International Civil Aviation Organization

Fifth Meeting of the Asia/Pacific Air Traffic Management Automation System Task Force (APAC ATMAS TF/5)

Chengdu, China, 5 – 7 June 2024

Agenda Item 7: ATS Inter-Facility Data - Link Communication (AIDC) Implementation Experience by States

REVIEW OF THE IMPLEMENTATION AND EXPERIENCE OF AIDC IN CHINA

(Presented by China)

SUMMARY

China has been continuously promoting the efficient application of the AIDC with its neighboring countries. Different problems have been encountered and solved through technical means at different stages of the process. This paper presents the review of the AIDC implementation in China.

1. INTRODUCTION

1.1 China closely follows ICAO standards and continuously promotes the implementation and development of AIDC between the regions across the country. Special working groups have been established to promote this work under the active guidance of the Air Traffic Management Bureau (ATMB) of CAAC. Implementing AIDC reduces air traffic controllers' communication effort significantly during flight handovers, thereby improving efficiency and safety during flight control. This paper provides a brief review of China's progress in promoting AIDC.

1.2 Currently, among the 70 pairs of air traffic control units with horizontal handover relationships in China, the AIDC implementation ratio of the main ATMAS is 97.14%, and the ratio of fallback systems is 84.29%. Among them, 55 ATC units use shared AFTN links, and 15 ATC units use dedicated line transmission. Besides, China has achieved AIDC with four neighboring countries.

2. DISCUSSION

The Phases of AIDC Development in China

2.1 AIDC between Large Air Traffic Control Centers

In 2012, the AIDC between the Beijing Area Control Center and the Shanghai Area Control Center was put into operation. This milestone marks the first implementation of AIDC between the ATMAS of the large Area Control Centers in China. By 2019, both the main and fallback ATMAS of the Beijing, Shanghai, and Guangzhou Area Control Centers had achieved AIDC with each other. Due to the large amount of AIDC messages between the three major regional control centers, high-quality message transmission is required. Therefore, the AIDC dedicated line transmission was chosen as the AIDC messages transmission method. Dedicated line is primarily used between ATC centers with high flight traffic to ensure timely response and transmission latency in milliseconds.

2.2 AIDC between Large Area Control Centers and Air Traffic Control Branches, and between two Air Traffic Control Branches

With the implementation of AIDC between large ATC centers, Chinese air traffic management units have accumulated experience in AIDC operation. The AIDC implementation is gradually improving between ATC centers and ATC branches. By the end of 2023, 70 pairs of ATC units nationwide have implemented AIDC. As more ATC units implement AIDC in ATMAS, each site selects transmission methods based on their operational needs and resource availability. Dedicated line transmission can reduce transmission latency, while reuse of AFTN links can improve resource utilization and reduce implementation costs.

2.3 AIDC with Neighboring Countries

With the development and maturity of AIDC technology, China has continuously promoted AIDC with international partners. In 2016, China has achieved AIDC with South Korea; and by 2023, China has successively achieved AIDC with Ulaanbaatar, Mongolia, Hanoi, Vietnam, and Vientiane, Laos. These efforts have significantly improved the communication efficiency of international flights.

Key Technological Solutions

2.4 Implementation of AIDC Function in Main and Fallback ATMAS

To strengthen ATC units continuous operation ability and emergency backup capability in various regions, each region has constructed fallback ATMAS to achieve dual-system redundancy. The main and fallback ATMAS maintain consistency in functionality, thus providing equivalent operational capabilities. As the main ATMAS in the regions have implemented AIDC with neighbouring ATC units, efforts have been made to promote the AIDC gradually in the fallback ATMAS. By the end of 2023, AIDC with neighbouring ATC units for main and fallback ATMAS have been completed in nationwide.

In operation, only the main ATMAS send and receive AIDC messages. During the switching between the main and fallback ATMAS, the AIDC function also switches. The method of switching AIDC links varies depending on how they are implemented.

- When using the shared AFTN link, it is possible to switch the AFTN link within seconds through the ATS Message Handling System (AMHS). This ensures that the transmission of AIDC messages switches between the main and fallback ATMAS.

- When using a dedicated line to achieve AIDC, the AIDC dedicated line can be switched between the main and fallback ATMAS using a dedicated line switcher. A dedicated line switcher detects the link signal level and switch the link automatically or uses a manual button to establish or disconnect the link. Thereby, it ensure that the dedicated line is established and disconnected between the main and fallback ATMAS in a short time, improving the efficiency of ATMAS switching.

2.5 Selection of Dedicated and shared AFTN Link

When implementing AIDC, there are two transmission options, namely the dedicated line and the shared AFTN link. The key consideration for selecting the line method lies in the tolerance for

transmission delay of AIDC messages. The advantages and disadvantages of the two methods are compared in the following table:

Table 1 Comparison of AIDC Implementation Methods

Comparison / Methods	Transmission delay	The implementation cost	Line switching
Dedicated line	Millisecond level	High	Inconvenient
Shared AFTN link	Second level	Low	Convenient

To solve the issue of transmission delay in the AIDC process using the shared AFTN link, the Civil Aviation Administration of China (CAAC) has established 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. The ATS Message Handling System (AMHS) 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. In this way, the transmission delay can be reduced. It has been verified that the transmission delay in using a shared AFTN link for AIDC can be effectively reduced to within 5 seconds, meeting the requirements for AIDC message transmission.

To solve the inconvenient situation in line switching when using the dedicated line, AIDC dedicated line switchers are used as a short-term solution. With switchers, the physical link between the main and fallback ATMAS can be automatically switched, significantly reducing the switching time compared to switching cables manually.

Currently, dedicated line is recommended for AIDC between large ATC centers, which usually have higher requirements on the message transmission delay due to large number of flights in short handover period. For AIDC between other ATC units, it is recommended to use a shared AFTN link.

Outlook

2.6 The application and popularization of AIDC in China have been well-improved. Almost all ATC units having achieved AIDC message exchange, and the main and fallback ATMAS are being implemented synchronously.

There are two AIDC implementation methods: shared AFTN link and dedicated line. The choice depends on the specific needs and characteristics of each site.

In the future, China will continue to promote the application of flight message exchange methods, to improve the utilization of various messages during AIDC exchange, and to make AIDC exchange more practical, effective and flexible.

3. ACTION BY THE MEETING

1.1 The meeting is invited to:

a) note the information contained in this paper; and

b) discuss any relevant matter as appropriate.

– – – – – – – – – – – – –