International Civil Aviation Organization

The Third Meeting of Air Traffic Management Automation System Task Force of APANPIRG (ATMASTF/3)

Web-conference, 8 – 10 June 2022

Agenda Item 4: ATM Automation System Implementation by States

4.1 ATMAS Implementation Status and Experience

SHARED EXPERIENCE OF ATMAS RELOCATION AND TRANSITION UPON BUSY AIRPORTS

（Present by China）

SUMMARY

This paper introduces the hurdles, technical solutions and work experience of risk management in the relocation and transition of ATM automation system in busy airports.

1 BACKGROUND

1.1 The relocation of the new airport is a huge and interlocking work. The smooth transition of communication, navigation and surveillance is a prerequisite for the smooth implementation of the transition. The most important equipment is the ATM automation system.

1.2 The various operational risks of the newly built ATM automation system require the joint efforts of the control department, technical department, system manufacturer and other parties. Adopting scientific management measures to ensure the safe, stable and continuous operation of the ATM automation system during the transitional period of the new airport.

1.3 Qingdao Jiaodong Airport was put into use at 0 on August 12, 2021, successfully realizing "overall relocation and overnight transition".

2 HURDLES IN TRANSITION AND RELOCATION

Urgent demand for adaptive interaction of the ATMAS

2.1 Qingdao Jiaodong Airport, will guarantee 300,000 flight take-offs and landings and passenger throughput of 35 million according to the planned target. The new airport has built two sets of large-scale ATM automation systems, an electronic flight strips system and a Tower ATM automation system (Integrated Tower).

2.2 After the transition, massive operation data will be generated among the main and fallback ATM automation systems, the electronic flight strips system, and the Tower ATM automation

system. The real-time, high-efficiency and integrity of the data interaction between the above systems will directly affect the safety.

2.3 The intricate interconnection between the ATM automation system and the external systems, and the system network security protection must be done under the relevant specifications and standards.

Defects in the native network architecture of the ATMAS

2.4 In the native network architecture of the ATM automation system, redundant links are used between switches to improve network reliability, result in many loops, and rely on the STP protocol to remove physical loops.

2.5 So, there have risks such as slow convergence, easy generation of network storms, and easy impact from external interconnection system network shocks.

Challenges to operation continuity of the ATMAS

2.6 The overnight transition mode puts forward extremely high requirements on personnel, equipment, environment, management and other aspects. All systems, including the ATM automation system, must be activated simultaneously at the same time point.

2.7 The newly built and existing airports must guarantee operation continuity of the ATM automation system.

Unknown risks in the operation of the ATMAS

2.8 As a large-scale intelligent system, the ATM automation system involves much complex software and hardware. The technicians are not familiar with the new system and the system maintenance capabilities are not skilled. At this stage, there may have many unknown operational risks.

3 SOLUTION

Realize data adaptive interaction to improve safety

3.1 The realization of data interaction among the main and fallback ATM automation systems, the electronic flight strips system, and the Tower ATM automation system is crucial to improving safety, efficiency and coordination.

3.2 Real-time synchronization of operation data and system environment data such as secondary code, restricted area, corrected sea level pressure (QNH), runway and sector information are realized between the main and fallback ATM automation systems based on standards.

3.3 The coordination data exchange of flight plan information and the real-time

synchronization of system environment data are realized between the electronic flight strips system and the Tower ATM automation system.

3.4 Based on the operation scenarios and requirements, the ATM automation system and the electronic flight strips system, and the Tower ATM control automation system have innovatively formulated data interface standards to realize data interaction. This greatly improves operational safety and efficiency. The data interface standards have been widely promoted.

3.5 To reduce risks caused by the interconnection between the ATM automation system and external systems, the network security protection capability has been strengthened by deploying firewalls at the border of the ATM automation system.

Optimize the system network architecture

3.6 The ATM automation system adopts dynamic link aggregation technology based on LACP protocol to eliminate physical loops, increase line redundancy, expand trunk line bandwidth, and realize load sharing.

3.7 By monitoring the on-off status of the uplink, it will trigger the real-time switching of the spare network card, and ensure the continuity of network services.

3.8 To improve the security and stability of the ATM automation system network, policies such as configuring edge ports and enabling Bridge Protocol Data Unit (BPDU) protection can avoid problems such as network oscillations caused by external systems.

Guarantee the operation continuity of control services

3.9 **Set up data transmission and sharing platforms**

- By building a data transmission and sharing platform between the old and new airports, it provides all kinds of operational data for the ATM automation system of the new airport. Relying on the operational data, the simulation operation of the ATM automation system of the new airport is realized.
- Formulating operation plans of two airports to ensure that all staff are familiar with ATM automation system facilities, working environment and operation processes in an orderly and batchwise manner.
- Carrying out a trial operation to fully expose problems, improve the familiarity of personnel with the system and test employees' understanding of "new standards, new environment, new equipment, new systems, new requirements".

3.10 **Establish backup modes to realize remote emergency takeover**

To ensure the safety of the transition, an implementation plan for the transition has been formulated, which is divided into trial operation (preparation stage), simulation operation stage, pre-shadow stage, transition switching stage and post-shadow stage.

- In the pre-shadow stage, controllers use the ATM automation system of the new airport to command flights, and the ATM automation system of the old airport is always ready for an emergency

takeover. It can effectively improve personnel's adaptation to the new environment, and confidence in the transition.

- In the transition stage, all parties cooperate closely with each other to promote the switching of new airport operation parameters of the ATM automation system in an orderly manner and prepare for emergency response to major faults.
- In the post-shadow stage, the ATM automation system of the old airport continues to make preparations for an emergency takeover.
- In the end, under the guidance of a mature and complete transition plan, the important goal of overnight transition was successfully achieved.

3.11 **Sort out the operation chain based on control service**

- By Using the Smart Operation System to sort out the whole operation chain of the ATM automation system based on the control service. System failures, problems, risks, requirements and defects are established. The classified management, continuous tracking of the operation chain to realize rapid emergency response to sudden failures are very important during the transition.
- It can realize the "second-time" switching between the active and backup hosts of the main and fallback ATM automation systems through the one-key operation of the KVM equipment which greatly improves the emergency response to the ATM automatic system failures.

Addressing unknown risks to equipment operation

3.12 To establish a problem management mechanism based on user service by setting up the post of technical director at the operation site. They can communicate with controllers in real time, and deal with them promptly, to improve operational safety and the quality of service.

3.13 To establish a device configuration mode based on distributed management by deploying some hosts on the operation site and the other hosts are connecting to the KVM equipment. This effectively reduces operational risks, strengthens emergency measures, and ensures the continuity of control service.

3.14 During the transition, to achieve effective communication and quick response to problems through Regulatory Services Meetings and Operational Assurance Meetings and Manufacturer's Technical Seminar.

4 SUMMARY

4.1 This paper analyzes the difficulties of ATM automation system transition under the overnight transition mode of Qingdao Jiaodong Airport formulates corresponding solutions, and finally successfully realizes the relocation and transition of the new airport. It is hoped that it can provide some reference for the transition and relocation to member countries in the Asia-Pacific region.

4.2 In the future, China will continue in-depth research and optimization of ATM automation system transition solutions under various transition modes with the help of advanced technology and management methods.

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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