International Civil Aviation Organization

SEVENTH MEETING OF THE ASIA/PACIFIC AIR TRAFFIC MANAGEMENT AUTOMATION SYSTEM TASK FORCE (ATMAS TF/7)

Bangkok, Thailand 2-4 June 2026

Agenda Item 5: ATMAS integration into SWIM

PROGRESS OF TBO PATHFINDER DEVELOPMENT IN THE ASIA/PACIFIC REGION

(Presented by New Zealand on behalf of Hong Kong China, Indonesia, Japan, Republic of Korea, Singapore, Thailand, and IATA)

SUMMARY

This paper presents progress by the Asia-Pacific (APAC) Trajectory-Based Operations (TBO) Pathfinder Project (Pathfinder). Pathfinder was initiated under the APAC Air Navigation Service Provider (ANSP) Committee (AAC) to develop pathways for implementing the ICAO Global TBO concept in the region.

While the past activities have been more ANSP-focused, with the focus for 2026 being FF-ICE/Release 2 (FF-ICE/R2), it is timely to involve Airspace Users (AUs) as key stakeholders to progress TBO towards deployment.

1. INTRODUCTION

1.1 Pathfinder involves the ANSPs of China, Hong Kong China, Indonesia, Japan, New Zealand, Philippines, Republic of Korea, Singapore, Thailand, United States of America and Viet Nam, along with CANSO and IATA, who have agreed to define, develop and demonstrate the concept of operations and requirements for TBO in the APAC region.

1.2 TBO represents a paradigm shift in air traffic management by proactively and collaboratively managing aircraft trajectories across four dimensions: latitude, longitude, altitude, and time. The degree of change needed to implement full TBO-based operations globally is significant, and ICAO is currently focused on global implementation harmonisation. Meanwhile, States and regions could focus on expediting the planning and implementation of the technical building blocks, like System-Wide Implementation Management (SWIM) and Flight and Flow Information for a Collaborative Environment (FF-ICE) to prepare for TBO.

1.3 Through the participation of ANSPs of States/Administrations and International Organisations, Pathfinder aims to (i) Raise TBO awareness in the region; (ii) Provide greater clarity on TBO requirements through workshops / table-top exercises / demonstrations; and (iii) Analyse benefits and develop a TBO roadmap for APAC.

1.4 Throughout 2025, Pathfinder efforts were focused primarily on FF-ICE/R1 application. A summative report of the efforts to support the implementation planning efforts among ANSPs was presented to ATM/SG/13 and summarised as follows:

a) Completion of the first edition of the TBO communication material in July 2025, followed by circulation of the copy to the Pathfinder members. The material will be uploaded on the AAC website for wider accessibility;

b) Completion of stakeholder engagement with Viet Nam in July 2025; Key stakeholders including Viet Nam's ANSP, airlines, airport and regulators participated in this engagement session and all gained appreciation on the TBO concept, its key building blocks and the key benefits from deploying TBO;

c) Completion of the FF-ICE/Release 1 (R1) laboratory demonstration (lab demo) in July 2025 where Pathfinder ANSPs participated actively to build up their technical capability to ready themselves for the deployment of SWIM and FF-ICE/R1 services; and

d) Completion of the APAC TBO roadmap where ATM/SG/13 agreed as Conclusion ATM/SG/13-6 to incorporate the roadmap into the 2026 revision of Asia/Pacific Seamless ANS Plan.

1.5 For 2026, with the focus moving to FF-ICE/Release 2 (FF-ICE/R2), Pathfinder will continue its trajectory to reinforce the long-term vision of full TBO implementation which will require active involvement of the Airspace Users (AUs

2. DISCUSSION

Learning and Advocacy

2.1 Text In 2026, Pathfinder is working to update the TBO communication material with 2 elements:

i) TBO roadmap - to provide a pathway towards deployment in APAC, and
ii) perspectives from AUs in APAC

2.2 The next stakeholder engagement session will be conducted in the Philippines which will involve their key stakeholders in June 2026.

2.3 To gain buy-in from AUs, IATA will organise regional webinars in 3Q 2026, to raise awareness of TBO and FF-ICE for AUs. These webinars will primarily target operational and technical subject matter experts, with additional separate high-level webinars to be delivered specifically for executive levels in airlines.

Capability Built-up

2.4 In preparation for the FF-ICE/R2 lab demo, Pathfinder facilitated a series of technical interchange meetings (TIM), table-top exercises (TTX) and online preparatory meetings. Thailand hosted the 1st TIM in January 2026 where the technical criteria for FF-ICE/R2 lab demo participation were agreed upon and Pathfinder members determined their level of involvement in the lab demo. Japan hosted the 1st FF-ICE/R2 TTX in February 2026 in conjunction of the Pathfinder Project Meeting #3 where participants were able to deep dive into discussion topics such as mixed mode operations, technical architecture and FF-ICE/R2 processes through the pre-defined operational scenarios. The

Philippines will host the 2nd FF-ICE/R2 TTX, to further refine the FF-ICE/R2 processes using the pre-defined operational scenarios and clarify issues raised in the earlier TTX.

2.5 Pathfinder is working towards the conduct of the FF-ICE/R2 lab demo in March 2027, to be hosted by Indonesia. Three operational scenarios are currently being worked on with the intention to showcase:

i) Key differences between a full FF-ICE/R2 and today's tactical 'in flight' planning processes in revising airborne trajectory, in response to weather constraints;
ii) Coordination of airborne trajectory revisions and management of delays across multi-leg operations due to volcanic eruption and ATFM constraints; and
iii) Strategic in-flight trajectory negotiation to facilitate early compliance with ATFM measures between two flights departing from different aerodromes but operating on the same route, within the same timeframe

2.6 Importantly for this phase of TBO on FF-ICE/R2, TIMs and TTXs increasingly included the active participation of AUs, specifically, All Nippon Airways, Bangkok Airways, Cathay Pacific, Garuda Indonesia, Japan Airlines, Singapore Airlines, SF Airlines and Thai Airways. These AUs enhanced the realism of the operational scenarios. Initial meetings have taken place to support two of the airlines to participate as FF-ICE enabled AUs. With the support of IATA, Pathfinder will continue to support the capability built-up of the AUs through their participation in the subsequent planned activities.

Benefit Analysis

2.7 In 2026, Pathfinder will develop 2 trajectory analysis methodologies to determine potential benefits of TBO for city pairs, and ANSP centric analysis. Upon completion, both methodologies and relevant results will be documented within the TBO benefits report.

Conclusion

2.8 The work of Pathfinder allows members and participants to gain better understanding of both the global and regional developments on SWIM and FF-ICE. This is an essential step given impending regional deployment timelines of SWIM (by 2030) and FF-ICE/1 services (by 2032).

2.9 For a meaningful outcome of the FF-ICE/R2 lab demo, stakeholder involvement is crucial, especially AUs. FF-ICE/R2 will extend trajectory negotiation beyond current flight dispatch (as in FF-ICE/R1application) and tactical airborne change (as in pilots' direct communications with ATC) to negotiation including pilots, flight operations units and ATM systems, altering the roles and responsibilities of all.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the progress and updates of the APAC TBO Pathfinder project;

b) support their ANSPs and national airlines to:

i. raise awareness on operational benefits of TBO in the region;

ii. work towards deployment of SWIM by 2030 and FF-ICE/R1 services by 2032;

iii. participate in the regional webinar(s) organised by IATA; and

c) discuss any relevant matter as appropriate

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