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Data-link Communication Implementation Task Force
(APA TF/6) of APANPIRG**

Web-Conference, 14 – 16 July 2020.

Agenda Item 7: Any other business

**PROMOTION AND APPLICATION OF ELECTRONIC HANDOVER
TECHNOLOGY BASED ON MH/T4029.3**

(Presented by China)

SUMMARY

This paper introduces the optimization of MH/T4029.3 electronic handover and its promotion and application in Yunnan ATC and the regional airports

1. INTRODUCTION

1.1 AIDC (ATS Inter-facility Data Communication) is a widely used electronic handover method in China, but it also has obvious disadvantages in some cases. AIDC needs to interact with a wide variety of messages, and the whole process takes a long time. When a flight is transferred between high and low sectors, or between air traffic control and regional airports, the time and distance required for handover is short. In general, it is too late to send the required AIDC messages to complete the handover. In addition, the AIDC handover process must demand a clear waypoint as the intersection which is applicable in neither of two cases.

1.2 Since 2018, CAAC had begun to explore the electronic handover between regional airports and air traffic control. As a pioneer, Yunnan Air Traffic Control carried out the test and verification of electronic handover with regional airports and put it into operational use with some regional airports.

1.3 Handover technology between ATC and regional airport is based on CAAC standard *Civil Aviation Air Traffic Control Automation System – Part 3: Flight Data Exchange*, which is called MH/T4029.3. This standard defines Category C data. The Category C data is applicable to flight electronic handover between different control units, especially for ATC automation systems in two or more regions where the AIDC protocol is not applicable.

1.4 The test and verification of electronic handover with regional airports had been introduced by CAAC at the SURICG / 4 meeting in April 2019.

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2. PROGRESS OF MH/T4029.3 HANDOVER

2.1 According to the current operation mode between regional airport and Yunnan ATC, MH/T4029.3 handover between Yunnan ATC and regional airports is capable to solve the following requirements:

- 1) Replace the telephone handover, implement the electronic handover between regional airports and Yunnan ATC.
- 2) Regional airports apply for flight release time from Yunnan ATC through Category C messages.
- 3) Yunnan ATC assign SSR code for departure flights of regional airports through Category C messages.
- 4) Synchronize flight plan information between Yunnan ATC and regional airports through Category C messages.

2.2 United with ATC automation system manufacturer, Yunnan ATC completed the software development and testing. The automation system is well support of MH/T4029.3 handover. Various functions meet the requirements. Extensive tests were conducted with Yunnan Xishuangbanna and Dali Airport and the success rate is above 95%.

2.3 In the promotion and application stage, Yunnan ATC and Xishuangbanna airport have conducted safety assessments of the use of MH/T4029.3 handover. And trial run began from July 1, 2019. During the period, all functions of the system are stable and meet the requirements.

2.4 According to statistics, from July 1st to 31st, 2060 flights were taken off and 1989 flights were landed at Xishuangbanna Airport as a total of 4,049 flights, with an average daily take-off and landing of 134 flights. During the trial run, a total of 3,428 flights were electronically transferred via MH/T4029.3 messages, with 3,301 successes, as a success rate of 96.3%. The Kunming system assigned 2208 times SSR codes to Xishuangbanna Airport, with 2194 successes, as a success rate of 99.4%. A total of 60 flights applied to Kunming for release time, with 56 successes as a success rate of 93%.

Item	Total	Success	Success rate
Handover	3,428	3,301	96.30%
Assign SSR code	2,208	2,194	99.40%
Apply for release time	60	56	93%
Total:4,049 (Takeoffs:2,060 , Landings:1,989)			

Table 1. statistics of trial run

3. BENEFIT ANALYSYS

3.1 **Safety benefits.** Given the MH/T4029.3 handover between Yunnan ATC and Xishuangbanna Airport, SSR code allocation, release time application and flight handover are automatically processed by the system and no more telephone notification will be required. It greatly avoids the problem of verbal notifications that are prone to misunderstanding. At the same time, synchronizing the flight plans in real time, it will be beneficial to both sides for an error-free handover.

3.2 **Operating efficiency improvement.** For example, Xishuangbanna Airport handled an average of 134 flights per day. It is roughly estimated that more than 400 coordination calls can be reduced every day, saving nearly 30 minutes of voice time, which can significantly reduce the workload of controllers. Meanwhile, SSR code no longer needs to be allocated in advance, which can reduce the SSR code occupation time and improve its utilization efficiency.

