International Civil Aviation Organization

The Second Meeting of the Asia/Pacific Air Traffic Management Automation System Task Force (APAC ATMAS TF/2)

Video Tele-Conference, 14 - 16 September 2021

Agenda Item 4: ATM Automation System Implementation by States

4.5 Emerging Technology Adaptations and Cybersecurity
Including: RECAT, TBO, Cyber Threats and Mitigation Measures

PBCS TECHNOLOGY APPLICATION AND ATM AUTOMATION SYSTEM FUNCTION REQUIREMENTS

(Presented by China)

SUMMARY

In April 2018, China launched the implementation of PBCS. The function evolution to adapt to the needs of PBCS in ATM automation system had been carried forward synchronously. This paper introduces the background of progress in the implementation of PBCS in China and the function evolution of ATM automation system to match the research of PBCS.

1. BACKGROUNDINTRODUCTION

PBCS Concept

1.1 In order to effectively quantify and evaluate the data link communication system and the timeliness of ADS-C message in remote airspace, ICAO introduced the concept of Performance-based Communication and Surveillance (PBCS), through the evaluation results to improve the system performance and support the safe operation of air traffic control.

1.2 At present, it is mainly used in CPDLC/ADS-C Ground-to-air Data Link Service and Reduced Horizontal Separation Minima (RHSM). In the future, a variety of ATC data link applications (such as TBO) will successively implement the required corresponding communication and surveillance specifications.

Implementation Progress

1.3 In March 2018, the Air Traffic Management Bureau of CAAC organized a route operation evaluation to determine the implementation route of Lanzhou and Urumqi control areas, to analyze and monitor the surveillance data link performance, as a result of working out the implementation specifications.

1.4 In April 2018, the Air Traffic Management Bureau issued RCP / RSP specifications in AIP, emending telegraph format standards, relevant operation approval policies and procedures of PBCS operation approval and management to develop ATC operation guidance materials and procedures.

1.5 It puts forward the modification requirements for the ATM automation system to meet the function of PBCS.

1.6 As typical remote areas in China, Lanzhou and Urumqi control areas selected routes providing CPDLC/ADS-C data link service, to carry out PBCS operation evaluation through ATC PBCS Real-time Monitoring System (PMS) and ATM automation system, and implemented PBCS operation in accordance with RCP240 / RSP180 specifications.

1.7 With the successful release and revision of “The Performance-Based Communication and Surveillance(PBCS)Operation Requirements for Data Link Routes with CPDLC/ADS-C Application in China Mainland Flight Information Regions”, the "Data Link Communication System Approval Process" (AC-91-FS-2018-006R1) and the “Ground-to-air Data Communication System Standard and Guidance for Air Carriers” (AC-121-FS-2017-016R2), combined with the first initial four-dimensional trajectory demonstration and verification flight, the application based on datalink shall be more reliable and widespread in the future.

2. IMPLEMENTATION SCHEME OF ATM AUTOMATION SYSTEM FITTING PBCS

2.1 In order to meet the requirements of establishing a long-term monitoring and evaluation mechanism for PBCS, the ATM automation system function shall be modified on the basis of assessment test on telegraph formats changing initiated by CAAC and the ADS-C / CPDLC relevant route operation assessment service.

a) **Message Queue Processing with PMS Interface:** The ATM automation system applies the message queue for data communication with the PMS, by the way of receiving the flight information in logon state and the PBC surveillance alarm, displaying the uplink and downlink instructions in the CPDLC window, and showing the alert on the track label.

b) **Heartbeat Message Processing:** The ATM automation system and PMS detect whether the systems of both parties can communicate normally through heartbeat message. When the heartbeat message sent by PMS isn’t received beyond the adaptive time (VPS), PMS will be considered as system failure, in the wake of condition that the HMI of the ATM automation system monitoring position will display red icon for interface failure.

c) **Plan Delivery from ATCAS to the PBCS system:** The ATM automation system automatically generates a PBCS plan according to the flight plan message, and likewise modify and delete the plan. The plan can be sent to the PBCS Monitoring System (PMS).

d) **ADS-C track display:** The ATM automation system processes the time scale according to the position report regularly updated by ADS-C and generates ADS-C track. It judges whether ADS-C has timed out according to the surveillance data sent by PMS. The system will mark the timeout data item in red on the track label when timeout occurs.

e) **Interactive Management with PMS:** The ATM automation system records the interactive process with PMS. The uplink and downlink message information of the activated flights can be viewed.

f) **PBCS Monitoring and Alert:** According to the PBCS monitoring and alert information of CPDLC and ADS-C sent from PMS to the ATM automation system, the data link status, surveillance performance and communication performance are respectively represented by "+", "S" and "M" on the track label. When the link status of the data link is abnormal, the symbol corresponding to the label will be displayed in red. The detailed list information of alerts can be viewed in the right-click menu of the label.

g) **PBCS Capability Identification:** The ATM automation system automatically judges the PBCS capability of the flight according to the flight plan while it is identified with the letter P in the EFS.

h) **PBCS Specific Alarm Query:** The ATM automation system provides a window to query specific alerts.

i) **PBCS Message Query and Display:** The ATM automation system can display and query the original message of group 10 and group 18 in the flight plan window.

3. CONCLUSION

3.1 The ATM automation system adopts a flexible processing mechanism while meeting existing route requirements, the normal operation will not be affected even though the route changed.

3.2 Via this project, CAAC completed the core functions like PBCS real-time alert, and post-event data link quality analysis and management, in order to improve PBCS alert capability of the operational unit, completed the PBCS operation monitoring and evaluation mechanism and data analysis capability in China, and laid a foundation for the application of new data link technology in the future, such as four-dimensional trajectory based operation.

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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