



FOURTEENTH AIR NAVIGATION CONFERENCE

Montréal, Canada, 26 August to 6 September 2024

Agenda Item 3: Air Navigation System Performance Improvement

3.1: Proposals to improve the efficiency of air navigation services contributing to LTAG

VALIDATION AND APPLICATION OF ALL-PHASE DATA LINK ATC SERVICE BASED ON AIR-GROUND DATA LINK IN CHINA

(Presented by China)

EXECUTIVE SUMMARY

This paper presents a series of all-phase data link air traffic control (ATC) service validation and application activities carried out in China since 2019. These activities fully use the aircraft communications addressing and reporting system air traffic services (ACARS ATS) capabilities of avionics system supported by nearly 100 per cent > 99-seat aircraft in China, in order to reduce the cost challenges for airlines and accelerate the development of data link ATC services.

1. INTRODUCTION

1.1 According to the ICAO Aviation System Block Upgrade plan and relevant plans of the Civil Aviation Administration of China (CAAC), data link services are the focus of the air navigation technology. Aircraft communication addressing and reporting system air traffic service (ACARS ATS) and controller-pilot data link communications, as two common data link air traffic services (ATS) technology currently in use, can be used to transmit various types of information between controllers and pilots, which will significantly reduce the workload of controllers and pilots, mitigate the shortage of voice communication frequency resources, and enhance the operation safety. Since 2019, China has successfully carried out flight validation of all-phase data link ATC service based on compatible future air navigation systems (FANS) 1/A and ACARS ATS protocols in Zhengzhou, Guangzhou, Haikou, Shanghai and other areas. The validation covers data link-flight information services (D-FIS) which are defined in the *Manual of Air Traffic Services Data Link Applications* (Doc 9694), emergency communication, similar call sign alerts based on data link, dangerous weather warning, etc., which will support the technical feasibility of the near-term (to 2027) planning goal of fully leveraging the existing system capacity of China to provide data link emergency communication and information services in major airspace, and to explore the development path of data link-voice hybrid application in China in the forthcoming “All-Phase Datalink-Based ATC Service Planning and Implementation Roadmap” (hereinafter referred to as the Roadmap).

¹ Chinese and English versions provided by China.

1.2 In 2024, China will promote the trial program of data link-based similar call sign alerts in some control areas, to research and validate the on-demand transmission of flight-related similar call sign alert information relying on the existing automatic ground control systems in various regions and the data link technology.

1.3 In 2024, China will carry out data link-voice hybrid flight validation on the basis of all phases of flights in Xinjiang, China, and has already completed the design of the flight validation plan, which involves 34 categories, >120 commonly used data link-based ATC advance instructions and flight-related auxiliary information, covering tower, approach and area, to explore the data link-voice hybrid operation in all phases of flights in China and the ATC-airlines-airports collaboration mode.

2. DISCUSSION

Avionics System

2.1 At present, more than 50 per cent of the aircraft with more than 99 seats in China support very high frequency (VHF) digital link (VDL) Mode 2, and 100 per cent support ACARS; as for the application of on-board data link-based control protocol, the existing on-board system capabilities of China are fully explored and utilized to carry out validation based on the ACARS ATS protocol supported by all aircraft with more than 99 seats in China while including FANS 1/A protocol compatibility as well, so as to reduce unnecessary investment in the upgrading and reconstruction of the on-board system.

2.2 Relying on the ground ATC system, various kinds of data link-based control information and emergency communication information are automatically/manually sent to the multi-function control display unit at the on-board end of the targeted flight crew.

Air-ground data link network

2.3 Regarding the air-ground data link network, the above validation is based on China's existing VDL Mode 2 and compatible with ACARS air-ground data link network. The VDL Mode 2 network covers major airports and air routes in the central and eastern parts of China and is planned to realize the coverage of major transport airports and air routes around China by 2025. The ACARS network has already covered major transport airports and air routes in China.

ATC information system

2.4 Regarding the validation of D-FIS, efforts have been made in utilizing the existing ATC system to carry out the automatic on-demand flight auxiliary information push based on the existing ATC system, such as approach procedures and runways for landing, in Zhengzhou and Guangzhou since 2019, and the services have been in operation on a regular basis in these two cities of China.

2.5 Regarding the validation of data link-based similar call sign alerts, the existing major automatic ground ATC system in all regions of China have been equipped with the function of similar call sign alert. The promotion of trial data link-based similar call sign alert program will be launched this year in some ATC areas, with upgrading and modification on the basis of the existing automation system, so as to realize the automatic identification of similar call sign within sectors and automatic push of digitized similar call sign alert information to the targeted flight crew.

Validation results

2.6 Regarding the validation of data link-based dangerous weather warning in air routes, efforts has been made in upgrading the existing ATC system based on the actual needs of ATC units to realize the information push of flight-related turbulence and other air route dangerous weather warning to relevant aircrew. The services have been in regular operation in the airspace of Zhengzhou, China, since 1 September 2023, with a daily average of 13.13 copies of data link-based air route dangerous weather warning information being sent out.

2.7 Since 1 May 2021, the trial operation of data link-based similar call sign alert has been carried out in Zhengzhou, China, with a daily average of 169.70 pieces of data link-based similar call sign alert message being sent out. According to statistics, relying on the data link-based similar callsign alert services, an average of about 38 minutes of voice calls can be saved per day, which effectively reduces the workload of air traffic controllers and aircrew and improves flight safety.

2.8 Starting from 1 August 2022, the D-FIS and emergency communication services have been in regular operation in the airspace of Guangzhou, with a daily average of 191.94 copies of data link-based flight auxiliary information being sent out, which significantly enhances the efficiency of ATC operation. In the future, according to ICAO's plan, China will gradually migrate to FANS 1/A and B2 applications in phases and eventually support trajectory-based operations.

3. CONCLUSION

- a) Note the information contained in this paper; and
- b) promote on-board system upgrading.

— END —