



THIRTEENTH AIR NAVIGATION CONFERENCE

Montréal, Canada, 9 to 19 October 2018

COMMITTEE A

Agenda Item 3: Enhancing the Global Air Navigation System

3.2: Flight and flow information for a collaborative environment (FF-ICE) and trajectory-based operations (TBO)

PRELIMINARY TBO VALIDATION ACTIVITY IN CHINA

(Presented by China)

EXECUTIVE SUMMARY

This paper presents the on-going efforts for trajectory-based operations (TBO) validation activity in China, and the flight trial of initial 4D trajectory operation.

Action: The conference is invited to consider the suggestions proposed in this paper.

1. INTRODUCTION

1.1 Trajectory-based operations (TBO) is one of the most critical concepts in ICAO's latest *Global Air Navigation Plan* (GANP, Doc 9750). TBO is also the main focus of validations conducted in regional programmes including Single European Sky ATM Research (SESAR, European Union), Next Generation Air Transportation System (NextGen, United States), Collaborative Actions for Renovation of Air Traffic Systems (CARATS, Japan) and etc. In the aviation system block upgrades (ASBU), initial TBO (iTBO) is suggested to be implemented in Block 1, while full TBO is suggested to take place in Block 3.

1.2 In order to meet the growing air traffic demand in China, the Civil Aviation Administration of China's Air Traffic Management Bureau (CAAC ATMB) has paid great attention to introduce new concepts and emerging technologies to improve air traffic operational safety and efficiency. CAAC ATMB has proposed China's Civil Aviation ATM Modernization Strategy (CAAMS), in which TBO is considered as one of the key operational concept. In line with the efforts of Air Traffic Management Requirements and Performance Panel (ATMRPP) in ICAO, ATMB established the TBO Task Force (TBO/TF) in October 2017 in China. The members of TBO/TF come from regional air traffic

¹ Chinese and English versions provided by China.

management (ATM) service providers (ASPs), airspace users (AUs), airport operators (AOs) and other ATM stakeholders (i.e., supporting corporations and universities). The tasks of TBO/TF include but not limited to:

- a) to better understand the work programme and tasks of ATMRPP, and carry forward the ATMRPP's outputs to domestic ATM community;
- b) to support the materialization of CAAMS with global concepts and technical enablers;
- c) to initiate and organize validation activities for TBO application in China; and
- d) to provide national implementation guidelines and/or roadmaps of the new concepts and emerging technologies, such as flight and flow information for a collaborative environment (FF-ICE), system-wide information management (SWIM), and etc.

1.3 In order to validate the expected performance gains of iTBO concept and investigate the technical & operational readiness of TBO in ASBU Block 1 in China, CAAC, together with Ministry of Science and Technology (MOST) of China, have launched the project of iTBO flight trial in 2015. The flight trial is expected to take place in March 2019. TBO/TF was committed to organize the coming flight trial and validations.

2. DISCUSSION

2.1 The iTBO concept to be validated is similar to the one has been validated and demonstrated by SESAR in 2012 and 2014, respectively. There two key elements in the concept. One is the extended projected profile (EPP) in automatic dependent surveillance – contract (ADS-C), which enables the airborne and ground trajectory synchronization in the flight, and the other one is controlled time of arrival (CTA) through controller-pilot data link communications (CPDLC), which enables precise and achievable time of arrival at a given waypoint. The main goal of the iTBO flight trial project is to validate the above two concept elements.

2.2 The scope of the project is depicted as Figure 1. In the project, there are 3 work packages, including the ground platform, airborne platform and the A/G data communication. In each package, there are different kinds of crucial prototypes as technical enablers should be implemented.

2.2.1 For the ground package, for ASP, iTBO compatible ATC automation system, A/G datalink front-end, and flight data processing system are provided to enable the ground iTBO capabilities. For airline, the flight tracking system is upgraded to provide the ability of 4D trajectory exchange with ASPs.

2.2.2 For the airborne package, several features should be available, including the improved accuracy of CTA control in iTBO flight management system (FMS), iTBO compatible communication unit and datalink display unit.

2.2.3 For the A/G data communication package, the aeronautical telecommunication network (ATN) enabled ADS-C and CPDLC have to be achieved.

2.3 There are 3 kinds of validations planned to be conducted, including one ground validation and 2 flight trials, namely ground real time simulation, and one flight trial with inspection aircraft and the other one with A320 aircraft. The performance goal of the flight trials is the accuracy of CTA control

should be up to plus or minus 15s in the terminal area, and the expectation to increased flight efficiency, predictability as well as the A/G digitalization and automation.

