

**58<sup>th</sup> CONFERENCE OF  
DIRECTORS GENERAL OF CIVIL AVIATION  
ASIA AND PACIFIC REGIONS**

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**AGENDA ITEM 4: AIR NAVIGATION**

**NEW-GENERATION AEROMACS PROGRESS IN CHINA**

(Presented by the People's Republic of China)

**SUMMARY**

This Paper presents the new-generation AeroMACS standardization in ICAO and 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 digitalization and intelligence, air traffic management, airline operation control, and passenger service have put forward higher requirements on communication capabilities in the aerodrome environment. To accommodate these surging service demands, AeroMACS needs to be open to additional technology (e.g., 5G), within the ITU allocated spectrum (5091 MHz - 5150 MHz)..

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 at developing the new-generation AeroMACS system.

## 2. DISCUSSION

### NEW-GENERATION AEROMACS STANDARDIZATION IN ICAO

#### BACKGROUND

2.1 CAAC presented a new Job-Card in the CP-DCIWG/6 meeting for the update of the ICAO AeroMACS provisions, while maintaining technology-agnostic requirements and performance-based approach, enabling safe/secured adoption of innovations, such as “5G”, for aeronautical safety communications.

2.2 The proposed Job-Card was in response to action items CP-DCIWG/6-12, CP-DCIWG/6-13 and CP-DCIWG/6-14, which reactivated Working Group-M (Maintenance) (WG-M) to review the proposed updates of the AeroMACS Job Card and further develop it. Mr. Zhu Yanbo from China volunteered to be the Rapporteur of WG-M.

2.3 With the support of CP-DCIWG Chair, Secretary as well as delegates from FAA, EuroControl, etc., The First Meeting of WG-M (hereinafter referred to as “WG-M/1”) was held virtually during 5-7 June 2023, with Mr. Zhu Yanbo as the Rapporteur and Mr. Gulam, Raza Ali Hussein as the Secretary. Thirty-nine participants from Member States and international organizations attended part or all of virtual meeting sessions of the WG-M/1.

#### ACTIVITIES OF WG-M/1

#### REVIEW AND APPROVAL OF THE WG-M TERMS OF REFERENCE

2.4 The meeting accepted minor editorial changes of the WG-M Terms of Reference (hereinafter referred to as “ToR”): a) Background; b) Scope; c) Required Expertise; d) Objectives; e) Specific Working Arrangements.

2.5 The Scope and the Objectives sections of the ToR for VDL M2 was amended and consideration for other VDL M2 industry standards were added.

2.6 The participants agreed to limit scope and objectives for the ATN/OSI standards Task in the ToR with the corresponding action item from DCIWG/6.

2.7 With the suggested amendments, the meeting approved the ToR.

#### WG-M WORK PROCEDURE & TECHNICAL APPROACH

2.8 The meeting suggested that WG-M set up three sub-groups to undertake the AeroMACS, VDL Mode2 and ATN/OSI standard amendment tasks, respectively. The sub-groups may develop the work plan and deliverable schedules to meet the WG-M mandates and provide their proposal to WG-M for endorsement.

2.9 The Rapporteur volunteered to chair the subgroup for AeroMACS, while Mr. Dongsong Zeng from MITRE volunteered to chair the subgroup for VDLM2 & ATN/OSI.

#### AMENDMENT AND DEVELOPMENT OF AEROMACS JOB CARDS

2.10 The expert at CAAC presented a Working Paper for an update proposal to the AeroMACS Job Card that was presented at DCIWG/6. The aim of this Job Card is to update the ICAO AeroMACS provisions to maintain technology-agnostic requirements and performance-based approach, and enable safe/secured adoption of innovations, such as “5G”, for aeronautical safety communications. The Job Card proposes to enable AeroMACS to support seamless integration of both RPAS and piloted aircraft CNS safety information exchanges in low-altitude airspace in the vicinity of airports.

2.11 After discussions, the title of the Job Card was added as “Advanced cellular and RPAS Alignment for AeroMACS”. The AeroMACS group leader, i.e., Mr. Zhu Yanbo, agreed to set the AeroMACS provisions delivery date to Mar. 2025.

#### DEVELOPMENT OF AEROMACS SARPS

2.12 A Working Paper was submitted by China for the AeroMACS SARPs amendment to make the SARPs more performance-based and inclusive of additional technology implementations and less specific to IEEE 802.16e within the ITU Allocated AeroMACS Spectrum (5030 – 5150 MHz). The SARPs update also includes AeroMACS communication option in low-altitude airspace in the vicinity of airport for seamless RPAS and air traffic management. Due to the meeting time limitation, the Rapporteur and the Secretary requested the participants to review the amendment proposal offline and provide comments.

#### PLAN FOR NEXT MEETING

2.13 The meeting agreed on the WG-M/2 meeting to be held in the Regional Office in Bangkok during 23-27 Oct. 2023.

#### NEW-GENERATION AEROMACS EQUIPMENT DEVELOPMENT

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

2.15 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.

2.16 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

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

2.18 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.

2.19 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.

2.20 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

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

2.22 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 BeiDou satellite navigation.

2.23 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.

2.24 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

2.25 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.

2.26 Pilots, using mobile devices with AeroMACS wireless broadband communication network for secure communication, received surface taxiing instructions from ground controllers and accessed 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.

2.27 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 CONFERENCE**

3.1 The Conference is invited to:

- a) to note the information presented in this Paper; and
- b) to support the enhancement of AeroMACS SARPs and Technical Manual in the CP meeting.

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