International Civil Aviation Organization

Twelfth Meeting of the Asia/Pacific Air Traffic Flow Management Steering Group (ATFM/SG/12)

Video Teleconference, 13 – 16 September 2022

Agenda Item 5: Regional ATFM Framework and Guidance Material

PROGRESS OF THE ATFM INFORMATION REQUIREMENT SMALL WORKING GROUP (ATFM/IR/SWG)

(Presented by ATFM/IR/SWG)

SUMMARY

This paper presents the background of the formation of the ATFM Information Requirement Small Working Group (ATFM/IR/SWG) and summarizes the progress having been made since the ATFM/IR/SWG was established. The paper proposes to;

i. Submit draft (revised) Regional Collaborative ATFM Framework Document version 4.0 for approval of ATFM/SG/12; and

ii. Include ATFM Training Guide Document as a reference document and to be made available in ICAO eDocument website.

1. INTRODUCTION

1.1 In 2015, the Asia Pacific Regional ATFM Network was starting to take its shape: The Asia/Pacific Air Traffic Flow Management Concept of Operation (CONOPS) had been developed, evolving from a concept in an ATFM operational trial conducted by Hong Kong China, Singapore and Thailand. The Regional Framework for Collaborative ATFM was completed at the ATFM/SG/5, and the Northeast Asia Regional ATFM Harmonization Group (NARAHG) just completed its first meeting in the second half of 2014 and commenced the execution of an ATFM Project between China, Japan and the Republic of Korea.

1.2 The interoperability is the goal of the global ATM development, so as to the regional ATFM initiatives. With a unique characteristic of the ATFM network development in the Asia & Pacific Region where the sub-regional ATFM projects had been being executed in parallel with the development of the regional implementation plan and guidance materials, it was recognized that the divergences in ATFM system specifications, standards, functionalities and operations would easily occur.

1.3 Timely and reliable information exchange among the regional ATFM “Node” is a fundamental component to support the interoperability of the entire regional distributed multi-nodal ATFM network, and to ensure the operational efficiency and effectiveness of the whole ATFM Network. In line with a proposal raised by China at the 5th Meeting of ICAO ATFM/SG held in Bangkok in 2015, a decision was made to establish a small working group with the tasks of drafting two documents, one was the Operational Requirements document for the exchange of, and interaction

with, ATFM information, another one was the technical Interface Control Document (ICD). The Terms of Reference (TOR) was developed accordingly (Decision ATFM/SG/5-1). This small working group was then named as the Information Requirement Small Working Group – ATFM/IR/SWG.

2. DISCUSSION

ATFM/IR/SWG meetings

2.1 According to the Terms of Reference (TOR) of ATFM/IR/SWG, it is stated that the ATFM/IR/SWG will conduct its activities mainly by electronic means between meetings of the ATFM/SG, with face-to-face meetings conducted only where necessary and in conjunction with other meetings where opportunity presents. A series of meetings (face-to-face) and teleconferences were held between 2018 to 2020. The ATFM/IR/SWG completed the following two main tasks.

ADP exchange procedure to Asia/Pacific Regional Framework for Collaborative ATFM

2.2 ATFM/IR/SWG was tasked by ATFM/SG to draft Operational Requirements Document including ATFM Daily Plan (ADP) for regional ATFM, stated on the Terms of Reference (TOR) of ATFM/IR/SWG. ATFM/IR/SWG, after many deliberations, proposed ADP exchange procedure in ATFM/SG/10. The procedure includes the contents of ADP Content and Format, ADP Exchange Protocols, ADP Exchange Frequency, Dissemination of ADP to Local Stakeholders, and Contact Information for ADP Exchange.

2.3 ATFM/SG/10 in Conclusion ATFM/SG/10-2: ADP Exchange Procedure Working Draft adopted the ADP Exchange Procedure to be uploaded to the ICAO APAC Regional Office eDocuments web-page in Working Draft form for immediate use by APAC Administrations, pending its inclusion in the planned amendment to the Regional ATFM Framework.

