM are used to achieve flight plan data and basic environmental data (ATC control sectors, control authority, maps open or close etc.) consistency between different ATM automation systems, and reduce safety risks caused by inconsistent flight plans and operating environment data during the switching process of the prime and standby ATM automation systems.

2.3 The FDECM is used as supplementary messages of AIDC, focusing on solving the problem that AIDC cannot be used between ATC centers. It is suitable for ATM automation system and other systems that require flight plan, and screen handover between different ATCcenters. The FDECM provides flight plan to the auxiliary systems, such as flow management system, A-SMGCS, EFS, DCL and other systems.

2.4 The controllers intuitive feeling of FDECM screen handover between two ATC centers is like being in different sectors of the same ATM automation system, while the two ATC centers do not need to define a fixed handover point and the handover height in each and do not need to coordinate the handover height and handover time in advance, which has high flexibility.

3. THE APPLICATION OF HM/T 4029.3 IN ATM AUTOMATION SYSTEM

3.1 The ATMB of CAAC is currently promoting the application of MH/T4029.3 standards in ATM automation system. It uses FDEXM and PSEXM messages to achieve data synchronization between the prime and standby ATM automation systems. FDECM is used to implement in different ATM automation system screen handover where AIDC is not applicable.

3.2 To date, there are totally 46 ATC centers in ATMB of CAAC, 45 of which are equipped with prime and standby ATC automation systems (the standby automation system has not yet put into use in Aksu control center), 31 of which fully or partially apply MH/T 4029.3 messages and realized the data synchronization between the prime and standby ATM automation systems, and 5 of which realize the FDECM screen handover with other ATC centers or the transportation airport.

3.3 The ATMB of CAAC has promoted the test and verification of the FDECM screen handover of the independent ATM automation system between Lanzhou and Xining, Xiamen and Fuzhou ATC centers, Kunming ATC center and small transportation airport in the jurisdiction.

3.4 The Lanzhou and Xining ATC centers have used independent ATM automation system to achieve flight screen handover between high and low altitudecontrol sectors. Since the trial operation in November 2019, Lanzhou and Xining ATC centers have been in stable operation of the screen handover. The number of screen handover flights is about 150 per day and the handover success rate has reached 99.9%. Xiamen and Fuzhou ATC centers are carrying out technical test of the screen handover between each ATM automation system.

3.5 According to the operational requirements of the small transportation airport to apply to the SSR and flow data (CTOT) to ATC center, adopting the open structure and expandable features of MH/T 4029.3, the FDECM message is expanded to realize the SSR and CTOT request and distribution between the ATC center and the small transportation airport.

3.6 At present, Kunming ATM automation systems (both prime and standby systems) have realized the FDECM screen handover with Xishuangbanna airport. Since July 2019 while the success rate of flight screen handover between Kunming ATC and Xishuangbanna Airport is 96.3% and the success rate of SSR assignment is 99.4% and the CTOT distribution success rate is 93%. The FDECM extension application reduces 400 control handover calls every day, saving 140 minutes of voice communication time for controllers. At the same time, the Kunming ATC and Dali Airport are undergoing technical test.

4. BENEFIT ANALYSYS

4.1 Eliminate potential safety hazards and improve the safety assurance capabilities of the ATM automation system. Ensure the consistency of flight plan data and basic environmental data between the prime and standby ATM automation systems and reduce the safety risks caused by inconsistent data when the prime and standby systems are switched.

4.2 Improve collaborative operation efficiency. The flight screen handover, as well as the electronic request and distribution of SSR and CTOT, could effectively improve the efficiency of the ATC control works.

4.3 Effectively reduce human error and workload, as well as improve controller's experience. The FDECM handover could avoid the error-prone problem of oral notification, and greatly reduce the voice communication time, and also make the controller feel like screen handover between different sectors in the same ATM automation system.

5. ACTION BY THE MEETING

5.1 The meeting is invited to:

a) This paper noted that the procedure is driven by the requirement. Encourage states to research and developed solutions for air traffic transmission between high and low sectors or between ATC and regional airports, to solve the environment that AIDC is not suitable for due to the short switching time and distance.

b) China is willing to share relevant experience with states in the Asia-Pacific region.

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Attachment:

The method of MH/T4029.3 FDECM Handover

AIDC (ATS Inter-facility Data Communication） is a widely used ATC flight screen handover technology in China and abroad, AIDC needs to define handover points and height, also takes a long handover cycle; it cannot meet the requirements of independent Air Traffic Management automation system screen handover between the ACC and the low to medium altitude control center (without handover height and handover point), include the small transportation airport in the jurisdiction of the ACC.

The ATM automation system flight screens handover between ACC and the low to medium altitude control center (include the small transportation airports), usually meet very short time and close distance, and also without the fixed handover point. Therefore, AIDC cannot meet the needs for flight screen handover in such situation.

