

Multi-Regional Trajectory Based Operations (MR TBO) Demonstrations – Selected Lessons Learned

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Foundational to the future global vision of an integrated, harmonized and globally interoperable Air Traffic Management system is a flight's trajectory as the basis for achieving an "optimum system outcome". The Multi-Regional Trajectory Based Operations demonstrations explore real-world operational, informational, and system implications ahead of plans for Trajectory Based Operations implementation.

Key Words: MR TBO, ATM, Flight Trajectory

1. Introduction

The global vision for the future Air Traffic Management (ATM) system is described in the International Civil Aviation Organization's (ICAO's) *Global Air Traffic Management Operational Concept*.¹⁾ The concept depicts the flight's trajectory as a core element of an information sharing environment supporting Collaborative Decision Making (CDM).

Since the concept's publication, significant advances in avionics, communications, and technology in general (including commercial products such as tablets), have precipitated specific efforts to make the vision real.

2. The Demonstrations

Multi-Regional Trajectory Based Operations (MR TBO) is a series of large-scale demonstrations across multiple Flight Information Regions (FIRs) incorporating system-to-system interactions and information sharing, simulated and live flight operations, and both ground and airborne platforms.

2.1 Participants

Participating regions are North America and Asia-Pacific with individual participants including the Federal Aviation Administration (FAA), Nav Canada, Aeronautical Radio of Thailand (AEROTHAI), Civil Aviation Authority of Singapore (CAAS), and Japan Civil Aviation Bureau (JCAB), as well as industry members including the Boeing Company and General Civil Aviation Authority (GCAA-UAE) as an observer.

2.2 Scenarios, Use Cases, and Focus Areas

A list of capabilities, interactions, and information needs were decomposed from a TBO operating concept into specific, detailed scenarios and use cases reflecting operations transiting multiple FIRs and regions. Across the scenarios and use cases, the selected areas of focus included validation of ICAO's Flight and Flow – Information for a Collaborative Environment (FF-ICE)

draft implementation guidance, global exchange models, application of the International Aviation Trust Framework (IATF), and analysis of Air Traffic Flow Management (ATFM) procedures and information needs.

3. Overarching Lessons Learned

MR TBO demonstrations produced a variety of insights, outcomes, and lessons learned. These include:

- TBO required sharing, maintaining, and using trajectories as a common reference is possible – even among multiple FIRs and authorized stakeholders.
- The global data exchange standards are foundational to TBO success.
- The varying security needs across authorized stakeholders can be met flexibly, consistent with IATF principles.
- TBO's reliance on the sharing of more information across relevant, authorized stakeholders is supported by the continued maturation and evolution of the Connected Aircraft.

4. Conclusion

Fulfilling the operational vision for the future ATM system is crucially dependent on a robust, advanced information sharing environment for authorized stakeholders. This environment requires flexible global standards and agile communication capabilities to support operational innovations, agility, and performance improvements.

The MR TBO demonstrations, through large-scale, multi-FIR simulations as well as live flight, has begun to identify information, procedural, and technological needs in preparation for the implementation of TBO.

References

- 1) ICAO: *Global Air Traffic Management Operational Concept*, Doc. 9854, 2005.