2.4 The ADP exchange procedure (working draft) is available on ICAO eDocuments website.

AFTN/AMHS based Interface Control Document (ICD)

2.5 ATFM/IR/SWG was also tasked by ATFM/SG to draft Operational Requirements Document including Interface Control Document (ICD) for regional ATFM, stated on the Terms of Reference (TOR) of ATFM/IR/SWG. The ATFM/IR/SWG developed the AFTN/AMHS Interface Control Document (ICD) for ATFM data exchange in the absence of SWIM environment. The ICD was proposed for adoption by ATFM/SG/10.

2.6 The Tenth Meeting of the Asia/Pacific ATFM Steering Group (ATFM/SG/10, Video Teleconference, 4 to 8 May 2020) proposed amendment to the AFTN/AMHS-based ATFM ICD which was endorsed by the Seventh Meeting of the Aeronautical Communications Services Implementation Coordination Group (ACSICG/7, Web-Conference, 21 – 23 July 2020). Subsequent to the ATFM/SG/10 meeting, the Secretariat conducted a further editorial review of the ICD, in consultation with the ATFM/SG Chair and the AMNAC Technical Sub-group. The document was further amended to correct some errors and minor omissions. In the 24th Meeting of the Communications, Navigation and Surveillance Sub-Group of APANPIRG, (CNS SG/24. December 2020) adopted: Conclusion CNS SG/24/3(ACSICG/7-2 (ATFM/SG/10-3)) - Amendment of the AFTN/AMHS-based Interface Control Document (ICD) for ATFM.

2.7 The amended AFTN/AMHS-based Interface Control Document (ICD) for ATFM is available on ICAO eDocument website (https://www.icao.int/APAC/Pages/eDocs.aspx).

2.8 The eleventh meeting of the Asia/Pacific ATFM Steering Group (ATFM/SG/11, Video Teleconference, 2-6th August 2021) proposed the following tasks to be undertaken by ATFM/IR/SWG.

Action Item	Description	Remarks
5/10	Develop First Draft Operational Requirements Document	Reviewed ATFM/SG/11 The need for the task to be reviewed after the Framework 2022 update
11/8	Review Regional Framework for Collaborative ATFM.	(Consolidation of action items 9/1, 9/2, 10/1). Scope of work provided in ATFM/SG/11 Report of the Meeting – Appendix E

ATFM/IR/SWG actions towards the above tasks:

2.9 Convening of ATFM/IR/SWG – All the previous States and IO which were part of ATFM/IR/SWG were requested to nominate Subject Matter Experts (SMEs) in the specialization of ATFM and /or A-CDM, to be part of ATFM/IR/SWG. 12 States and 3 IOs responded and nominated SMEs to the ATFM/IR/SWG.

2.10 Meetings of ATFM/IR/SWG – The ATFM/IR/SWG meetings were conducted virtually through VTC. The schedule of meetings is shown below.

Meeting	Held on	Tasks completed
ATFM/IR/SWG Meeting-I	18th March 2022	Identification of sub-tasks; formation of groups and leads; assignment of tasks to groups and initial timelines
ATFM/IR/SWG Meeting-II	10th May 2022	Preliminary discussions on identified tasks and materials
ATFM/IR/SWG Meeting-III	24th June 2022	Preliminary draft submission by each group and collective review
ATFM/IR/SWG Meeting-IV	26th July 2022	Submission of final drafts by each group and review.

2.11 Continuous coordination was carried out by way of emails and teleconferences. There was wholehearted engagement by all members towards accomplishing the tasks.

