International Civil Aviation Organization

Sixteenth Meeting of the Asia/Pacific Air Traffic Flow Management and Airport Collaborative Decision-Making Steering Group (ATFM & A-CDM/SG/16)

Bangkok, Thailand, 06 – 10 April 2026

Agenda Item 4a: Review of Current ATFM Operations and Problem Areas

Improving Post-Operations Analysis for Cross-Border ATFM Operations within AMNAC

(Presented by China, Hong Kong China, Singapore and Thailand)

SUMMARY

This paper presents ongoing efforts by the Asia-Pacific Cross-Border Multi-Nodal ATFM Collaboration (AMNAC) to enhance the Post-Operations Analysis (POA) process for cross-border Air Traffic Flow Management (ATFM) operations in the Asia-Pacific region. Recognising the increasing need for more robust and accurate evaluation of ATFM measures, the air navigation service providers (ANSPs) participating in AMNAC have initiated the development of a standardised set of Key Performance Indicators (KPIs) and associated methodologies for POA reporting. The proposed KPIs complement existing compliance and delay indicators by introducing metrics to assess the effectiveness of ATFM measures in addressing demand–capacity imbalances. Participating ANSPs in AMNAC will trial these KPIs, feedback will be gathered in upcoming AMNAC meetings for refinements as required before incorporation into POA reporting.

1. INTRODUCTION

1.1 The Asia-Pacific region has been conducting cross-border ATFM operations since 2015 using the Distributed Multi-Nodal ATFM network concept, following its introduction as the regional concept for ATFM operations. Through collaborative arrangements among participating air navigation service providers (ANSPs), ATFM measures have been implemented to manage demand–capacity imbalances affecting airports and airspace.

1.2 The implementation of cross-border ATFM operations has been further facilitated through regional collaboration such as AMNAC. This collaboration has enabled participating ANSPs to coordinate ATFM measures, exchange operational information, and review the outcomes of implemented ATFM measures.

1.3 With the Asia-Pacific region forecasted to experience the fastest growth in air traffic globally, the need for effective and coordinated cross-border ATFM operations is expected to increase in tandem with traffic growth. In this context, the ability to assess the effectiveness of ATFM measures and share the results of POA becomes increasingly important in supporting operational transparency, collaborative decision-making, and continuous improvement of ATFM operations.

2. DISCUSSION

Current State

2.1 At various ATFM-related forums such as the ICAO ATFM & A-CDM Steering Group and AMNAC meetings, airspace users have increasingly expressed the need for greater robustness from ANSPs regarding the analysis of ATFM measures implemented, including the reasons for their activation and whether such measures have been effective in addressing demand–capacity imbalances. These opinions were similarly reflected in the recent survey conducted among airspace users as part of the work undertaken by the ICAO Asia/Pacific ATFM Concept Design Ad-Hoc Group, where views were sought on areas for improvement in ATFM operations within the region.

2.2 In addition, it is anticipated that ICAO *Annex 11 – Air Traffic Services* and *Doc 4444 (PANS-ATM)* will include new provisions for States to establish and provide ATFM service for all controlled airspace and designated aerodromes by 2030[1]. These developments highlight the increasing importance of ATFM, and with it, the establishment of structured mechanisms for reporting post-operations analysis results, to enhance transparency, support performance evaluation, and facilitate continuous improvement of ATFM operations.

Progress on Work by AMNAC

2.3 Currently, AMNAC shares POA results during AMNAC meetings, which are generally convened twice annually. In addition, information on flights impacted by ATFM operations is consolidated monthly and made available through the AMNAC network POA portal. These reports primarily focus on operational compliance and impact indicators, such as CTOT compliance rates and ATFM delays experienced by flights.

2.4 During the 25th AMNAC meeting held in March 2026, the participating ANSPs discussed about expanding a standardised set of KPIs for future POA reports. In addition to existing compliance and delay indicators, the proposed KPIs include metrics aimed at assessing the effectiveness of ATFM measures, with reference to indicators such as terminal airspace delays and degree of demand exceedance or capacity under-utilisation, as shown in Appendix A.

2.5 AMNAC also discussed a standardised methodology for the calculation of the proposed KPIs to ensure alignment and consistency in the way performance indicators are derived, thereby enabling more meaningful and equitable comparisons of results across participating ANSPs. The proposed methodologies are provided in Appendix B to this paper.

Next Step

2.6 As an initial step, AMNAC agreed to trial the standardised KPIs and methodologies when presenting POA results at the next two AMNAC meetings. This trial implementation will also provide an opportunity to gather feedback from members and identify areas where the KPIs and methodologies may be further refined.

2.7 Following the trial implementation, AMNAC will review the feedback and observations gathered from the application of the standardised KPI reporting. Subject to the outcomes of this evaluation, AMNAC may consider proposing for these KPIs and methodologies to be incorporated into the ICAO Asia/Pacific Recommended Framework for ATFM Post-Operations Analysis[2], with the aim of promoting greater consistency and transparency in POA reporting across the region.

