



## **FOURTEENTH AIR NAVIGATION CONFERENCE**

**Montréal, Canada, 26 August to 6 September 2024**

### **Agenda Item 3: Air Navigation System Performance Improvement**

#### **3.3: Eighth Edition of the Global Air Navigation Plan (GANP)**

### **PROGRESS BY CHINA IN ASBU IMPLEMENTATION**

(Presented by China)

#### **EXECUTIVE SUMMARY**

This paper presents the efforts by China's civil aviation air traffic management system in implementation of the modernization strategy, including the efforts in areas such as the Aviation System Block Upgrade (ASBU). These efforts are aimed at making progress in the achievement by global air navigation system of its established vision through concrete actions.

## **1. INTRODUCTION**

1.1 In the year 2023, China's civil aviation industry handled 1.26 billion passengers, including 60.927 million on international routes and routes connecting Hong Kong SAR, Macao SAR, and the Taiwan Region of China, and 16.833 million tons of cargo and mail. The industry boasted a fleet of 4 270 registered public transport aircraft. There were a total of 259 civil transport airports in operation, with 25 each handling more than 10 million passenger trips in the year. Air traffic management (ATM) system supported the operation of 41.66 million flights, with air traffic control (ATC) services provided to 9.86 million movements. For six consecutive years, there were no incident or more serious occurrence attributable to ATC, with the rate of common occurrences being at 0.24 per cent per million flights.

1.2 Due to a robust recovery in global and domestic air travel demand, the continuous expansion of China's aircraft fleet, and the development goals set by China civil aviation to have 450 public transport airports and ATC services provided to 30 million movements by 2035, China will witness a rapid growth of its transport aviation industry. Meanwhile, the entry into the market of new airspace users and their exponential growth, along with the requirements for green development, pose significant challenges to the development of ATM system.

1.3 To address these challenges, the ATM Bureau of Civil Aviation Administration of China (CAAC) has developed Civil Aviation ATM Modernization Strategy tailored to China's development needs by referring to *Global Air Navigation Plan* (GANP, Doc 9750) and the Aviation System Block Upgrade

<sup>1</sup> Chinese and English versions provided by China.

(ASBU), and developed a five-year ASBU implementation plan, to ensure a smooth transition from the current system to the new system.

## 2. DISCUSSION

2.1 While systematically examining how well ASBU-related technologies and standards are implemented in China, this paper mainly focuses on four aspects: maturity level of research and development and application in China of new air navigation technologies, level of balanced development of fundamental technical elements, how well key technical elements are applied and promoted, and how synchronized China is in its ASBU implementation as compared with the ASBU benchmark timeline. This paper puts forth three comprehensive indicators, i.e. element maturity level, element achievement rate and application and promotion rate, to conduct a multi-dimensional evaluation of where CAAC's ATM sector is in terms of ASBU implementation.

2.2 Element maturity level, which refers to whether research for a new technology has been initiated or where the technology is in terms of implementation, indicates the extent to which the technology meets specific performance improvement targets. Taking into account the features shown in the application and promotion of new air navigation technologies, maturity can be categorized into four levels, which if ranked based on level of maturity are: existence of no plans, research and feasibility studies, experimentation and validation, and application and promotion. This indicator is also a basic indicator used in this survey on ASBU implementation. 109 elements were involved in the survey, 92 of which have reached the application level in China (including those at the maturity level of experimentation and validation), accounting for 84.4 per cent of the total, and 74 of which have reached the maturity level of application and promotion, representing 67.9 per cent (with mature technologies in the areas of operations, communications, navigation and surveillance (CNS), and information accounting for 45.9 per cent, 13.8 per cent, and 8.3 per cent respectively). This showcased that most of the ASBU related technologies in China are in the phase of being mature enough for implementation.

2.3 The element achievement rate, which refers to the proportion of the elements within a performance module that have reached the level of application and promotion, reflects the level of complete and balanced implementation of the underlying key technical elements required to achieve the improvement of such a performance. Of the 32 modules surveyed, 17 have an element achievement rate above 80 per cent, seven are in the 50 to 79 per cent range, and 8 are below 50 per cent. Notably, there are 15 modules that reached a 100 per cent achievement rate and have essentially achieved a comprehensive improvement in performance. Such modules include meteorological observation, forecast and early warning, climate and historical meteorological products and other meteorological information service capabilities; Airport collaborative decision-making (A-CDM) related information sharing, traffic flow management, and integration; performance-based navigation (PBN) approach, arrival and departure procedures, continuous descent operation (CDO)/ continuous climb operation (CCO) and other approach, arrival and departure operational capabilities; controller-pilot data link communications (CPDLC), automatic dependent surveillance – contract (ADS-C), satellite communication and other air traffic services (ATS) communication services capabilities.

