

**61ST CONFERENCE OF
DIRECTORS GENERAL OF CIVIL AVIATION
ASIA AND PACIFIC REGION**

*Kuala Lumpur, Malaysia
7 – 11 September 2026*

AGENDA ITEM 4: AIR NAVIGATION

**UNLOCKING THE FULL VALUE OF ATM MODERNIZATION
THROUGH TRAJECTORY-BASED OPERATIONS (TBO)**

(Presented by the Republic of Korea)

SUMMARY

The Asia and Pacific (APAC) region is projected to experience the world's strongest growth in air traffic over the coming decades. While States continue advancing Air Navigation Services (ANS) modernization under ICAO's Global Air Navigation Plan (GANP) and the Aviation System Block Upgrade (ASBU) framework, the full operational, economic and societal value of these investments cannot be realized through isolated national implementation.

Trajectory-Based Operations (TBO), enabled by System-Wide Information Management (SWIM), Flight and Flow Information for a Collaborative Environment (FF-ICE), provides the operational framework for transforming ATM modernization into measurable operational improvements for airlines, passengers, airports, ANSPs and national economies. Because TBO is inherently network-centric, its successful implementation depends upon interoperable systems, harmonized regional implementation and sustained political commitment. This paper invites the Conference to reaffirm its commitment to coordinated regional implementation of TBO as a strategic priority for maximizing the value of ATM modernization across the APAC Region.

UNLOCKING THE FULL VALUE OF ATM MODERNIZATION THROUGH TRAJECTORY-BASED OPERATIONS (TBO)

1. INTRODUCTION

1.1 Air transport is a strategic enabler of economic development, trade, tourism and regional connectivity. As the fastest-growing aviation market, the APAC region faces increasing pressure to accommodate future demand while maintaining safe, efficient and environmentally sustainable air navigation services.

1.2 Recognizing these challenges, ICAO has established Trajectory-Based Operations (TBO) as a key operational concept for the future ATM system through the Global Air Traffic Management Operational Concept (GATMOC, Doc 9854) and the Global Air Navigation Plan (GANP, Doc 9750). Supported by enabling capabilities such as SWIM, FF-ICE and collaborative decision-making, TBO enables aircraft trajectories to be collaboratively planned and dynamically managed across all phases of flight, improving the overall performance of the air navigation system.

1.3 The 42nd Session of the ICAO Assembly reaffirmed the importance of accelerating digital transformation, strengthening interoperability and enhancing implementation support to achieve a seamless global air navigation system. Consistent with this direction, the APAC Seamless ANS Plan promotes coordinated regional implementation as the foundation for future ATM modernization.

1.4 While many APAC States have made substantial progress in implementing Performance-based Navigation (PBN), Air Traffic Flow Management (ATFM), SWIM and other modernization initiatives, implementation maturity continues to vary across the region. TBO should therefore not be viewed simply as the next stage of ATM modernization; rather, it is the operational mechanism through which decades of investment in air navigation are translated into measurable operational, economic and societal benefits.

2. DISCUSSION

ATM Modernization is an Investment in Economic Growth

2.1 Air navigation modernization should not be viewed solely as a technical programme. Efficient air navigation directly supports national productivity, international trade, tourism, supply-chain resilience and sustainable economic growth. Every avoidable delay increases airline operating costs, fuel consumption and emissions, while reducing passenger confidence and network efficiency.

2.2 Conversely, improving the efficiency of air navigation enables States to accommodate increasing traffic demand without proportionate expansion of physical infrastructure. Investment in ATM modernization is therefore an investment in national competitiveness.

2.3 This principle is reflected throughout ICAO's GANP, which identifies Capacity, Efficiency, Predictability, Cost-effectiveness, Environmental Sustainability and Interoperability as key performance ambitions supporting the future evolution of the global air navigation system.

TBO Unlocks the Benefits of ATM Modernization

2.4 TBO provides the operational environment through which these strategic objectives can be realized by supporting more efficient use of airspace, improved traffic predictability and better utilization of existing airport and airspace capacity.