4. OPTIMIZATION OF MH/T4029.3 HANDOVER

4.1 Recently, ADS-B is wildly constructed and applied in China, greatly improving the surveillance coverage of low-altitude airspace across the country. It increases the reliability of MH/T4029.3 handover in low-altitude airspace.

4.2 Analysis and troubleshooting based on unsuccessful cases, China solves a few system defects related to plan matching in the processing of category C messages, so as to further improve the success rate.

4.3 According to the ATC requirements, Human Machine Interface (HMI) of MH/T4029.3 handover has been optimized several times, in order to enhance the better user experience.

4.4 The Yunnan backup ATC automation system has also been upgraded with MH/T4029.3 handover function, which successfully achieved the handover between ATC automation systems from different manufacturers. Benefit from it, when the main/backup automation system switchover occurred, the MH/T4029.3 handover will be still available.

5. IN THE FUTURE

5.1 Continue to optimize the software and further improve the efficiency of MH/T4029.3 handover.

5.2 Continue to use MH/T4029.3 data to implement electronic handover in cases where AIDC is not applicable.

5.3 Meet more operational needs by expanding the MH/T4029.3 messages.

5.4 Attempt to use MH/T4029.3 data to transfer and synchronize flight plan among Electronic Flight Progress Strip system, A-SMGCS system and ATC automation system.

6. ACTION BY THE MEETING

6.1 The meeting is invited to:

- a) note the information contained in this paper; and
- b) discuss any relevant matter as appropriate.

Attachment:

The Method of MH/T4029.3 Handover

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. Hereafter 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, while the track label starts flashing after the recipient receives the handover request. After the handover is accepted, 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 authorization, and the handover party releases the control authorization. Handover completes.
- 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 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 MH/T4029.3 Handover

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

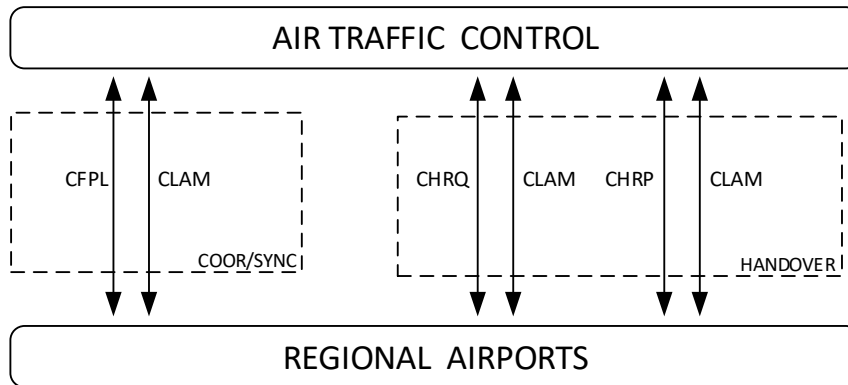


Figure1. Process of MH/T4029.3 handover

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

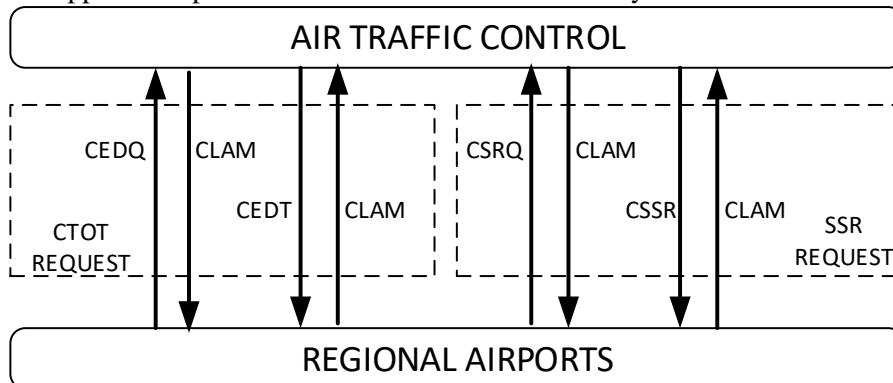


Figure2. The electronic application process