International Civil Aviation Organization

Twelfth Meeting of the FANS Interoperability Team – Asia (FIT-Asia/12)

Video Teleconference, 25 – 28 July 2022

Agenda Item 4: Review of ADS-C/CPDLC Operations and Performance

VERIFICATION OF AIR TRAFFIC CONTROL SERVICES BASED ON DATA-LINK FOR ALL FLIGHT PHASES IN CHINA

(Presented by China)

SUMMARY

In order to support China's civil aviation Data link Air Traffic Control Services for All Flight Phases planning and implementation roadmap (hereinafter referred to as "roadmap") research and formulation, since 2019, ATMB of CAAC has carried out technical feasibility verification of Data-link Air Traffic Control Services and emergency communication service in Zhengzhou airspace, which effectively supported the research and release of roadmap.

1. INTRODUCTION

1.1 In 2019, Air Traffic Management Bureau (ATMB) of Civil Aviation Administration of China (CAAC) entrusted Aviation Data Communication Corporation to launch the project of "Technology and Application Research to support Data-link Air Traffic Control Services for All Flight Phases". After three years' research, all verification plans have been completed.

1.2 One of the main objective of the project is to compose a short-term planning and identify implementation milestones of the roadmap, relying on the requirement of Southern Regional ATMB, in combination with Henan Air Traffic Control Sub-bureau, Hainan Airlines and other stakeholders to carry out the Data-link Air Traffic Control Services application demonstration. The output of the project recognizes the feasibility of the key work during the 14th Five Year Plan period of the road map, and achieved the results as expected.

1.3 In 2021, the Data-link Air Traffic Control Services and emergency communication service based on ACARS ATS protocol was successfully carried out in Zhengzhou to demonstrate the feasibility of the road map's recent (to 2025) planning goal improving the existing system capacity of civil aviation of China to provide digital ATC service in continental airspace.

2. DISCUSSION

Avionic Systems

2.1 This system made a full use of our existing airborne system capabilities, and carried out research and verification based on the ACARS ATS protocol that data link control service supported by all 99+ seats aircraft of civil aviation of China. In the current environment, the system reduced unnecessary investment in the upgrading and transformation of airborne systems, and maximized the cost savings for operators.

2.2 The project selected two aircraft from Hainan Airlines and, completed avionics modification, carrying out EFB based visual service verification during the flight. The project realized real-time visual display and auxiliary guidance of Data-link Air Traffic Control Services combined with EFB electronic aeronautical chart in the whole stage of flight operation for the first time.

Air-Ground Data Link Communication Network

2.3 The project conducted verification work based on the existing Chinese VDL MODE2 data link communication network, which is compatible with ACARS. At present, more than 50% of the Chinese aircraft with more than 99 seats supports VDL MODE2, and 100% supports ACARS. VDL MODE2 network has covered the airspace of major Chinese airports and routes in central and eastern China. The VDL MODE2 network is planned to cover the major transport airports and routes in China by 2025. The ACARS network has covered the main transport airports and routes in China.

ATC Information System

2.4 According to the requirements of air traffic control operation, the project selected Data-link Air Traffic Control Services and emergency communication services to carry out the verification, this includes but not limited to RTA and delay time, estimated use frequency, diversion suggestions, estimated arrival and departure procedures, estimated runway, estimated arrival and departure taxiing routes, estimated stand, and emergency communication reminders.

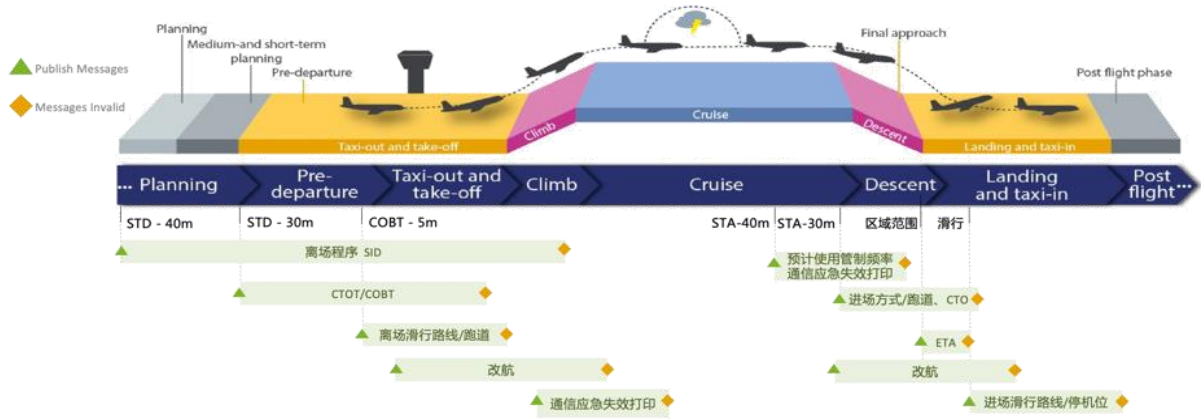

Figure 1 Verification scheme of Data-link Air Traffic Control Services for All Flight Phases