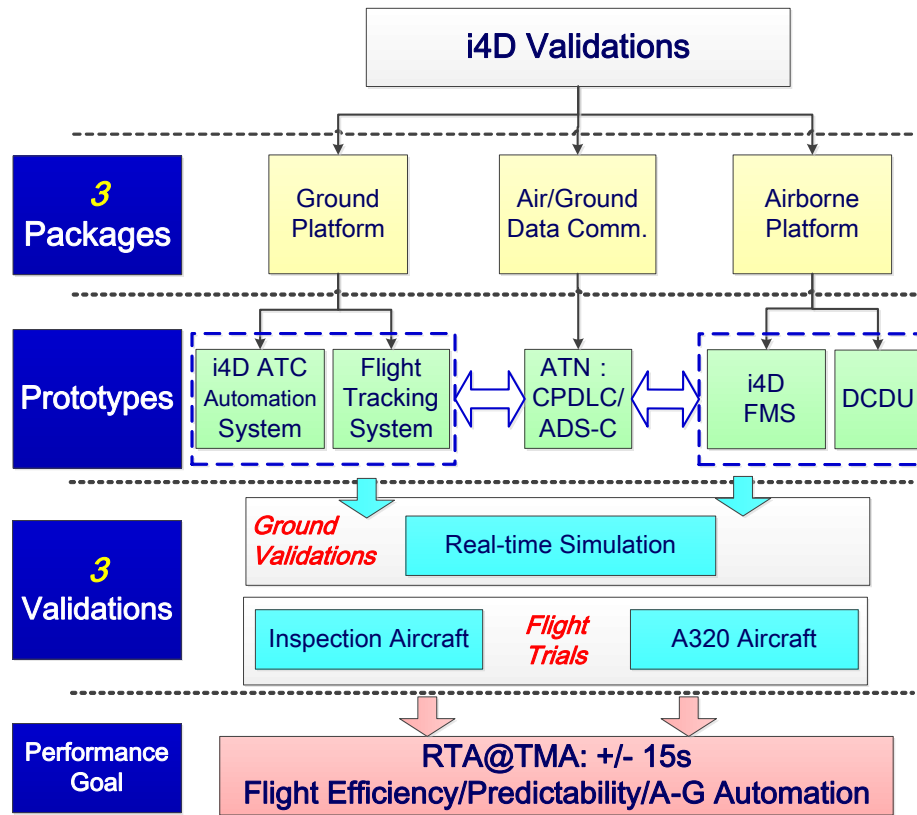


Figure 1. The scope of iTBO flight trial project

2.4 The project is led by Aviation Data Communication Corporation (ADCC), which is an ATMB corporation and the A/G datalink service provider in China. The domestic partners of the project include Beihang University, China Southern Airline, Flight Inspection Center of CAAC, Technical Center of ATMB, Meteorological Center of ATMB, and etc. With respect to A320 flight trial, the project has special cooperation with Airbus. For the sake of ATN deployment in China, ADCC also has cooperation with ARINC, Rockwell Collins, and etc.

2.5 Up to now, all the iTBO prototypes have been developed and tested and the ground validations have been done. The real flight trial with A320 is expected next March. The aircraft ordered by China Southern Airline and delivered at Airbus Tianjin Assembly Line will be used for test flight. The planned test route is from Tianjin Binhai International Airport (ZBTJ) to Guangzhou Baiyun International Airport (ZGGG). The iTBO ground ATC automation system and ATN capabilities will be deployed along the route. TBO/TF will be in charge of the coming flight trial and validations. The validation results will be provided to ICAO ATMRPP by TBO/TF as a following action.

3. **CONCLUSION**

3.1 The Conference is invited to:

- a) note the information contained in this paper; and/or discuss any relevant matter as appropriate;
- b) consider to suggest ICAO to further clarify the global iTBO concept and to define the corresponding required capabilities of ATC automation system, ATFM system, A/G datalink and airborne CNS avionics;
- c) consider to suggest the states or regions to investigate the existing capabilities of airborne and ground systems, and to conduct GAP analysis;
- d) consider to suggest ANSPs to provide policy guidance and operational supports to encourage the airlines to equip the aircraft with iTBO capable avionics. The aircraft with iTBO capability should be provided with high level air traffic service.

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