2.12 After many deliberations, a revised and updated Framework for Regional Collaborative ATFM document (V 4.0) was prepared. The significant changes/modifications made are shown below:

- Scope of the framework – Editorial corrections;
- Executive summary – Amended to reflect the current edition;
- ATFM Principle – Reflect the APAC Seamless ANS Plan principles, identified priorities and ASBU modules;
- Airspace and Airport Capacity – Reflects DOC 9971 concept of enhance capacity first, then adjust demand;
- Capacity planning, adjustment – terminology consistent with Doc 9971;
- CDM- Updated and a new Appendix on CDM;
- New addition on A-CDM and ATFM and ACDM integration;
- ATFM Terminology – Reflects Doc 9971 ; removing inconsistencies;
- ATFM System Communication – Consistent with Doc 9971 and a new Appendix on ADP;
- ATFM Communication by AFS -reflects present plan of using AFN/AMHS ICD in

the interim;

- ATFM Phraseology – Removal of inconsistencies and a new Appendix;
- Training and Competency – Refers to an updated ATFM Training Guide;
- Regional ATFM Implementation Guidance – Updated with reference to Doc 9971 implementation guidance;
- Current Situation – Reflects the progress of Regional ATFM Implementation since the first edition;
- Performance Improvement Plan – Updated to be consistent with APAC Seamless ANS Plan; Performance Objectives. Proposes Phase III PIP. Proposes updated ATFM Monitoring and Reporting Form;
- Research & Future development Possibilities – Updated to reflect current scenarios;
- Milestones, Timelines… - Updated for consistency;
- Appendices – Revised and updated – Includes reference to APSAP Principles relevant to ATFM and A-CDM; Appendix on ATFM Phrases and Terminology; A brief on CDM; Updated Regional ATFM Monitoring and Reporting Form

2.13 The updated and revised Regional Collaborative ATFM Framework document (V 4.0) is attached in **Attachment A**.

2.14 The ATFM/IR/SWG proposes to list the ATFM Training Guide as a separate document and to be made available for reference on the ICAO eDocument website. The updated ATFM Training Guide is attached in **Attachment B**.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this paper;

b) Consider Draft Conclusion XX to approve the draft Regional Collaborative ATFM Framework Document (Version 4.0, Attachment A) and to submit the same for approval in the forthcoming ATM/SG/10;

c) Consider Draft Conclusion XX to list the updated ATFM Training Guide (Attachment B) as a separate document on ICAO eDocuments website; and

d) discuss any relevant matters as appropriate.

…….

Draft Conclusion/~~Decision~~ ATFM/SG/12-X: Update Regional Framework for Collaborative ATFM	
What: That, the Asia/Pacific Regional Framework for Collaborative ATFM Version 4.0. be adopted, and made available on the ICAO Asia/Pacific Regional Office web site, replacing Version 3.0.	Expected impact: ☐ Political / Global ☐ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical
Why: To amend the Regional Framework document and performance expectations, taking into account updates in APAC Seamless ANS Plan and GANP and related ASBU modules;	Follow-up: ☒Required from States
When: On adoption by ATM/SG/10 21-Oct-22	Status: Draft to be adopted by Subgroup
Who: ☒Sub groups ☒APAC States ☒ICAO APAC RO ☐ICAO HQ ☐Other: XXXX	

Draft Conclusion/~~Decision~~ ATFM/SG/12-X: ATFM Training Guide	
What: That, 1. the ATFM Training Guide provided in Appendix XX to the report be made available on the ICAO Asia/Pacific Regional Office website; and 2. Asia/Pacific Administrations are urged to refer to the ATFM Training Guidance material for developing their training programs.	Expected impact: ☐ Political / Global ☐ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical
Why: To provide guidance on ATFM Training and regional best practices	Follow-up: ☒Required from States
When: On adoption by ATM/SG/10 21-Oct-22	Status: Draft to be adopted by Subgroup
Who: ☒Sub groups ☒APAC States ☒ICAO APAC RO ☐ICAO HQ ☐Other: XXXX	

