

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

*Kuala Lumpur, Malaysia
7 – 11 September 2026*

AGENDA ITEM 4: AIR NAVIGATION

**AIR TRAFFIC FLOW MANAGEMENT (ATFM) IN
ASIA-PACIFIC: BRIDGING IMPLEMENTATION GAPS FOR
ENHANCED EFFICIENCY AND SAFETY**

(Presented by Bangladesh)

INFORMATION PAPER

SUMMARY

The Asia and Pacific (APAC) region is the world's largest and fastest-growing air transport market, accounting for a substantial and increasing share of global traffic. This growth, while delivering economic benefits, places immense pressure on establishing and providing Air Traffic Flow Management (ATFM) services by the individual States and on airport capacity leading to congestion, delays and potential safety risks. However, despite nearly a decade of progress, significant disparities in implementation maturity persist, cross-border coordination remains suboptimal, and the region has yet to realize the full safety and efficiency benefits of a truly networked ATFM system.

The APAC region should aspire to a seamless, collaborative and regional ATFM network enabling full participation from all regional States and Administrations and achieving regional optimization of traffic flows. The regional concept of ATFM network is the main theme of the paper.

AIR TRAFFIC FLOW MANAGEMENT (ATFM) IN ASIA-PACIFIC: BRIDGING IMPLEMENTATION GAPS FOR ENHANCED EFFICIENCY AND SAFETY

1. INTRODUCTION

1.1 Air Traffic Flow Management (ATFM) is a critical tool for balancing demand with available capacity, ensuring that traffic flows safely and efficiently through the regional network. The APAC region is the world's largest and fastest-growing air transport market, accounting for a substantial and increasing share of global traffic. This growth, while delivering economic benefits, places immense pressure on airspace and airport capacity, leading to congestion, delays and potential safety risks.

1.2 Back in 2015, the ICAO APAC Region adopted a Distributed Multi-Nodal ATFM Concept of Operations, along with implementation expectations which is continually updated in the Asia/Pacific Regional Framework for Collaborative ATFM. Rather than unpredictable tactical flow restrictions, ATFM enables orderly cross-border responses to unforeseen disruptions, including weather phenomena such as typhoons, runway surface damage and GNSS radio frequency interference.

1.3 However, despite nearly a decade of progress, significant disparities in implementation maturity persist, cross-border coordination remains suboptimal, and the region has yet to realize the full safety and efficiency benefits of a truly networked ATFM system. The DGCA/60 in Sendai (2025) identified air navigation as a priority area, and the DGCA/61 theme "Smart Skies: Emerging Technologies for Safe, Secure, Sustainable and Efficient Aviation" provides a timely opportunity to address these implementation gaps.

1.4 This paper takes stock of the current ATFM implementation status in the APAC region, identifies persistent gaps and emerging challenges, and proposes a concrete roadmap to bridge these gaps through enhanced collaboration, technology adoption, and regulatory alignment.

2. DISCUSSION

2.1 The ICAO APAC Office conducts annual surveys to assess ATFM implementation status against the performance objectives of the Regional Framework. The 2025 survey received responses from 23 Asia/Pacific Administrations.

2.2 The 2025 survey, presented at ATFM/SG/15, received responses from 23 Asia/Pacific Administrations. Against three tiers of implementation status, e.g. "Robust" (90-100%), "Marginal" (70-89%) and "Incomplete" (0-69%), a total of 10 States/Administration achieved "Robust" status.

Types of Progress	Names of the States
Robust (90%-100%)	Australia, Cambodia, China, Hong Kong China, Japan, Republic of Korea, Singapore, Thailand and United States
Marginal (70%-89%)	India, Malaysia, New Zealand and Viet Nam
Incomplete (< 70%)	Bangladesh, Bhutan, Macao China, Fiji, French Polynesia, Indonesia, Maldives, Mongolia, Myanmar, Nepal, New Caledonia, Pakistan, Papua New Guinea, Philippines and Sri Lanka
No report	Afghanistan, Brunei Darussalam, Cook Islands, DPRK, Kiribati, Lao PDR, Marshall Islands, Micronesia, Nauru, Palau, Samoa, Solomon Islands, Timor Leste, Tonga, Tuvalu and Vanuatu

Disparity in Implementation Maturity

2.3 The significant variation in ATFM implementation status across the region represents a fundamental challenge. While some States have achieved robust implementation with sophisticated systems, others remain at incomplete levels or have not reported. This disparity creates fragmentation that undermines the network-wide benefits of ATFM.

2.4 States with incomplete implementation face multiple barriers such as limited technical expertise, inadequate infrastructure investment, and insufficient institutional capacity to develop and maintain ATFM capabilities. The absence of reporting from several Pacific States further complicates regional planning.

2.5 Cross-border ATFM coordination, while improving, remains constrained by several factors: These are, limited visibility of overall regional situation, potentially contradictory ATFM solutions from different nodes, non-binding nature of current arrangements, and communication gaps regarding the location of disruptions and reasons for delays.

2.6 As noted by the ATFM/SG Chair, there are known shortcomings in communicating the location of disruptions or the reason why a flight is asked to delay. This results in unexpected reactions, such as flights rerouting around airspace incorrectly perceived as the reason for the delay.

2.7 Another arrangement, the AMNAC arrangement is a valuable step forward having three tiers of participation. But this tiered structure, while pragmatic, limits full participation and shared ownership.

2.8 The APAC region faces challenges in integrating ATFM with emerging concepts such as: Free Route Airspace (FRA), System-Wide Information Management (SWIM), Flight and Flow – Information for Collaborative Environment (FF-ICE) and Trajectory-Based Operations (TBO).

