International Civil Aviation Organization
CAR/SAM Regional Planning and Implementation Group (GREPECAS)
Eighteenth Meeting of the CAR/SAM Regional Planning and Implementation Group (GREPECAS/18)
Punta Cana, Dominican Republic, 9 to 14 April 2018

Agenda Item 3: Air navigation activities at global, inter and intra-regional level

3.2 Follow-up on the implementation of global, inter and intra-regional activities

SUPPORT FOR A GLOBAL TBO CONCEPT

(Presented by the United States of America)

SUMMARY

Trajectory Based Operations (TBO) has been a cornerstone of NextGen and involves pilots, controllers, air traffic managers, airlines and other operators exchanging four-dimensional trajectories (4D) for flight planning, strategic operations management, aircraft sequencing, spacing and separation.

This paper seeks to show how the FAA TBO development and implementation efforts are tied to the *Global Air Traffic Management (ATM) Operational Concept* (GATMOC, Doc 9854) and to seek GREPECAS support of the Global TBO concept in regional air traffic modernization planning, as defined in the GATMOC.

Strategic Objectives:

B: ***Air Navigation Capacity and Efficiency****—Increase the capacity and improve the efficiency of the global aviation system*

1. INTRODUCTION

1.1 The FAA is transitioning the National Airspace System (NAS) from the legacy of a largely tactical surveillance and separation structure — based on where an aircraft is — to a more strategic NextGen time-based management system through TBO.

1.2 TBO is defined by ICAO as a concept enabling globally consistent performance-based 4D trajectory management by sharing and maintaining trajectory information which will enhance planning and execution of efficient flights, reducing potential conflicts and resolving upcoming network and system demand/capacity imbalances early.

1.3 With TBO, an aircraft will arrive at a desired waypoint within seconds of an agreed upon flight plan time, boosting NAS capacity while decreasing congestion and fuel burn. It will also reduce the potential for human errors related to voice communications.

1.4 TBO introduces a high degree of predictability into the NAS by shifting the FAA from supporting individual flight paths or trajectories to gate-to-gate, NAS-wide trajectory operations that extend benefits to all phases of flight. TBO provides separation support, sequencing, merging and spacing of flights based on a combination of their current and future positions. It uses 4D trajectory to strategically manage and tactically control surface and airborne operations.

1.5 This paper seeks to show how FAA TBO development and implementation efforts are tied to the GATMOC and to seek GREPECAS support of the Global TBO concept in regional air traffic modernization planning, as defined in the GATMOC.

2. DISCUSSION

2.1 The FAA's efforts to transition to TBO are in concert with the TBO concept contained in the updated GATMOC. The GATMOC identifies some significant changes as the ATM system migrates towards the concept vision. One such change, TBO is described as follows (from §1.9.2 of ICAO Doc. 9854):

> *"Air traffic management (ATM) considers the trajectory of a manned or unmanned vehicle during all phases of flight and manages the interaction of that trajectory with other trajectories or hazards to achieve the optimum system outcome, with minimal deviation from the user-requested flight trajectory, whenever possible."*

2.2 Every component of NextGen supports the deployment of time-based management across the NAS, and we are building on initial improvements that are already in place to meet major Air Traffic Management objectives by 2025.

2.3 TBO is fundamental to realizing the GATMOC and affects many processes, procedures and information flows impacting a variety of ICAO provisions. Moreover, TBO is the subject of several large-scale national and regional development and implementation programs.

2.4 TBO represents a shift from present operations towards the use of a shared trajectory, collaboratively-developed as the basis for decision-making across the ATM System Participants. Thus, TBO provides an opportunity to shift operations towards greater predictability with flight-impacting decisions being coordinated across concept components. The main differences between today's operations and TBO are:

- Sharing of trajectory information eventually leading to a common view as the Agreed Trajectory
- Managing trajectory information using Collaborative Decision Making (CDM)
- The Agreed Trajectory, is used as reference for the flight by providing a common intent to be achieved during execution of the flight

2.5 As stated above, TBO involves the development of an Agreed Trajectory, coordinated across participants that extend through all phases of flight. Under TBO, principles are developed to ensure that the Agreed Trajectory and associated constraints are known to relevant participants. For example, ATC instructions should minimize the need for open-ended vectors, and their impact should be reflected as an update to the Agreed Trajectory in a timely manner. While TBO shares an Agreed Trajectory,

accuracy of and control to this trajectory is tailored to the performance needs of the circumstances. In other words, not every aspect of a flight needs to be predetermined and captured precisely in the Agreed Trajectory at the time of departure.

2.3 Covering ATM processes starting at the point of individual flight planning through flight execution to post flight activities, TBO will act as the glue between ATM components. TBO works during tactical planning and flight operations by synchronizing the trajectory between different actors and ensuring consistency between the trajectory and/or generic constraints that originates from the various ATM components and regions that shape the trajectory.

2.6 For TBO to succeed and to deliver its anticipated benefits, it is of paramount importance that: a) all the processes and procedures that are part of TBO effectively interact; and b) TBO is developed and deployed in a globally harmonised manner. This starts with a common understanding of what TBO is and the TBO concept document is aiming to achieve this.

2.7 GATMOC is also intended to align global developments, interpretations and nomenclature, and remove ambiguities and inconsistencies in the use of elements of TBO, particularly when used in the development of provisions and strategic plans.

3. ACTION BY THE MEETING

The Meeting is invited to:

a. Note that the FAA TBO development and implementation efforts are tied to the *Global Air Traffic Management (ATM) Operational Concept* (GATMOC, Doc 9854);

b. In recognizing that the GATMOC is intended to align global developments, interpretations and nomenclature, and remove ambiguities and inconsistencies in the use of elements of TBO, particularly when used in the development of provisions and strategic plans, agree as a region to support the Global TBO concept as defined in the GATMOC in regional air traffic management modernization planning.

— END —