INTERNATIONAL CIVIL AVIATION ORGANIZATION

D R A F T

ASIA/PACIFIC

REGIONAL FRAMEWORK

FOR

COLLABORATIVE AIR TRAFFIC FLOW MANAGEMENT

DRAFT Version 4.0

This Plan was developed by the Asia/Pacific Air Traffic Flow Management Steering Group (ATFM/SG)

Approved by xx Meeting of ATM Sub-Group of APANPIRG and published by the ICAO Asia and Pacific Office, Bangkok

CONTENTS

SCOPE OF THE FRAMEWORK

Background of Regional Air Traffic Flow management

1.1. The 24th Meeting of the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG/24), held in June 2013, considered that with the strong growth of air traffic in the Asia Pacific Region there was a need to effectively manage demand and capacity, particularly at major international air hubs and in the associated major traffic flows (MTF).

1.2. The airspace of the Asia/Pacific Region, particularly that of South East Asia, is characterized by relatively small FIRs with corresponding low flight transit times. Any demand management process applied unilaterally in one FIR has a knock-on effect in multiple 'downstream' FIRs, and procedures applied are therefore structured around the lowest capability along any particular route/flow. 'Flow Management' in the region tended to be limited to rudimentary traffic spacing measures imposed by individual FIRs, rather taking a wider network view that optimizes available capacity and manages demand, only when necessary, on a sub-regional basis.

1.3. The Asia/Pacific Seamless ANS Plan provides a blueprint for coordinated Regional development, including capability improvements described in the ICAO Aviation System Block Upgrades (ASBU) roadmap. Air Traffic Flow Management (ATFM) taking a network view, is a key module in ASBU Block Zero and One. NOPS-B0/1-5 -Improved Flow Performance through Planning based on a Network- Wide view have since been identified by APANPIRG as one of sixteen priorities for the Asia/Pacific Region.

1.4. While the concept of a single ATFM entity to serve a region works well in Europe and North America, a centralized ATFM Unit (ATFMU) approach is not practicable for the Asia/Pacific region. The need for a regional ATFM framework focusing on sub-regional, multi-State implementation, rather than individual FIR-based programs, was recognized by APANPIRG/24 in its adoption of the following Conclusion:

Conclusion 24/15: Asia/Pacific ATFM Steering Group

That, States participate in, and support the Asia/Pacific ATFM Steering Group to develop a common Regional ATFM framework, which addresses ATFM implementation and ATFM operational issues in the Asia/Pacific region.

1.5. This document, the Asia/Pacific Regional Framework for Collaborative ATFM (the Framework) is intended to provide a common regional framework that addresses ATFM implementation and ATFM operational issues in the Asia/Pacific region. Further discussed in later sections, a core concept of the Framework, is the distributed multi-nodal ATFM network, envisaged as interconnected States and/or sub-Regional groups operating in an ATFM network without the need for any central, physical facility providing the network management function.

1.6. Doc 9971 states that in its initial application, ATFM need not involve complicated processes, procedures or tools. The goal is to collaborate with system stakeholders and to communicate operational information to airspace users, air navigation service providers, and to other stakeholders in a timely manner.

1.7. Version 3.0 of the Framework included near to medium term performance objectives to prepare and guide States in the implementation of collaborative, cross- border ATFM, providing for regionally harmonized ATFM concepts, communications and practices.

1.8. The present Version of the Framework recognises that many States are progressing, albeit

slowly, towards implementing Air Traffic Flow Management systems and procedures in their areas in conformity with the Regional ATFM Framework. In order to encourage greater harmonization and ensure interoperability of various national and sub-regional ATFM implementation programs in the region, the Framework has further expanded the previous performance expectations in the medium term.

Framework Structure

1.9. The Framework, developed by the Asia/Pacific ATFM Steering Group (ATFM/SG),forms part of a suite of global and regional air navigation planning documents relevant to the Asia/Pacific Region.

