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ASSEMBLY — 41ST SESSION

Agenda Item 33: Other issues to be considered by the Technical Commission

UPDATES OF TRAJECTORY-BASED OPERATIONS (TBO) ACTIVITIES IN CHINA

(Presented by China)

EXECUTIVE SUMMARY

This paper presents the progress by China in the development of the concept of the Trajectory Based Operations (TBO), technical validation and flight test in recent years and the next plan.

I4D test, TBO concept, flight test, FF-ICE/1 validation.

<i>Strategic Objectives:</i>	This working paper relates to the Air Navigation Capacity and Efficiency Strategic Objective.
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<i>Financial implications:</i>	None.
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<i>References:</i>	Doc 9854, <i>Global Air Traffic Management Operational Concept</i> Doc 9750, <i>Global Air Navigation Plan</i>
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¹ English and Chinese versions provided by China.

1. INTRODUCTION

1.1 The plan on Aviation System Block Upgrade (ASBU) in the 6th edition of the Global Air Navigation Plan (GANP) published by ICAO specifies Trajectory Based Operations (TBO) as one of the ultimate goals in the ASBU and it will be put into practice after 2031.

1.2 China attaches great importance to the development and application of the new concept of TBO and new technologies relating to it. In March 2020, the Air Traffic Management Bureau of Civil Aviation Administration of China (ATMB of CAAC) formulated the Roadmap for the Implementation of the China Civil Aviation ATM Modernization Strategy (CAAMS), which sets the application of TBO as one of the three major goals of the ATM modernization in the next 15 years and specifies 16 key tasks regarding the application of TBO and approaches on the implementation of each task.

1.3 The ATMB of CAAC has organized universities, research institutes and enterprises related to the field of ATM to establish a TBO task force to actively promote the research, development, demonstration and validation on TBO concept and related technologies.

2. MAIN PROGRESS IN THE PAST THREE YEARS

2.1 In March 2019, the first flight test of the initial four-dimensional (I4D) trajectory operation was carried out by ATMB, which fully validated the I4D operational concept and capabilities of Controller–Pilot Data Link Communications (CPDLC), Extended Projected Profile (EPP) sharing and Required time of Arrival (RTA), achieving good results and laying a solid foundation for TBO concept and technology validation and demonstration in China.

2.2 The realization and application of TBO is a complex and systemic project with wide coverage, long implementation period and high-level technical integration. It involves not only the upgrading and renovation of flight planning, traffic flow management system, ATC automation system, data link system and airborne avionics system and equipment but also the upgrading, development, validation and application of a series of technical standards such as ATC operation process, traffic flow management strategy and methods, flight operation standards, and collaborative information environment. In order to unify the understanding of the operational concept of TBO and clarify the development vision of ATM operation, ATMB of CAAC developed the TBO Operational Concept in 2020, with reference to the TBO operational concept developed by the Air Traffic Management Requirements and Performance Panel (ATMRPP) of the Air Navigation Commission (ANC) of ICAO, which answers the questions of what is TBO, what will be the future TBO operation and its management process in China, and what capabilities are required to be enhanced.

2.3 Flight and Flow Information for a Collaborative Environment (FF-ICE) is an important technical enabler for TBO to realize information interaction, collaborative decision making and efficient operation. The ICAO Doc 9965 of the Manual on FF-ICE describes in detail the concept of FF-ICE in the future ATM system and the ATMRPP is studying and developing the Guideline on FF-ICE. Since 2018, ATMB of CAAC has organized research on the standards and specifications for pre-departure flight and flow information for a collaborative environment (FF-ICE/1) collaborative flight planning services, conducted several tabletop exercises and developed a demonstration and validation platform for collaborative flight planning services based on FIXM to carry out validation of the effectiveness and adaptability of the application in China's civil aviation industry. Based on the above tabletop exercises and testvalidation, we have proposed revisions and recommendations to the Guideline on Implementation

of FF-ICE developed by ATMRPP. Meanwhile, ATMB of CAAC is also working on the research on and development of the implementation roadmap for FF-ICE/1 of China civil aviation ATM.

2.4 In order to continuously carry out test validation of new TBO concept and technologies, ATMB of CAAC, based on the single-aircraft I4D test flight in 2019, launched a dual-aircraft TBO test flight project in 2021. The project is an expansion of the single-aircraft I4D test flight project, which is embodied specifically in the following three aspects: (1) the expansion of operational concept, namely, "air-ground collaboration" is expanded to "air-ground and ground-ground collaboration"; the single control application of ATM business is expanded to a combination of collaboration between ATC and traffic flow management and collaboration between ATM and airlines; (2) the expansion of test scenarios, that is, ground-air flight control test scenarios for one single aircraft is expanded to the collaborative and interactive scenarios between the two aircraft; (3) the expansion of focus of test validation. The focus on development and test of core technology system is expanded to the focus on the development and validation of technical standards and operational specifications. By building a air- ground data link communication network and integrating the ground ATM systems such as initial TBO ground control automation system, air traffic flow management system and approach management system of AMAN, this TBO dual-aircraft test flight validation uses two commercial aircraft with FANS 3/Cto test and verify the TBO operational concept on the route from Urumqi Diwopu International Airport to Beijing Daxing International Airport, with the focus on verifying the effect of airborne EPP data on the ground ATM system's trajectory prediction, conflict management and flow management, and the airlines' operational control capabilities. The test flight is planned to be conducted in the second half of 2022....

3. CONCLUSION

3.1 The Assembly is invited to take note of the information provided in this paper. China will continue to promote the development and application of new TBO concept and technologies and contribute to achieving a unified vision of the global air navigation plan together with other countries around the world.

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