2.5 The benefits extend well beyond operational performance:

- a) for ANSPs, TBO enhances capacity, resilience and operational efficiency;

- b) for airlines, it reduces unnecessary airborne and ground delays, fuel consumption and operating costs while improving schedule reliability;
- c) for passengers, the benefits are experienced not as technology, but as shorter delays, more predictable journeys and improved travel confidence; and
- d) for governments, TBO strengthens regional connectivity, economic productivity and environmental performance while maximizing the value of previous investments made under the GANP and ASBU framework.

The Value of TBO Depends upon the Regional Network

2.6 Unlike many national infrastructure projects, the value of TBO increases as more States become operationally connected. The value of TBO is not created by the implementation of individual States, but by the continuity of trajectory management across an interoperable and harmonized regional network.

2.7 This characteristic fundamentally distinguishes TBO from conventional national modernization programmes. The operational value of trajectory information depends upon its continuous availability across Flight Information Region (FIR) boundaries.

2.8 Consequently, investments made by individual States will achieve their greatest operational and economic return only when neighbouring States progress collectively toward interoperable and harmonized implementation.

Interoperability Alone is Not Enough

2.9 Interoperability is widely recognized as a fundamental enabler of future ATM as it allows operational stakeholders to exchange information efficiently through common data standards, digital platforms and connected systems.

2.10 However, interoperability alone does not guarantee seamless operations. While interoperability enables the exchange of information, harmonized implementation enables the consistent application of that information across operational environments.

2.11 States may implement similar technologies, yet differences in implementation timelines, operational procedures, governance arrangements, information-sharing practices or workforce readiness can significantly reduce the overall network benefits. TBO therefore requires more than interoperable technology. It requires States to advance collectively towards common operational objectives through harmonized implementation.

2.12 This approach is consistent with the ICAO GANP, the ASBU methodology and the APAC Seamless ANS Plan, all of which emphasize harmonized regional implementation as the foundation for seamless ATM.

A Shared Responsibility for a Shared Regional Network

2.13 The APAC region possesses unique operational characteristics that reinforce the need for collective implementation. The region accommodates some of the world's busiest international city pairs, numerous cross-border FIRs, extensive oceanic operations and highly diverse levels of ATM implementation maturity. Traffic demand is expected to continue growing faster than in any other ICAO region.

2.14 These characteristics present both the greatest opportunity and the greatest responsibility for demonstrating the practical value of next-generation ATM concepts. In such an interconnected operating environment, realizing the full potential of TBO depends upon coordinated regional implementation.

Sustaining Political Commitment to Realize the Full Value of ATM Modernization

2.15 Over the past two decades, APAC States have made substantial investments in ATM modernization through the implementation of the ICAO GANP and the ASBU framework. The remaining challenge is to ensure that these investments collectively deliver their intended operational, economic and societal benefits across the regional network.

2.16 Achieving this objective now depends less on developing additional ATM capabilities than on translating existing modernization investments into coordinated regional implementation and tangible operational outcomes. Sustained political commitment is therefore essential to ensure that these investments deliver their intended operational and economic outcomes.

2.17 Directors General are uniquely positioned to sustain long-term policy continuity, align national investment priorities and reinforce regional cooperation, thereby creating the policy environment necessary for interoperable and harmonized implementation of TBO across the APAC region.

3. ACTION BY THE CONFERENCE

3.1 The Conference is invited to:

- a) recognize that TBO provides the operational mechanism for realizing the full operational, economic and societal value of ATM modernization, and that this value can only be realized through interoperable systems, harmonized regional implementation and sustained political commitment;
- b) encourage States to continue implementing ATM modernization in accordance with the ICAO GANP, the ASBU framework and the Asia/Pacific Seamless ANS Plan, while advancing coordinated regional implementation to maximize the value of existing modernization investments; and
- c) call upon States' Directors General to sustain long-term policy commitment, align national ATM modernization priorities, and strengthen regional cooperation to realize the full operational value of TBO through interoperable and harmonized implementation across the APAC region.

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