



International Civil Aviation Organization

WORKING PAPER

A40-WP/311¹

TE/130

2/8/19

(Information paper)

Chinese only

Revision No. 1

9/9/19

(Information paper)

English and Chinese only

ASSEMBLY — 40TH SESSION

TECHNICAL COMMISSION

Agenda Item 30: Other issues to be considered by the Technical Commission

APPLICATION AND DEVELOPMENT OF NEW TECHNOLOGIES OF ATM IN CHINA

(Presented by China)

REVISION NO. 1

EXECUTIVE SUMMARY

This information paper presents the progress of promoting new technology of air traffic management in China's civil aviation, including 4D flight path operation (I4D), the full-stage digital flight control, AeroMACS, the airport surface applications based on BDS and AeroMACS, the application of ADS-B technology and model S DAPs data.

Action: The Assembly is invited to take note of the information contained in this information paper.

| | |
|--------------------------------|---------------------------------------------------------------------------------------------------------------------|
| <i>Strategic Objectives:</i> | This information paper relates to Strategic Objectives of Air Navigation Capability and Efficiency |
| <i>Financial implications:</i> | N/A |
| <i>References:</i> | Doc 9854 — <i>Global Air Traffic Management Operational Concept</i> Doc 9750 — <i>Global Air Navigation Plan</i> |

¹ English and Chinese versions provided by China.

1. INTRODUCTION

1.1 Basing on the unified vision of Global Air Navigation System and in light of the realities of the development in China's civil aviation, on the basis of extensive lesson learning of the key technical elements in Global Air Navigation Plan (GANP) and Aviation System Block Upgrade (ASBU) framework, Air Traffic Management Bureau (ATMB) of Civil Aviation Administration of China (CAAC) developed the Civil Aviation ATM Modernization Strategy (CAAMS) in 2016.

1.2 According to CAAMS strategy, China's air traffic management departments have made persistent efforts in such areas as I4D operation, the full-stage digital flight control, AeroMACS, airport surface applications based on BDS and AeroMACS, the application of ADS-B technology and model S DAPs data.

2. THE DEVELOPMENT OF TECHNOLOGY OF AIR TRAFFIC MANAGEMENT

2.1 The first I4D test flight in civil aviation industry of China

On March 20, 2019, the first I4D test flight on route from Tianjin Binhai Airport to Guangzhou Baiyun Airport was launched, which flown over 6 control entities and 12 control sectors, with a total of over 3800 kilometers. An Airbus A320 aircraft with 4D FMS and FANS C communication capabilities was used for this test flight; the ground I4D flight path control test system is installed at Guangzhou Air Traffic Control Center; VHF Mode 2 data link communication ground station are installed along the test route, and the full-stage data communication, conforming to ATN Baseline 2 protocol, is achieved between the aircraft and the ground control test system. The test flight fully verified the capabilities including Controller Pilot Data Link Communication (CPDLC) and air-ground EPP Trajectory sharing (ADS-C) in I4D operation, and tested the Required Time of Arrival (RTA) capability at three waypoints during the test flight. In the test, the RTA time deviations of three points are controlled within 5 seconds, and realized the accurate arrival control of the timing and fixed point, completing a successful test flight. On the basis of the I4D test flight, China's civil aviation will continue to promote the research and application of new concepts and technologies based on Trajectory Based Operation (TBO) in accordance with ICAO's initiatives.

2.2 Support the research and verification for full-stage digital flight control service data link technology application

At present, the DCL and D-ATIS digital air traffic control services, based on AECEC623 protocol, have been provided at 44 airports in China and their operation become stable. In addition, the CDM information on-demand services, based on air-ground data links, were launched on December 29, 2018 at all airports each with over ten million movements. Under the plan of Air Traffic Management Bureau CAAC, the research and pilot work of the full-stage digital air control technology will be promoted on a full scale, which will gradually interconnect the air traffic control with the control instructions, information and flight information from the airlines' ground systems and aircraft avionics equipment during the full-stage flight to achieve air-ground integrated control operation. At current stage, it is planned to use AECEC623 ground-to-air data link air traffic control protocol that supports 95% existing avionics system in China's civil aviation, and to select trial airports and routes to carry out digital control instruction and information service verification.

2.3 Providing auxiliary services of taxiing guidance by using the new generation airport wireless broadband surface safety data link communication standard of AeroMACS

The research, based on Aeronautical Mobile Airport Communication System (AeroMACS), conforms to an airport surface taxiing guidance technology that meets the needs for Advanced Surface Movement Guidance and Control System (A-SMGCS). The AeroMACS network covering the runway, the taxiway and the parking space at Beijing Capital International Airport has been developed from 2016 in order to realize one-way and real-time connection with the data on the flight changes, the taxiing path and the surface restriction area of A-SMGCS system used by CAAC North Regional Administration. In October 2017, working with the four airlines including Air China, China Eastern, Hainan Airlines and Shandong Airlines, the first phase of aircraft test verification was completed and received applaud from the controllers and pilots participating in the test. On December 4, 2018, in cooperation with Beijing Capital Airport, Air China and CAAC North Regional Administration, CAAC accomplished the IIIA approach landing verification test flight at Beijing Capital Airport and initiated AeroMACS taxiing guidance aided technology verification in the cockpit, with positive results. The technology will effectively improve the safety of taxiing of the inbound and outbound flights at airport under low visibility, to further improve the regularity of flights and the airport supporting capability of operation under low visibility.

