International Civil Aviation Organization

Seventh Meeting of the Asia/Pacific ATS Inter-Facility Data-Link Communication Implementation Task Force (APA TF/7) of APANPIRG

Video Teleconference,

Agenda Item 3: Sharing of experience on AIDC implementation and update the implementation status

HYBRID APPLICATION OF AIDC AND OLDI

(Presented by China)

SUMMARY

This text introduces the application of AIDC and OLDI between Shenyang ACC,Beijing and Khabarovsk air traffic control area, and illustrates the two protocolparameters settings and handover process in the NUMEN3000 system.

1. INTRODUCTION

1.1 Shenyang ACC was founded in 2015and provides air traffic control service for Shenyang air traffic control area, which is adjacent to Beijing and Khabarovsk air traffic control area. The coordination points with Beijing are ANOBI、KAKAT、OPIMU and UKDUM, and the coordination points with Khabarovsk FIR are ARGUK、BISUN、MAGIT and SIMLI. According to statistics, there are about 662 flights are passing by the Beijing FIR coordination point every day, and 58 flights passing by the Khabarovsk FIR. The increasing flights and kinds of coordination point facts bring huge challenges for controllers to handover.

1.2 Before using electrons handover, the way Shenyang ACC uses to communicate with Beijing FIR and Khabarovsk FIR is telephone handover. The telephone handover has a disadvantage in occupying large hotlines and public telephone network resources, it often reduces communication accuracy and makes information ambiguous or inaccurate, which brings inconvenience for controllers.

1.3 According to handover protocol, the controllers realize notification、coordination and handover through the air traffic control automatic system data communication. At present, Shenyang ACC communicates with Beijing FIR through AIDC (Air Traffic Services Interfacility Data Communications) protocol that uses in the Asian-Pacific region, and with Khabarovsk FIR through OLDI (On-Line Data Interchange) protocol of European standard, which improves the efficiency of handover and lowers controllers' workload. The electrons handover promotes the safety of flight and improves the efficiency of operation, which solves all problems mentioned above.

2. APPLICATION BASED ON AIDC PROTOCOL

Introduction of AIDC application

2.1 The electrons handover between Shenyang and Beijing started in Oct. 2016, and Shenyang ACC uses NUMEN3000 automatic system to complete the handover stably. The private line completes link transmission, using X.25 protocol to transmit AIDC protocol bidirectionally. The private line uses the DMHS-AIDC telegram exchange processing system, and it can provide telegram forwarding service by intersecting when main and backup automatic systems change to become each other without changing the physical line. The AIDC telegram and handover process takes the standard mode, according to the AIDC controller application manual instruction about civil aviation of China. The process of handover is notification, coordination, and handover, and the automatic system sends ABI message、EST message and ACP message automatically, and TOC message、AOC message artificially.

Application effects and issues

2.2 Since using the AIDC handover between Shenyang and Beijing FIR formally, there are hundreds flights are doing this every day, and the success rate is over 98%. The delay of transmission link controlled within 1 second, which enhances the situation awareness of handover work between adjacent FIRs, and improves the safety and efficiency of air traffic control operation.

2.3 At the beginning of using the electrons handover with Beijing FIR, there are some flights are failing to handover. The reason for that is the automatic system of Beijing can't process ABI messages exactly and leads to the handover process interrupted. After making some changes to the issue, the operation of AIDC between Shenyang and Beijing become normal.

3. APPLICATION BASED ON OLDI PROTOCOL

Introduction of OLDI

3.1 The electron handover between Shenyang and Khabarovsk started on Sep. 2019. Shenyang ACC completes electron handover rather than telephone handover with NUMEN3000 automatic system after debugging several times. The transmission link adopts a 2M private line service from Russia to Hong Kong, China, which is provided by China Mobile operator. Then, the link transmits from Hong Kong to Shenyang using TCP/IP protocol to transmit OLDI protocol packets in two-way. Both OLDI packet and handover process take standard mode, which is based on 《EUROCONTROL Standard Document For On-Line Data Interchange (OLDI)》（Edition Number：3.0. We signed 《OLDI specification between Khabarovsk Area Control Centre and Shenyang Area Control Centre》 to stipulate the handover process, which is notification, coordination ,and handover. The notification phrase completes by sending ABI message automatically from our system, and the coordination phase completes by sending ACT message automatically from the system, and the handover phase completes by sending HOP message manually, meanwhile accepting ACP message from the other side transmitted manually.

Application effects and issues

3.2 Since using the OLDI handover between Shenyang and Russia FIR formally, there are nearly 50 flights are doing this every day, and the success rate is over 96%. The delay of transmission link is controlled within 1 second, which improves the efficiency of handover work, and eases the work burden of controllers.

3.3 At the beginning of using the electrons handover with Russia FIR, there are some issues caused by using imperial unit when the flight entered into Shenyang ACC, and the automatic system handles anomaly when the flight passing the transmission point, which leads to handover failure. After negotiating with Russia, we reached a consensus on using the metric units to solve the issue.