2.5 The system was deployed in the Air Traffic Control (ATC) ground system in Zhengzhou, and automatically/manually provides all kinds of Data-link Air Traffic Control Services and emergency communication information to the Multi-function Control Display Unit (MCDU) and Electronic Flight Bag (EFB) of designated flight and the receiving status of the airborne equipment and the 'ACCEPT' status when flight crew review information in MCDU will be provide to ATC ground system in real-time.

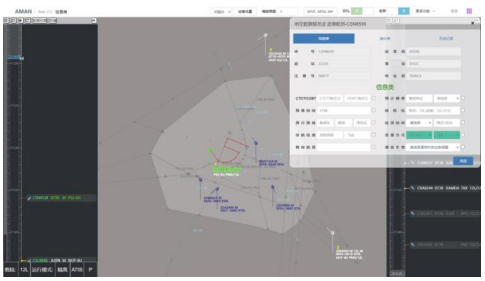

Figure 1 Ground-controlled approach system

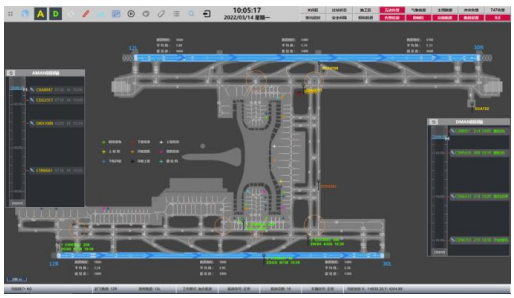

Figure 2 Tower controller ground system

2.6 Flight-related Data-link Air Traffic Control Services pushed by the project is displayed in text at airborne MCDU terminal and in graphics at the EFB terminal for aircrew. Meanwhile, the system can provide visual guidance of flight path during the all flight phases based on the aircraft position, route and ATC's digital control messages.

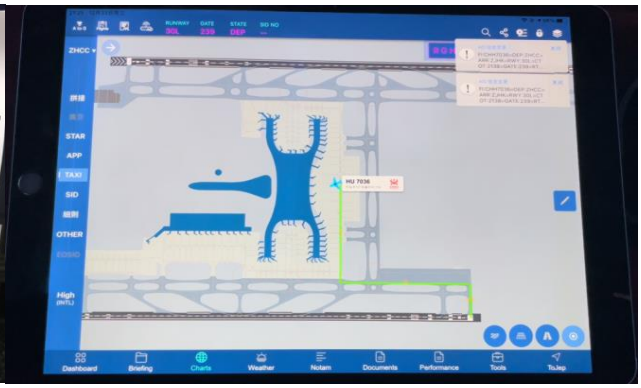

Figure4 Data-link Air Traffic Control Services in MCDU Fugure5 Data-link Air Traffic Control Services in EFB

2.7 The project has carried out routine flight verification tests in Zhengzhou airspace (flight level below 7800 meters) for 10 months, involved nearly 37000 flights. Henan ATMB sent more than 500 datalink ATS information services every day. In that case, daily use of voice communication in the airspace is expceted to decrease 1.39 hour while keeping an equal operation quality, reducing at least 500 hours per year.

2.8 The project established the interface between A-G datalink network and ATC information system, which is proved to be applicable to ATC systems including ATC automation system, Electronic Flight Strip and AMAN.

Service Performance

2.9 Through the ananlysis of VDL MODE2 network message during the flight verification (flight altitude 0-7800 meters) of the project, the average delay of one-way ground-air communication is 4.03 seconds, and the percentage of lost message is 3.8%.

2.10 According to ED120, ED122, ED228A and other relevant standards, the project carried out the required communication performance (RCP) evaluation for the flight verification data based on the capability of Chinese ground-air data link network and the aircraft avionics system, and the actual requirement of air traffic control operation, based on the data analysis, the project preliminarily put forward the RCP evaluation method to different flight stages and different air traffic control service, which will be the basis for the formulation of the RCP specification of digital air traffic control services of China

Follow up work plan

2.11 The ATMB of CAAC will also carry out the operation verification of the mixed use of ACARS ATS and CPDLC in Haikou.

2.12 Based on the experimental verification results, the ATMB of CAAC will continue to accelerate the research, formulation and release of the roadmap.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this paper; and

b) discuss any relevant matters as appropriate.

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