2.4 The first airport surface operation application based on BDS and AeroMACS in China's Civil Aviation

In 2018, according to the plan of Office of Air Traffic Regulation and CAAC Central and Southern Regional Administrations, a pilot project on the surface taxiing guidance, which combing BDS with AeroMACS, was launched at Zhangjiajie Hehua Airport. Aviation Data Communication Company (ADCC) and Beihang University 712 Joint Laboratory started the building at Zhangjiajie Hehua Airport from May 2018 and completed the project planning and the development, implementation and commissioning of the whole system at Zhangjiajie Airport in December. The project, based on BDS enhanced positioning technology and through AeroMACS network and handheld portable mobile terminals, realized high-precision positioning of vehicles and aircraft on the surface at airport, with the error can be controlled below one meter. It is the first innovative project that used for the airport surface operation, with combining AeroMACS with BDS high-precision positioning in China and even in the world, which is conducive to the meticulous management and efficient operation of the apron.

2.5 Promotion of international standardization of Beidou in civil aviation

Under the guidance of CAAC and China Navigation Satellite System Administration Office, CAAC issued *Overall Implementation Program for the Promotion Project of Beidou International Standardization in Civil Aviation* in September 2014. As of April 2019, after rounds of conference discussions of ICAO NSP, BDS B1I/B1C/B2a has developed the draft paper of Part A of SARPs for ICAO Annex 10, and is now in the verification stage of NSP VWG. The next step is mainly to focus on completing the VWG verification of BDS signals in Part B of SARPs for ICAO Annex 10.

2.6 Application of Ground-Based Augmentation System (GBAS) for Beidou to the civil airplanes made by China

Under the guidance of CAAC and China Navigation Satellite System Administration Office, relying on the major projects of Beidou Navigation Satellite System and large airplanes, Beihang University took the lead in constructing a monitoring station of Beidou GBAS Type I on northern glide path station of Dongying Shengli Airport in Shandong Province, in conjunction with Tianjin 712 Telecommunication Broadcasting Co., Ltd. and Dongying Research Institute of Beihang University. On October 14, 2017, based on the platform of ARJ21-700, according to the relevant international standards and Chinese technical standards, the performance test on the precision approach of the Beidou GBAS Type I and function and performance test on airborne Beidou Multi-Mode Navigation Receiver (MMR) were

successfully finished. For the first time, the combination of four "domestications" has been achieved, namely the combination of domestic navigation satellite system, domestic navigation satellite GBAS and domestic airborne MMR to the platform of domestic large civil airplanes. As a result, a large number of experimental data were collected for future international standardization, application promotion and testing and certification of Beidou Navigation Satellite System.

2.7 Promoting application of ADS-B comprehensively

At the end of 2018, the Chinese civil aviation project of ADS-B came to completion officially, and a nationwide ADS-B surveillance network has taken shape. 308 ADS-B ground stations were built across China. Two first-level ADS-B data processing centers, eight second-level ADS-B data centers and 36 ADS-B data stations were built, which laid a solid foundation for the full-swing ADS-B based ATM operations.

At 16:00 on January 4, 2018 (UTC), control operation of ADS-B OUT was first trialed in Urumqi Control Zone, Xinjiang, which was the first area in China applying ADS-B technology comprehensively. The overall plan of the Chinese civil aviation is to have the initial operation capability of ADS-B OUT on July 1, 2019, and to implement towards the first phase target from October 10, 2019. With emphasis on the West and some border areas, priority will be given to the integrated implementation of ADS-B control in the high altitude airspace (higher than 8400 meters, inclusive) without radar coverage and approach control areas, and for the areas (higher than 8400 meters, inclusive) with radar coverage, radar control and ADS-B integrated operation will be carry out so as to enhance the overall operational capability of China's airspace.

2.8 Positive contribution to implementation and operation of DAPs data with model S in Asia Pacific region

With the gradual improvement of surveillance equipment made in China, nearly 70 sets of model S radar are deployed across China, construction of ADS-B surveillance network covering the whole country is completed and researches and explorations into model S and DAPs data by the Chinese civil aviation have been carried out in an in-depth way. As early as August 2013, the Chinese civil aviation began to use data on "selecting altitude" of the enhanced model S (EHS) data item in the automatic system of Chengdu area control center; presently researches on using other data of DAPs are on-going, for example, pressure altitude and wind speed. In order to make active contribution to the application of model S in the Asia Pacific region, the Chinese civil aviation, based on experience in applying the model S and achievements in the application of new technologies, accepted the tasks of development of *Guidance on Implementation and Operation of Airborne Down-Link Parameters of Model S (Mode S DAPs IGD)* of ICAO Asia Pacific region, together with Civil Aviation Department of Hong Kong, so as to guide the implementation and operation of Airborne Down-Link Parameters of Model S in Asia Pacific countries. Other Asia Pacific member states also took part in the task. *Mode S DAPs IGD* was reviewed and approved during ICAO APAC SURICG/4 and was officially published.

3. **ACTIONS BY ASSEMBLY**

3.1 The Assembly is invited to take note of the information contained in this paper. The Chinese civil aviation will continuously push forward the its ATM Modernization Strategy (CAAMS) and application of new ATM technology and contribute to realizing the unified visions outlined in *Global Air Navigation Plan (GANP)* with other countries.

— END —