International Civil Aviation Organization

Third Meeting of the Asia/Pacific Air Traffic Management Automation System Task Force (APAC ATMAS TF/3)

Video Tele-Conference, 8– 10 June 2022

Agenda Item 6: ATS Inter-Facility Data - Link Communication Implementation by States

6.2 Review Implementation Issues Reported and Discuss Recommended Solutions

THE AIDC IMPLEMENTATION AND APPLICATION IN CHINA

(Presented by China)

SUMMARY

This paper presents the current AIDC implementation status of ATMAS in China, discusses the challenge of balancing AIDC packet delay and switching convenience when the main and fallback ATMAS are switched, and introduces further solutions.

1. INTRODUCTION

1.1 The AIDC function has been equipped in ATMAS in China to reduce the controller's workload by automatic screen control handover. At present, 79% of ATM automation systems in China have achieved automatic handover with AIDC.

1.2 There are two ways to implement the AIDC message transmission: one is to send and receive AIDC messages through a shared AFTN link, which is the main method currently used, accounting for 76%. The other is to send and receive AIDC messages through a dedicated line which is based on X.25 protocol, and mainly used between areas with large flight traffic to ensure a millisecond-level response.

2. DISCUSSION

2.1 The two methods of the AIDC message transmission have their advantages and disadvantages, when main and fallback ATMAS are switched.

Shared AFTN link

- The advantage of the AIDC link switching from the main system to the fallback system is very convenient. And it is beneficial to implement new AIDC pairs, since it only needs to add address pairs for AIDC messages in the systems without constructing a set of new communication devices.

- The disadvantage is the inevitable transmission delay caused by several layers of message transmission systems between AIDC pairs, and the higher requirements for the carrying load

of the message transmission systems. With the increment of AIDC pairs, the challenge is growing. Taking the AIDC between Taiyuan and Hohhot as an example, AFTN and AIDC share the link channel for testing, the average transmission time is 9.3 seconds, while the minimum delay is 5 seconds and the maximum delay is 20 seconds. The link transmission delay is long and the transmission stability is not good.

Dedicated line

- The advantage is the millisecond-level packet transmission. For the transmission of AIDC messages between places with large flight traffic, such as Beijing, Shanghai, and Guangzhou, there are higher requirements for packet transmission delay. For these places, a dedicated line for AIDC is required. The dedicated line is used for AIDC packets transmission, while 90% of the packets are transmitted within 219 milliseconds, and 99.8% of the packets are transmitted within 448 milliseconds, which can achieve a real-time response.

- The disadvantage is the high implementation cost, including the cost of the dedicated line construction and the line rental fee. Besides the dedicated line needs to be plugged and unplugged between the main and backup ATM automation systems when the switchover occurs, which will make the switching operation more complicated.

2.2 China initiates research into the problem and works out the improvement solutions.

Shared AFTN link

- In order to solve the transmission delay of AIDC packets in the AFTN shared link, China has put forward the functional requirements of the transmission system and network after test and verification.

- A solution is to establish a separate and direct routing between regions. Taking the AIDC among Beijing, Taiyuan and Hohhot as an example, the AFTN and AIDC messages are transmitted through AFTN devices and civil aviation communication networks. The ATS Message Handling System (AMHS) of three places can separate AIDC message packets from AFTN packets in a different channel by address filtering, and the civil aviation communication network will transmit AIDC and AFTN messages using different network links. It is beneficial to reduce the mutual influence and message transmission delay. The figure below shows how AFTN and AIDC messages are transmitted among three places.

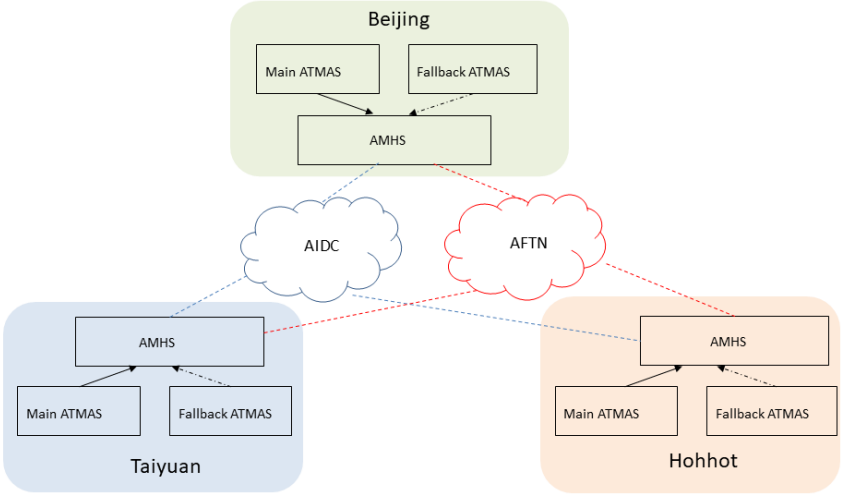

Figure 1 AFTN and AIDC messages transmission flow path

- In ATMAS, Main and Fallback systems receive AIDC messages (different channel from AFTN), and only the main ATC system processes the AIDC packets. Meanwhile, only the main system is configured to send AIDC messages. During the main-fallback switchover of the ATMAS, AMHS switches the channel configuration synchronously, so the AIDC packet transmission can be switched between the main and fallback ATM automation systems.

- According to the test, the duration of AIDC message transmission based on the AFTN link is within 8 seconds, and the one-way duration can be within 4 seconds, which can meet the AIDC packet transmission requirements.

Dedicated line

- In order to simplify the dedicated line switching when the main and fallback ATMAS are switched, an AIDC dedicated line switcher can be used. After using the line switcher, the physical links of the AIDC dedicated line can be set on-off automatically, and reduce switch time.

3. SUMMARY AND PROSPECT

3.1 By establishing a direct route between the message transmission system proposed above, combined with the solution of realizing AIDC and AFTN message separation. It has been verified through experiments in many places, that can guarantee 90% of the AIDC packets sent/received within 4 seconds delay, and 99.8% of the AIDC packets sent/received are less than or equal to 10 seconds. The overall delay meets the requirements of implementing AIDC between ATCUs.

3.2 China will gradually transfer the AIDC transmission from a dedicated line to the shared AFTN line. With the development of technology and in-depth research, China will continue to solve the challenge of balancing AIDC packet delay and switching convenience when the main and fallback ATMAS are switched, and promote the controller's work as more scientific and efficient.

4. ACTION BY THE MEETING

4.1 The meeting is invited to:

a) note the information contained in this paper; and

b) discuss any relevant matter as appropriate

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