AGENDA ITEM 4: AIR NAVIGATION

APPLICATION AND DEVELOPMENT OF NEW TECHNOLOGIES IN AIR TRAFFIC MANAGEMENT OF CHINA

(Presented by People’s Republic of China)

INFORMATION PAPER

SUMMARY

This paper presents the development of new technologies in air traffic management of China, including the first I4D demonstration flight, datacomm based ATC services across full flight phases, AeroMACS, BeiDou Navigation Satellite System (BDS) and their application on airport surface operations, ADS-B as well as Mode S DAPs data.
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1. INTRODUCTION

1.1 Aiming at the unified vision of global air navigation system, the Air Traffic Management Bureau (ATMB) of Civil Aviation Administration of China (CAAC) developed Civil Aviation ATM Modernization Strategy (CAAMS) in 2016, in line with the Global Air Navigation Plan (GANP) and Aviation System Block Upgrade (ASBU).

1.2 Under the guidance of CAAMS, the ATMB of CAAC has made unremitting efforts in new technologies in air traffic management of China, including the first I4D demonstration flight, datacomm based ATC services across full flight phases, AeroMACS, BeiDou Navigation Satellite System (BDS) and their application on airport surface operations, ADS-B as well as Mode S DAPs data.

2. DISCUSSION

2.1 1st I4D Demonstration Flight in China

2.1.1 On March 20, 2019, the first I4D demonstration flight was organized by the ATMB of CAAC. The route of the flight trial was from Tianjin Binhai International Airport (ZBTJ) to Guangzhou Baiyun International Airport (ZGGG), passing through 6 ATC units and 12 ATC sectors, covering a total mileage of more than 3,800 kilometres. The test aircraft was an A320 aircraft equipped with 4D FMS and FANS C airborne communication unit. The ground I4D test systems were installed in Guangzhou ATC Centre. VHF Mode 2 ground stations were deployed along the flight route. The full-process data communication between the aircraft and the ground test system was in accordance with ATN Baseline 2 protocol. The flight trial fully validated the performance of Controller Pilot Data Link Communications (CPDLC) and air-ground Extended Projected Profile (EPP) sharing via ADS-C in I4D operation. With regard to the test of Required Time of Arrival (RTA) at given waypoints, 3 RTAs has been achieved with deviation less than 5 seconds, which marked the I4D flight trial a complete success. After this first flight trial, CAAC will continue to promote the researches and application of new Trajectory Based Operational (TBO) concepts and technologies in the future.

2.2 Supporting the Researches and Verification of Datacomm Based ATC services across Full Flight Phases

2.2.1 Till June 2018, D-ATIS and DCL services based on AEEC623 protocol have been provided in 44 towers in China. Meanwhile, the CDM information on demand service based on data link in all 10 million airports has been launched since December 29, 2018. According to the plan of ATMB of CAAC, researches and verification of Datacomm Based ATC services will be comprehensively promoted. At current stage, AEEC623 is planning to be used since it is supported by 95% of the avionics system of CAAC. That means CAAC is capable of carrying out the verification of digital en-routes ATC instructions and information services.

2.3 Using the New Generation of Airport Secure Data Link Communication Broadband Wireless Standard AeroMACS for D-TAXI Auxiliary Services

2.3.1 Based on AeroMACS (Aeronautical Mobile Airport Communications), the airfield D-TAXI technology that meets the requirements of A-SMGCS (Advanced surface movement guidance and control system) is studied. Since 2016, an AeroMACS network covering runways, taxiways and gate positions has been deployed in Beijing capital international airport to realize one-way and real-time connection with A-SMGCS flight dynamics, taxi route, restricted area and other data. In October 2017, ATMB, together with Air China, China Eastern, HNA and Shandong airlines, has completed the first phase of aircraft test and verification work, which was highly
appraised by the controllers and pilots participating in the test. On December 4, 2018, the CAAC coordinated with Beijing capital airport, Air China, and North China Air Administration and conducted class IIIA demonstration flight in Beijing capital airport. At the same time, AeroMACS for taxi route auxiliary technology verification was performed, and good results have been achieved. This technology can effectively improve the safety assistance of flight landing and departure in low visibility at the airport, further improve flight regularity and enhance the airport's low visibility ability.