2.8 With increasing expectations of greater transparency in ATFM operations from the airspace users, as well as the requirement for States to provide ATFM services, it is important for ANSPs to continue enhancing the POA processes associated with ATFM implementation. While the

[1] Ref: Proposal for Amendment (PfA) included in State Letter SP 52/4-25/85 distributed to States on 17 September 2025
[2] Ref: Current version of the Recommended Framework is Version 1.0 accessible here.

standardisation of KPIs within individual ATFM collaboration groups such as AMNAC represents an important first step, there may also be value in exploring, at the broader Asia-Pacific level, mechanisms that could encourage or facilitate ANSPs implementing ATFM measures to share POA results more systematically. Such efforts would contribute to strengthen regional situational awareness, improving performance evaluation, and supporting the continuous improvement of ATFM operations.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the ongoing efforts by the ANSPs participating in AMNAC to enhance the POA process through the development of standardised KPIs and methodologies; and

b) discuss any relevant matters as appropriate.

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— END —

APPENDIX A

Proposed Standardised KPIs for POA Reporting

	Impact Analysis	**Compliance Assessment**	**ATFM Effectiveness**
Objective	• Impact of ATFM measure activated • Provide insights on ATFM delay trend, fairness in ATFM delay distribution, and areas where further collaboration is required	• Assess level of ATFM compliance exhibited by stakeholders • Analyse compliance level from different stakeholders – e.g., airspace user, departure aerodromes, airport operators, etc.	• Evaluate the outcome at the ATM resource for which ATFM measure has been activated • Ascertain that ATFM measures objectives and parameters are appropriately established
KPIs	• Number of GDP implemented • Participation rate o Number of flights subjected to GDP • ATFM delays per measure o Total o Average • Distribution of ATFM delays o Departure aerodromes o Airlines • Reasons & Locations for ATFM delays	• CTOT compliance rate (compare with previous year) o Airlines o Departure aerodromes o Air Navigation Service Providers • Compliance category o 6-10mins early o More than 10mins early o Compliant (-5/+10mins or -5/+5 mins) o 11-20 mins late o More than 20mins late	• Airport constraint o Actual Demand Exceedance vs Declared Capacity (%) o Capacity under-utilisation (%) o Average additional time in terminal airspace (min) • Airspace constraint o Actual Demand Exceedance vs Declared Capacity (%) o Capacity under-utilisation (%)

APPENDIX B

Standardised methodology for calculation of KPIs

CTOT Compliance Rate (%)	
For Facilitating ATFM Unit	For Initiating ATFM Unit
$CTOT\ compliance\ rate = \frac{no.\ of\ CTOT\ compliant\ flights}{no.\ of\ CTOTs\ received\ for\ facilitation}\ x\ 100\%$	$CTOT\ compliance\ rate = \frac{no.\ of\ CTOT\ compliant\ flights}{no.\ of\ CTOTs\ issued}\ x\ 100\%$
Where, • CTOT compliant flights = Flights where, -5≤ATOT-CTOT≤+10 mins (for airport constraint) and -5≤ATOT-CTOT≤+5 mins (for airspace constraint); and • No. of CTOTs issued = CTOTs issued with sufficient lead time i.e., time of CTOT issue is earlier than or equals to (EOBT-90mins) • No. of CTOTs received for facilitation = Total number of CTOT received, excluding: o CTOTs cancelled by initiating ATFMU o CTOTs with insufficient lead time i.e., time of CTOT issue time is later than (EOBT-90mins)	

ATFM delay (min)
ATFM delay = CTOT – ETOT
Where, • ETOT = EOBT + STT • STT = Standard taxi-out time • EOBT = Estimated-off-block time

Additional Time in Terminal Airspace (min) *Aligned with GANP KPI08*
$Additional\ time\ in\ Terminal\ Airspace = Actual\ Terminal\ Airspace\ Transit\ Time - Unimpeded\ Terminal\ Airspace\ Transit\ Time$
Where, • Actual Terminal Airspace Transit Time = Actual Landing Time – Terminal Airspace Entry Time

• Unimpeded Terminal Airspace Transit Time = 20th percentile of actual terminal airspace transit times* (for each entry segment/landing runway combination) recorded at an airport *value needs to be periodically reassessed

Demand Exceedance (%)	
For Airport Constraint	For Airspace Constraint
$\%\ Demand\ Exceedance = \frac{\sum max\ (0,\ actual\ demand - declared\ capacity)}{\sum declared\ capacity}\ x100\%$	$\%\ Demand\ Exceedance = \frac{\sum max\ (0,\ throughput - declared\ capacity)}{\sum declared\ capacity}\ x100\%$
Where, • Actual Demand = No. of flights estimated to arrive at designated airport in each hour, prior to tactical ATC intervention • Declared Capacity = Operating Airport Arrival Rate (AAR) determined per hour	Where, • Throughput = Traffic movement crossing the affected airspace per hour (based on entry count) • Declared Capacity = Declared capacity of the affected airspace (sector, ATS route, waypoint etc.)

Capacity under-utilisation (%)	
For Airport Constraint	For Airspace Constraint
$\%\ Capacity\ under-utilisation = \frac{\sum max\ (0,\ declared\ capacity - actual\ demand)}{\sum declared\ capacity}\ x100\%$	$\%\ Capacity\ under-utilisation = \frac{\sum max\ (0,\ declared\ capacity - throughput)}{\sum declared\ capacity}\ x100\%$
Where, • Actual Demand = No. of flights estimated to arrive at designated airport in each hour, prior to tactical ATC intervention • Declared Capacity = Operating Airport Arrival Rate (AAR) determined per hour	Where, • Throughput = Traffic movement crossing the affected airspace per hour (based on entry count) • Declared Capacity = Declared capacity of the affected airspace (sector, ATS route, waypoint etc.)