4. TRIGGER JUDGMENT METHOD OF AIDC AND OLDI HANDOVER

4.1 When the automatic system performs the electronic handover of the flight, it will first trigger the judgment method of handover according to the relevant handover parameters of AIDC and OLDI configured in the system. And then it performs the handover based on the corresponding handover process according to the triggered handover method (AIDC or OLDI). (Refer to the attachment for the handover parameter setting and handover process)

4.2 For the handover out flight, the automatic system analyzes the route information reported in the filed flight plan message firstly, and calculates the route points the handover in flight passes through. The system will give priority to the matching judgment based on the coordination point in the AIDC protocol coordination parameter configuration and the flight analysis route point, when the flight plan is activated. When the system matches the AIDC coordination point and satisfies the conditions for automatic reporting, it enters the AIDC handover process, and performs subsequent automatic reporting and manual handover processing in accordance with the AIDC protocol. If the system does not match the AIDC parameter configuration, it will start to match and judge the flight analysis route point and the coordination point in the OLDI protocol coordination parameter configuration. When the system matches the OLDI coordination point and satisfies the conditions for automatic reporting, it enters the OLDI handover process, and performs subsequent automatic reporting and manual handover processing in accordance with the OLDI protocol.

4.3 For handover in flights, the protocol is judged according to the received handover-in messages. By matching AIDC telegram parameters and OLDI telegram parameters, to determine the method of the handover protocol, and then mark the protocol used for this flight. The subsequent electronic handover process will use the marked protocol for interaction.

5. ACTION BY THE MEETING

5.1 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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Attachment: Parameter settings and handover process of AIDC and OLDI handover mode

Shenyang Air traffic control system uses two handover protocols in electrons handover, and the system needs to judge which protocol to use when handover processing, so it is necessary to clarify the handover parameters and handover process of AIDC and OLDI.

1. AIDC handover parameters and handover process

1.1 AIDC handover parameters.

According to the China Civil Aviation AIDC Control Application Guide, taking Shenyang NUMEN3000 system as an example, AIDC handover requires configuration of AIDC Telegraph parameters, AIDC adjacent intelligence regions and AIDC coordination parameters, as shown in the following figure:

Figure 1 Schematic diagram of AIDC telegram parameters

Figure 2 Schematic diagram of AIDC coordination parameters

Figure 3 Schematic diagram of AIDC adjacent intelligence regions

1.2 AIDC handover process

According to the above parameters, for the outbound flight, in the notification stage, the handover system will automatically send the ABI message to the recipient system 15 minutes before the coordination point. Then in the coordination phase, the handover system meets the upper and lower limits of the handover height and automatically transmits the ACT report 190km or 15 minutes before the coordination point for coordination dialogue. Within the preset time parameter, if the handover system receives the ACP report from the recipient system, the coordination is successful. If it does not receive the recipient system's reply, the coordination fails, and a signage will be used to indicate. Finally, in the handover phase, the handover system manually sends the TOC message, and receives the AOC message manually replied by the recipient system, and the whole handover process ends.

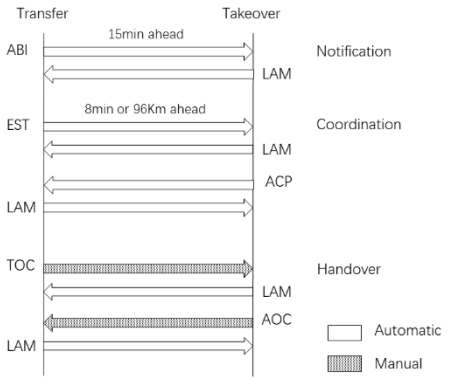

Figure 4 Schematic diagram of AIDC handover process

2. OLDI handover parameters and handover process

According to "OLDI specification between Khabarovsk Area Control Centre and Shenyang Area Control Centre", taking Shenyang NUMEN3000 system as an example, OLDI handover needs to be configured with OLDI Telegraph parameters, OLDI handover parameters and OLDI coordination parameters, as shown in the following figure:

Figure 5 Schematic diagram of OLDI telegram parameters

Figure 6 Schematic diagram of OLDI coordination parameters

Figure 7 Schematic diagram of OLDI handover

According to the above parameters, for the outbound flight, in the notification stage, the handover system will automatically send the ABI message to the recipient system 30 minutes before the coordination point. Then in the coordination phase, the handover system meets the upper and lower limits of the handover height and automatically transmits the ACT report 190km or 15 minutes before the coordination point for coordination dialogue. Within the preset time parameter, if the handover system receives the LAM report from the recipient system, the coordination is successful. If it does not receive the recipient system's reply, the coordination

fails, and a signage will be used to indicate. Finally, in the handover phase, the handover system manually sends the TOC message, and receives the ACP message manually replied by the recipient system, and the whole handover process ends.

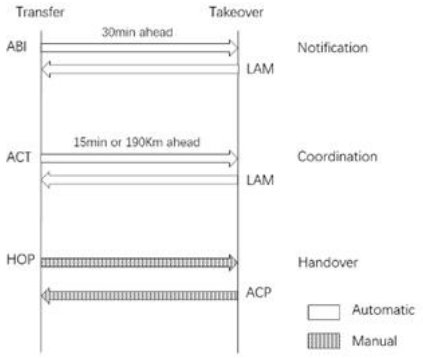

Figure 8 Schematic diagram of OLDI handover process