2.4 The application and promotion rate, which refers to the application shown in a percentage of a mature technology by stakeholders within the ATM system, reflects the extent to which mature technologies or standards are applied and promoted within the ATM system. Among the 74 mature technologies that have reached the level of application and promotion, 31 have an application and promotion rate above 80 per cent, eight are between 50 per cent to 79 per cent, and 35 are below 50 per cent. Technologies such as aeronautical data and information services, ATS interfacility data communications (AIDC), meteorological observation/forecast/warning services, basic conflict detection and consistency monitoring, dynamic allocation of air traffic flow time slots, short-term conflict alert

functions, minimum safe altitude and other warning functions, automatic dependent surveillance – broadcast (ADS-B) and multilateration surveillance, and very high frequency (VHF) data link have been widely applied in China.

2.5 The Progress Report on the implementation of ASBU, developed by CAAC ATM Bureau based on the 7th Edition of the GANP, approved by the 41st Session of the ICAO Assembly in October 2022, outlines the progress made in recent years in the implementation of ASBU elements and summarizes the progress made in the implementation of the 80 ASBU Blocks 0 and 1 elements.

2.6 There are a total of 11 threads, 19 modules, and 65 elements in the operations category. China has applied and promoted 50 of these elements. In terms of technical maturity, 45.9 per cent of the elements are mature enough for application and promotion, which is the highest percentage among the three categories. In terms of element coverage, over 52.6 per cent of the modules have seen all of their elements being promoted and implemented, which is the highest among the three categories. In terms of the level of progress made, 76.9 per cent of the technical elements implemented have achieved the same progress as the international counterparts. However, there are areas such as satellite-based augmentation system (SBAS)/ground-based augmentation system (GBAS) Category I precision approach and departure management, performance-based minimum longitudinal/lateral separation, pre-validated and coordinated ATS routes, and comprehensive integration of airspace management and air traffic flow management that are still lagging behind the planned schedule. In terms of the application and promotion rate, 10 elements have achieved a 100 per cent application and promotion rate, such as the capabilities for basic conflict detection and instructions consistency monitoring. The air traffic flow management (ATFM) system is now able to allocate critical nodes time slot resources for flights, and the ground-based safety net has been fully equipped with functions such as short-term conflict alert and minimum safe altitude warning.

2.7 There are a total of four threads, eight modules, and 23 elements in the CNS category. China has applied and promoted 15 of these elements. In terms of technical maturity, most technologies are in the research and experimentation phase, with 13.8 per cent of the technologies having reached the application and promotion phase. In terms of element coverage, 37.5 per cent of the modules have seen all of their elements being promoted and implemented. In terms of level of progress made, 65.2 per cent of the technical elements implemented have achieved the same progress as the international counterparts, with the application of satellite-based ADS-B, SBAS, and GBAS relatively lagging behind. In terms of the application and promotion rate, eight elements have achieved a 100 per cent promotion rate, such as ADS-B and multilateration in surveillance systems, VHF data links in communication infrastructure, and minimum operational network (MON) in navigation systems.

2.8 There are a total of four threads, five modules, and 21 elements in the information category. China has applied and promoted none of these elements. In terms of technical maturity, 8.3 per cent of the technologies have reached the application and promotion phase. In terms of element coverage, two modules have seen all of their elements being promoted and implemented. In terms of level of progress made, 42.9 per cent of the technical elements implemented have achieved the same progress as the international counterparts. However, there are areas such as the provision of database services for digital terrain, obstacles, airport surveying, and instrument flight procedures, and the application of system wide information management (SWIM) information that are relatively lagging behind. In terms of the application and promotion rate, six elements have achieved a 100 per cent promotion rate, such as reliable aeronautical data and information services in digital aeronautical information management, AIDC in flight and flow – information for a collaborative environment (FF-ICE), and meteorological observations, forecast, and warning product services in meteorological information.

### 3. **CONCLUSION**

3.1 In the foreseeable future, the demand in the Chinese aviation market remains robust. We will accelerate the implementation of Civil Aviation ATM Modernization Strategy and ASBU to ensure a smooth transition from the existing system to the new air navigation system.

3.2 The Conference is invited to note the information contained in this paper.

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