1. Message type and processing logic

1) CFPL: Flight plan coordination and synchronization. When certain conditions are met, CFPL is sent to the receiver for flight plan coordination, and the flight plans of both sides begin to synchronize, and the handover operation can be initiated after successful coordination.
2) CHRQ: Handover request. The handover party sends CHRQ to initiate the handover, and the track label starts flashing after the recipient receives the handover request. After the handover accepts, the receiver takes over the flight.
3) CHRP: Response for the handover. The recipient sends CHRP to indicate that it accepts the handover. At this time, the recipient obtains the control authority, and the handover party releases the control authority, which means handover success.
4) CEDQ: Apply for release time. After the system receives the CEDQ, the controller will manually assign the exact release time for the corresponding flight.
5) CEDT: Allocate the release time. Send the release time to the applicant by this type of message.
6) CSRQ: Apply for SSR code. When the ATM automation system receives the CSRQ, it triggers the system to assign an SSR code to the corresponding flight.
7) CSSR:Allocate the SSR code. After receiving the CSSR, fill the assigned SSR code into the corresponding flight plan.
8) CLAM: Represents the logical confirmation of a received message. When CLAM is received, it means that the message corresponding to CLAM has been received and processed correctly.

2. Process of FDECM Handover

According to the definition and processing logic of the message, a handover process is shown in the figure below:

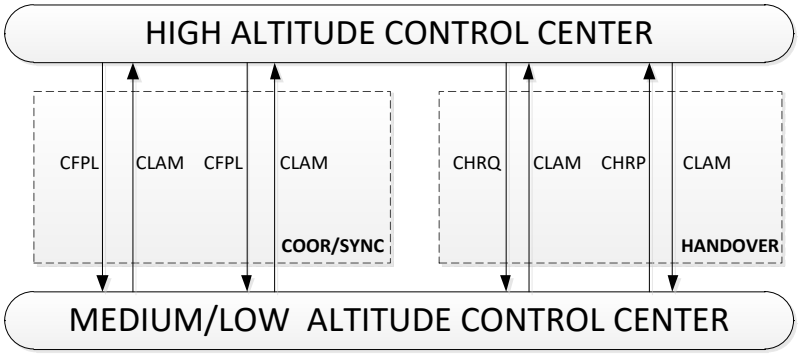

Figure1. Process of FDECM handover

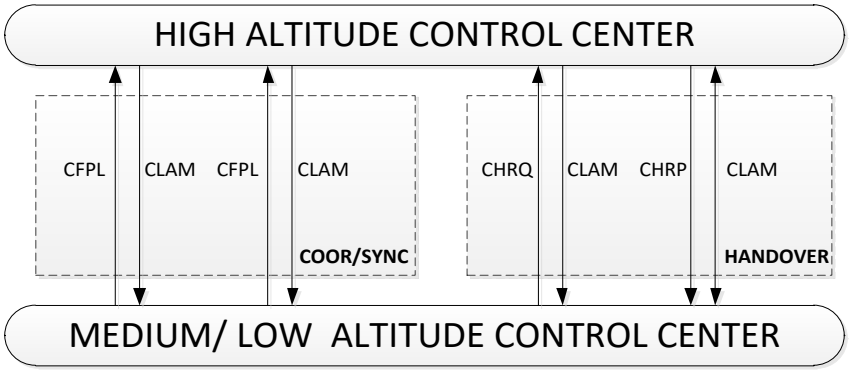

Figure2. Process of FDECM handover

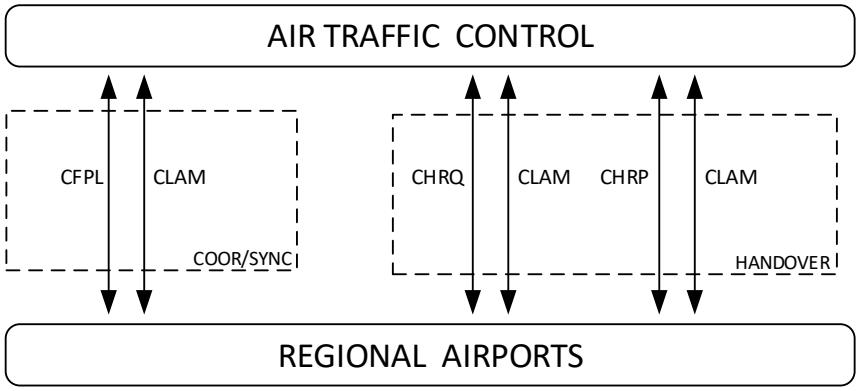

Figure3. Process of FDECM handover

The electronic application process for release time and secondary code is as follows:

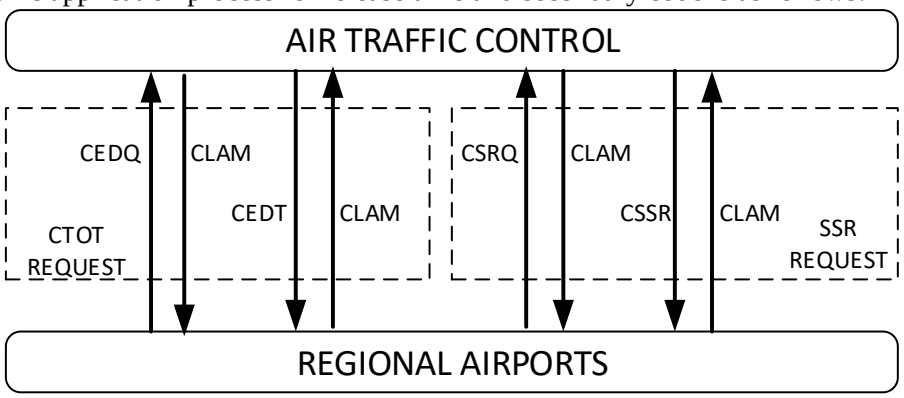

Figure4. The electronic application process