2.9 The region also faces difficulties in maintaining airspace capacity during disruptive events. During large-scale weather deviations, there is both a reduction in available altitudes and an increase in required spacing between aircraft, significantly reducing airspace capacity. Extreme weather events, including typhoons, are becoming more frequent and severe.

2.10 Recent geopolitical events have further complicated the situation. Since 2021, flights between Asia and Europe have had to detour around the Kabul FIR, with the situation exacerbated by airspace unavailability over Eastern Europe. These constraints have created traffic bottlenecks on east-west traffic flows.

2.11 GNSS Radio Frequency Interference (RFI) has emerged as a significant operational challenge, impacting navigation accuracy and ATM system reliability. DGCA/60 considered multiple papers on this topic, and Thailand proposed the establishment of an APAC GNSS Interference Coordination Task Force.

2.12 Cybersecurity resilience in CNS/ATM systems was also highlighted in the DGCA/60 as a priority area, with Bangladesh presenting a paper on strengthening cybersecurity resilience.

Emerging Opportunities

2.13 ICAO is advancing global ATFM provisions through proposed amendments to Annex 11 – Air Traffic Services and PANS-ATM (Doc 4444). These amendments would establish new provisions for States to establish and provide ATFM service for all controlled airspace and designated aerodromes, including the establishment of ATFM units, coordination between them, and the designation of Flow Management Positions (FMPs). The proposed changes are envisaged to apply from November 2030.

2.14 Accompanying these amendments is a revision of the ICAO Manual on Collaborative ATFM (Doc 9971), being updated through the ICAO ATM Operations Panel. This would provide an opportunity for the APAC region to align its framework with global standards.

2.15 Virtual ATFM offers a promising pathway to full regional participation without requiring each State to acquire expensive standalone ATFM systems. A virtual regional network, interconnecting existing systems, can provide solutions that address multiple constraints across the region, not just locally.

2.16 The concept of ATFM as a managed service addresses the economic reality that it is often not cost-effective for a dozen or more APAC ANSPs to each purchase a separate ATFM system. Sharing a common service platform can achieve level three participation for all, with costs divided over numerous users.

2.17 This approach aligns with the principle that ATFM capital equipment acquisition can be replaced by buying ATFM solution as a service, significantly lowering the barrier to full participation for States with limited resources.

2.18 The application of Machine Learning (ML) and Artificial Intelligence (AI) presents exciting opportunities to enhance the accuracy of trajectory prediction, thus improving ATFM operations. The integration of FF-ICE and ATFM processes will enable ANSPs to achieve more accurate trajectory and traffic demand predictions.

2.19 The proposed renaming of the ATFM Steering Group to the ATFM and A-CDM Steering Group reflects the growing recognition that ATFM and Airport Collaborative Decision-Making are intrinsically linked. The integration of these functions, including AMAN and DMAN systems, is critical to optimizing airport and airspace capacity.

2.20 The normalization of the Asia/Pacific Regional A-CDM Monitoring and Reporting Scheme as part of the annual reporting framework will provide better visibility of airport-level performance and its impact on network operations.

Roadmaps for Bridging Gaps

2.21 The APAC region should aspire to a seamless, collaborative ATFM network that will be able to enable full participation from all regional States and Administrations, achieve regional optimization of traffic flows - not just local solutions, integrate with emerging concepts including SWIM, FF-ICE, and TBO, leverage AI and data analytics for predictive, proactive management and maintaining operational resilience during disruptive events.

2.22 States with incomplete ATFM implementation should be provided targeted support through technical assistance from States with robust implementation, training programmes for ATFM personnel, aligned with the Regional Framework's competencies, managed service options for States that cannot justify independent system acquisition.

2.23 The ICAO APAC Office, in collaboration with CANSO and other partners, should facilitate the sharing of expertise and resources.

2.24 Building on the AMNAC initiative, the region should promote the sharing of ATFM Daily Plans in accordance with the Regional Framework, including constraints and expected ATFM measures, without requiring the signing of agreements.

2.25 Establish instant communication mechanisms, such as web conferences, to share the location and causes of delays, supporting appropriate responses to develop a binding framework or regional supervisory body to establish ground rules for equity and ensure transparency.

2.26 The ATFM & A-CDM Steering Group should lead the development of these enhanced collaboration mechanisms.

- 2.27 The APAC region should collectively pursue:
- a) SWIM implementation as a strategic priority, transitioning from traditional messaging to system-wide information exchange;
 - b) digitization of the ATFM Daily Plan, moving away from PDF email attachments to machine-readable formats that enable automatic processing;
 - c) cross-border FIXM standardization, with a clear change process for system-to-system information exchange;
 - d) Free Route Airspace implementation through a phased approach;
 - e) participate in the Data Analytics Ad-hoc Group established under the ATM Sub-group, providing data to identify regional bottlenecks; and
 - f) share used cases for AI advancement in air traffic control services.
- 2.28 APAC region States may consider:
- a) reviewing and redesigning the regional ATFM Concept of Operations by 2027, considering the challenges of current operations and the advent of new capabilities including SWIM, FF-ICE, and TBO;
 - b) developing coordinated contingency plans for large-scale airspace disruptions, building on experience gained from recent geopolitical events;
 - c) strengthening collaboration with meteorological service providers to improve weather forecasting for ATFM purposes;
 - d) participating actively in the development of the revised ICAO Doc 9971 Manual on Collaborative ATFM;
 - e) prepare for the implementation of the proposed Annex 11 and PANS-ATM amendments by November 2030;
 - f) incorporate lessons learned from operational implementation and cross-border trials; and
 - g) contribute to the review of the Regional ATFM Monitoring and Reporting Form in 2026 to align with new global provisions.

3. ACTION BY THE CONFERENCE

- 3.1 The Conference is invited to note the information contained in this Paper.

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