

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

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AGENDA ITEM 4: AIR NAVIGATION

**ENHANCING AERODROME SURFACE OPERATION BY  
AEROMACS AND BDS**

Presented by the People's Republic of China

**SUMMARY**

Aeronautical Mobile Airport Communications System (AeroMACS) is being developed to provide a new broadband wireless communications capability for safety critical communications in the airport surface domain, providing connectivity to aircraft and other ground vehicles as well as connections between other critical airport fixed assets. This paper presents the development of applications based on AeroMACS in 13 airports in China since 2014, and the trial using AeroMACS and BDS which further enhance the aerodrome surface operation, the AeroMACS development in China has progressed from basic system performance testing, D-TAXI assistance application for aircraft and ground vehicles development.

## Enhancing Aerodrome Surface Operation by AeroMACS and BDS

### 1. INTRODUCTION

AeroMACS is short for Aeronautical Mobile Airport Communications System. It is a wireless broadband technology, which supports the increasing need for airport data communications, meanwhile it also supports the information sharing on the airport surface for both fixed and mobile applications.

Based on the mature WiMAX standard (IEEE 802.16e), AeroMACS operates in the aeronautical band from 5091 MHz to 5150 MHz, which has been allocated for use by the aeronautical mobile service on a worldwide basis by the International Telecommunication Union ITU. The AeroMACS is specified in ICAO Annex 10 Volume III, applicable in the end of 2016 and the Manual on AeroMACS was developed by the ICAO Communication Panel, First Edition of which, has been available since 2017.

AeroMACS is internationally standardized and globally harmonized. It is the only wireless technology that has been validated by EUROCONTROL, Federal Aviation Administration (FAA), and International Civil Aviation Organization (ICAO) to support the safety and regularity of flight.

### 2. DISCUSSION

#### 2.1 AeroMACS network deployment in China

Radio Commission of CAAC has formally authorized AeroMACS frequency in 110 airports in China since 2017. AeroMACS networks has already been deployed in 13 airports including Beijing Capital International airport, in which, 14 AeroMACS base stations have been installed, covering airport surface including runways, taxi ways, and gate positions.

#### 2.2 AeroMACS applications in China

Trial applications has been carried out since 2014.

##### 2.2.1 *AeroMACS avionics*

Airport field studies was conducted on the AeroMACS ground system and the prototype of avionics from 2016 in Chengdu airport. With the support of an avionics manufacturer, the prototype avionics connected with CMU, FMS and MCDU can communicate with AeroMACS base stations.

##### 2.2.2 *D-TAXI assistance system via AeroMACS*

The D-TAXI assistance system is based on A-SMGCS system which has the ability to monitor aircraft surface movement in real time using radar, ADS-B, MLAT systems, and match aircraft with flight plan by integrating the ATC automation system.

D-TAXI assistance system in cockpit provides the pilot with surface GIS map of airport in iPad-based EFB, displaying the position of itself and all related aircrafts in the airport surface simultaneously. It also provides real-time guidance according to the approved taxi route by the ATC tower controller. The portable AeroMACS CPE (Customer Premise Equipment) was redesigned for the trial. The CPE antenna is stuck on the back window of cockpit. The CPE provides Wi-Fi and Bluetooth hotspot which can communicate with EFB, in which the D-TAXI App for the pilot is installed.

Phase one of cockpit trial in Beijing Airport was conducted between Oct.1st and 7th in 2017, 56 flights from Air China, China Eastern, Hainan Airline and Shandong Airline attended the D-TAXI system cockpit trial in the phase of departure and landing taxi stage. ATC controller totally released 82 taxi routes for the flights, and the pilots received all 82 taxi route data when they use the D-TAXI system via AeroMACS. The performance trial was based on ICAO DOC 9830 A-SMGCS Manual, including safety, coverage and speed.

### 2.2.3 *Surface vehicle surveillance and navigation application based on BDS and AeroMACS*

AeroMACS also helps to fulfill basic surface movement guidance and control for medium-sized and small airports. Following the guidance of the Air Traffic Regulation Office of CAAC, the Central and Southern Regional Administration of CAAC has initiated the demonstration project of the BDS (BeiDou Navigation Satellite System) based airport surface operation and application this year, and plans to launch the surface vehicle surveillance and navigation application demonstration based on BDS and AeroMACS technology.

Three AeroMACS base stations has been installed in August 2018 to achieve basic coverage of the airport. One BDS ground augmentation station will be deployed to achieve BDS high-precision position service in the whole area of the airport. Mobile terminals combining BDS with AeroMACS will be developed to provide the vehicle of the surface with surveillance and navigation functions. The D-TAXI assistance system mentioned in 2.2.2 will be demonstrated in the future.

## 2.3 **Future Plan**

With the support of domestic manufacturers, CAAC is speeding up AeroMACS network construction in airports and is going to set up one AeroMACS control center in Beijing. AeroMACS chip research will be conducted to enhance the performance of portable CPE, reduce the power consumption and physical volume. The research of AeroMACS avionic and antenna will be promoted and the online functions of EFB via AeroMACS, such as weather App, AMM (Airport Movement Map), will be enhanced in collaboration with industries and airlines.

Practice proved that the D-TAXI assistant application base on AeroMACS and BDS has good application effect and great popularization and application value, CAAC is promoting the application via AeroMACS in the Asia Pacific Region. CAAC is working on publishing D-TAXI assistance application regulations and guidance materials. CAAC is willing to provide support for the promotion of AeroMACS applications in Asia Pacific region.

**3. ACTION BY THE CONFERENCE**

3.1 The Conference is invited to:

- a) note the information contained in this paper; and;
- b) push forward the application of AeroMACS and GNSS to enhance aerodrome surface operation in Asia Pacific region according to the specific needs of various countries; and
- c) propose ICAO to develop guidance materials for aerodrome surface operation based on AeroMACS and GNSS, to ensure that a harmonized approach to be adopted.

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