International Civil Aviation Organization

The Fifth Meeting of System Wide Information Management Task Force (SWIM TF/5)

Video Tele-conference, 9 – 11 August 2021.

Agenda Item 9: State, Regional and Global SWIM Updates

MULTI-REGIONAL TBO DEMONSTRATION

(Presented by Japan, Singapore, Thailand, and USA)

SUMMARY

This paper presents an overview of Multi-Regional TBO Demonstration, a collaborative project undertaken by Japan, Singapore, Thailand, USA, and Canada to validate TBO concept as well as to showcase the TBO operational values and technical capabilities required to support TBO.

1. INTRODUCTION

1.1 ICAO Doc 9854 Global Air Traffic Management Operational Concept (GATMOC) presents the vision to achieve an interoperable global ATM system, for all users during all phases of flight, that meets agreed levels of safety, provides for optimum economic operations, is environmentally sustainable, and meets national security requirements (§ 1.1.1). It is stated in §1.9.1 that key to the philosophy adopted within this GATMOC is the global information utilization, management, and interchange within the ATM system to support a holistic, cooperative, and collaborative decision making where the diverging expectations and interests of all members of the ATM community are balanced. This global information management and interchange foundation was later developed as System-Wide Information Management (SWIM) concept.

1.2 §1.9.2 of ICAO Doc 9854 further describes that the envisioned ATM system considers the trajectory of a manned or unmanned vehicle during all phases of flights 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. This premise fundamentally explains Trajectory Based Operation (TBO).

1.3 To validate and demonstrate the TBO concept aforementioned, Japan (Japan Civil Aviation Bureau (JCAB)), Singapore (Civil Aviation Authority of Singapore (CAAS)), Thailand (Aeronautical Radio of Thailand Ltd. (AEROTHAI)), USA (Federal Aviation Administration (FAA)) and Canada (NAV CANADA) have put together the collaborative effort to conduct Multi-Regional TBO Demonstration (MR TBO Demo). The main objectives of this demonstration also include (*i*) to explore the impacts of TBO within the context of modernization initiatives and (*ii*) to support the development of information exchange standards and related ICAO materials.

2. DISCUSSION

2.1 MR TBO Demo is divided into two phases:

- Phase 1 (May 2020 – July 2021)
  - Planning and developing activities for TBO demonstrations;
  - Establishing (baseline) technical capabilities;

  - Establishing industry and international partnership;
- Phase 2 (July 2021 – 2022/2023)
  - Execution of MR TBO Demo.

2.2 Building on the Mini Global Demonstrations, the SWIM in ASEAN Demonstration as well as various concept validation activities, the operational scenarios which align with the TBO concept have been developed with the aim to not only validate the TBO concept but also highlight the TBO operational values, including:

- Enhanced predictability – A common plan (strategy) shared among stakeholders enhances predictability and improves operations by mitigating confusion with stakeholders operating of the same trajectory;
- Alignment of strategic plan and tactical actions – Sharing, management, and use of the trajectory as a common framework help create alignment of strategic plan and tactical actions;
- Increased reliable flexibility – Sharing, management, and use of the trajectory as a common framework among stakeholders provide flexibility in accommodating trajectory changes while maintaining business objectives;
- Improved strategic planning – Improved planning (incorporating out-of-zone traffic) helps mitigate deterministic delay factors, improve network performance and more equitably delay distribution; and
- Decrease uncertainty – Improved trajectory accuracy decreases uncertainty in the system.

2.3 Due to the COVID-19 pandemic, key project artifacts were developed through a series of virtual events, i.e. (*i*) guided discussions – activities focusing on operational topics such as operational use cases and scenarios development, defining and refining of the TBO concept elements, and (*ii*) technical interchange meetings – activities focusing on technical topics, especially to address the technical issues and obtain concurrences among key project partners on technical approach for demonstrations.

2.4 To provide an opportunity for the project partners to exercise their initial TBO capabilities and to assess the risk for Phase 2, technical exercise was conducted virtually on 23-24 June 2021, demonstrating several vignettes, snippets derived from the gate-to-gate operational scenarios for Phase 2. Technical capabilities tested during this event included:

- Flight and Flow Information for a Collaborative Environment (FF-ICE) services, using FIXM (Flight Information Exchange Model) version 4.2 FF-ICE messages;
- Boundary coordination, using FIXM version 4.2 AIDC (ATS Inter-facility Data Communication) messages.
- Aeronautical information exchange, using AIXM (Aeronautical Information Exchange Model) version 5.1;
- Meteorological information exchange, using IWXXM (ICAO Meteorological Information Exchange Model) version 3.0;
- Air Traffic Flow Management (ATFM) information exchange, using FLXM (Flow Information Exchange Model) version 1.0.2;
- Clearance delivery over air-ground SWIM; and
- Message integrity checking through security services, using ICAO International Aviation Trust Framework (IATF) certificates.

Some of the technical capabilities listed above were also shown using the RJAA-VTBS pre-flight planning vignette at the ICAO Asia/Pacific SWIM Workshop 2021 on 7 July 2021.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this paper;

b) encourage States/organizations to consider utilizing demonstration(s) to create better understanding on new operational concepts and technical capabilities required to support such concepts;

c) propose suggestions to enhance collaboration across aviation stakeholders and synergize development efforts where appropriate, and

d) discuss any relevant matter as appropriate.

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