2.4 Applications of Beidou and AeroMACS in airport surface operations

2.4.1 The project utilizing Beidou and AeroMACS in the slide guidance at Zhangjiajie Airport was launched in 2018, which is inspired by the plan of Air Traffic Management Regulatory Office and the Central South Administration of the CAAC. In December, the project and the development of the entire system were completed at Zhangjiajie Airport. Based on the Beidou enhanced positioning technology, high-precision positioning of vehicles and aircraft in the airport surface has been realized by the AeroMACS network and the handheld portable mobile terminal. The deviation can be controlled at the sub-meter level. This project is the first trial in China and even the world to use AeroMACS combined with Beidou high-precision positioning technology for Airport Surface management. The completion of the project is conducive to the fine management and efficient operation of the apron.

2.5 International Standardization of Beidou in Civil Aviation

2.5.1 CAAC issued the “Overall Implementation Plan for the International Standardization Promotion of Beidou Civil Aviation” in September 2014, with the joint guidance of CAAC and the China Satellite Navigation Office. After several discussions at the ICAO NSP Meetings, BDS B1I/B1C/B2a has formed the draft of Part A of ICAO Annex10 SARPs by April 2019. This draft is verified by NSP VWG. The next step is to complete the VWG verification of the Part B of ICAO Annex10 SARPs.

2.6 Beidou GBAS supported the first flight of the Commercial Aircraft of China

2.6.1 A Beidou GBAS monitoring station, which supports the CAT I approach, was constructed at North Glide-Path Station of Dongying Airport. This project was led by Beihang University, cooperated by Tianjin 712 Communications Broadcasting Co., Ltd. and Beihang Dongying Research Institute. This project is guided by CAAC and the China Satellite Navigation Office, relying on the key projects of the Beidou satellite navigation system and large aircraft. The performance test of the Beidou GBAS and Beidou airborne Multi-Mode Receiver (MMR) was successfully completed on ARJ21-700 at October 14, 2017, which is carried out in the relevant international civil aviation standards and the relevant technical standards of China civil aviation. This flight test realized the first combination of four “localizations”, which combined Domestic satellite navigation system, Domestic Ground-Based Augmentation system (GBAS), Domestic airborne Multi-Mode Receiver (MMR) with the Domestic Commercial Aircraft. This flight test has gathered huge amounts of test data, which will be used in the international civil aviation standardization, application promotion and test certification of Beidou satellite navigation system.

2.7 Promoting the application of ADS-B technology

2.7.1 The ADS-B surveillance network was constructed at the end of 2018, and it covers the whole Chinese Airspace. There are 308 ground stations, 2 level-1 data processing centers, 8 level-2 regional data processing centers and 36 local data processing stations. All of the infrastructures and systems in the project will support the whole airspace ADS-B operation implementation of China.

2.7.2 At UTC 16:00, 4th Jan, 2018, Urumqi ACC implemented the ADS-B OUT operation, which is the first area of the ADS-B used in ATC formalization in China. According to the Integrated
Work Plan of the Civil Aviation of China, ADS-B OUT initial operation ability is required after 1st Jul, 2019. Based on the requirement of CAAC, the ADS-B Implementation Phase I target of China is:

2.7.3 To implement the ADS-B Air Traffic Control for the above 8400 meters (included) no-radar surveillance airspace and approach control area priority; and

2.7.4 To implement the ADS-B and Radar comprehensive operation for the above 8400 meters (included) radar surveillance airspace.

2.7.5 This target will improve the integrated operation abilities of China, which will be implemented on 10th Oct, 2019.

2.8 Making a positive contribution to the Mode S DAPs data implementation and operation for the Asia & Pacific Region

2.8.1 With the continuous improvement of the surveillance infrastructure construction of the Civil Aviation, China has deployed about 70 Mode S Radars and established the ADS-B surveillance network. The researches on Mode S and DAPs data of civil aviation applications in China are also deepening. After Aug 2013, the “Selected Height” data item of the Enhanced Mode S (EHS) have been used in the ATC System of Chengdu Air Control Centre. Currently the application of other data items of DAPs is under the research process such as Mode C Altitude and Wind Speed and so on. As the accumulation of experience and the development of new technology application of the Mode S, Civil Aviation of China make a positive contribution to the Mode S implementation and operation for the Asia & Pacific Region. The development of the Mode S Downlinked Aircraft Parameters Implementation and Operation Guidance Document (Mode S DAPs IGD) have been undertaken by CAAC and Hong Kong Civil Aviation Department, and other APAC states. In March 2019, The Mode S DAPs IGD Document has been approved and published by The Forth Meeting of Surveillance Implementation Coordination Group (ICAO APAC SURICG/4).

3. ACTION BY THE CONFERENCE

3.1 The Conference is invited to note the information contained in this Paper.

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