International Civil Aviation Organization

Twenty Seventh Meeting of the Communications/ Navigation and Surveillance Sub-group (CNS SG/27) of APANPIRG

Bangkok, Thailand, 28 August – 01 September 2023

Agenda Item 5: Aeronautical Mobile Communications Service and Aeronautical electromagnetic spectrum utilization

NEW-GENERATION AEROMACS PROJECT PROGRESS IN CHINA

(Presented by China)

SUMMARY

This Information Paper presents the new-generation AeroMACS Project Progress in China.

1. INTRODUCTION

1.1 Aeronautical mobile airport communications system (AeroMACS) is a high-capacity data link supporting mobile and fixed communications, related to the safety and regularity of flight, on the aerodrome surface.

1.2 AeroMACS is currently derived from the IEEE 802.16-2009 mobile standards. AeroMACS profile document (RTCA DO345 and EUROCAE ED222) lists all features from these standards which are mandatory, not applicable or optional.

1.3 With the fast development of air transportation system towards the direction of digitalization and intelligence, air traffic management, airline operation control, and passenger service have put forward higher requirements on communication capabilities in the aerodrome environment. As such, AeroMACS needs to be open to additional technology implementations (e.g., 5G), within the ITU allocated spectrum (5091 MHz - 5150 MHz), to accommodate these surging service demands.

1.4 In April 2021, CAAC released the Doc *Roadmap of The New-Generation Aeronautical Broadband Communications of CAAC*. Thereafter, in January 2022, CAAC released the Doc *Implementation Plan for the Construction and Application of 5G Airport Scene Broadband Mobile Communications System (2022-2025)*, aiming for developing the new-generation AeroMACS system.

2 DISCUSSION

New-Generation AeroMACS Equipment Development

2.1 The equipment development is based on the technical requirements issued by ICAO. All software and hardware are produced independently by the Chinese industry.

2.2 The equipment software and hardware are compatible with various network element products including multiple baseband chips. Moreover, the technical requirements for each interface are defined to ensure the security and reliability.

2.3 The equipment adopts the frequency conversion module to adapt to the carrier frequency of AeroMACS. The ground station antennas are redesigned to meet the EIRP and coverage requirements on the aerodrome surface.

New-Generation AeroMACS Testing and Demonstration

Remote Collaborative Maintenance System

2.4 In collaboration with Commercial Aircraft Corporation of China and Chengdu Airlines, AeroMACS broadband wireless communication network has been established at Chengdu Shuangliu International Airport, covering certain apron areas, hangars, and taxiing areas.

2.5 Simultaneously, a remote collaborative maintenance platform based on the AeroMACS network has been developed. Leveraging the advantages of AeroMACS in terms of high bandwidth and low latency, real-time transmissions of high-definition video from the maintenance site to the aircraft maintenance center was achieved.

2.6 Maintenance experts can watch the live video synchronously online, provide guidance to on-site maintenance engineers through voice communication, mark inspection points and equipment operating parameters, and issue maintenance work orders. This enables remote collaborative troubleshooting and maintenance for in-service aircraft, including line inspections, line maintenance, on-wing inspections, hangar maintenance, and aircraft scheduled inspections at multiple operational locations.

2.7 The Remote Collaborative Maintenance System significantly improves the capability and efficiency of on-site maintenance, reduces aircraft downtime caused by a severe shortage of aircraft maintenance experts, enhances the safety of aircraft operations, and improves the operational efficiency of airlines.

Intrusion Prevention System for Runways

2.8 At Shanghai Hongqiao International Airport, a runway intrusion prevention system has been established through collaborative efforts involving the East China Air Traffic Management Bureau, ZSSS, and Eastern Airlines.

2.9 The system was developed based on the network infrastructure construction, vehicle modification, and ground system establishment. The AeroMACS broadband wireless communication network was deployed to cover the operational areas of the airport. Additionally, one ground vehicle from the East China Air Traffic Management Bureau and one from ZSSS were equipped with AeroMACS wireless receivers that possess precise positioning capabilities based on GNSS.

2.10 The vehicles were equipped with on-board AeroMACS terminals, integrated with tablets for monitoring and communication during ground operations. Furthermore, an airport surface control workstation was established in the airport control department to monitor the movement of ground vehicles and issue operational instructions to vehicle drivers.

2.11 This system enabled airport surface controllers to monitor various operating vehicles, providing both drivers and controllers with the same situational awareness. This helped to avoid hazardous proximity and collisions between vehicles and aircraft, as well as between vehicles. The system ensures the safety of aircraft and ground vehicles during operations, enhances the efficiency of ground vehicle operations, and minimizes and prevents accidents resulting from hazardous proximity.

Visual Taxiing Guidance System

2.12 The Visual Taxiing Guidance System utilized visual electronic map guidance, integrating tower control systems, critical path points, and operational area relationship data. A backend service system for taxiing guidance assistance was established in the airport control department to facilitate taxi route planning and conflict prevention.

2.13 Pilots, using mobile devices with AeroMACS wireless broadband communication network for secure communication, received surface taxiing instructions from ground controllers and access digital map data of the airport surface. The system provided visual and voice guidance to pilots, ensuring safe taxiing from the parking position to the runway entrance and from the runway exit to the parking position.

2.14 The use of the Visual Taxiing Guidance System significantly improves communication efficiency and accuracy between controllers and pilots, reduces their workload, prevents taxiing errors in low visibility and complex taxiing scenarios, avoids surface operation conflicts and risks, reduces taxiing time, unnecessary fuel consumption, and enhances aircraft surface taxiing efficiency. Additionally, it greatly reduces the significant construction costs associated with airports that rely on light guidance systems.

3. ACTION BY THE MEETING

3.1 The meeting is invited:

a) to note the information presented in this Information Paper; and

b) to support the enhancement of AeroMACS SARPs and Technical Manual in the CP meeting.

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