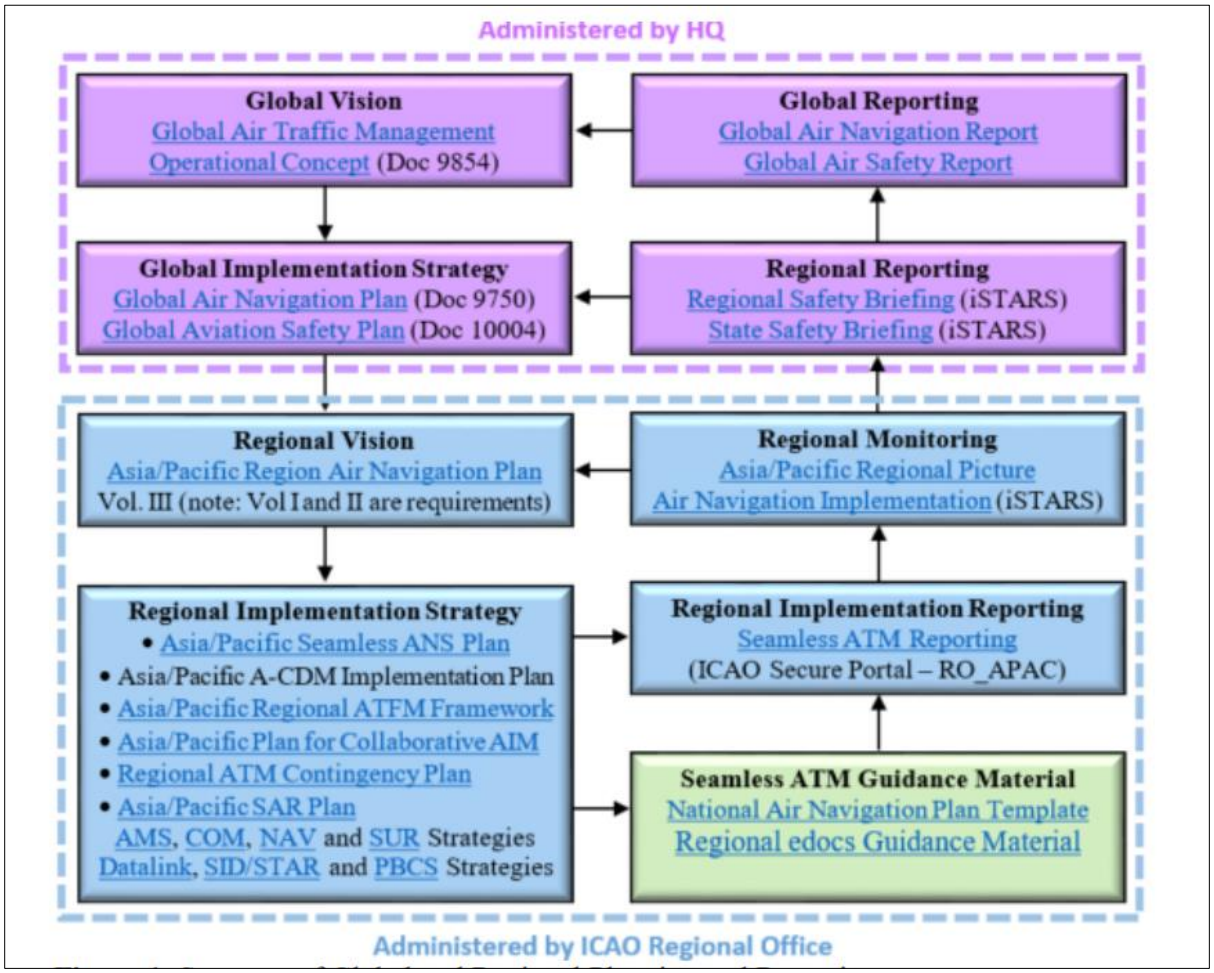


Figure 1 : Hierarchy of Global and Regional Plans

1.10. Global vision and strategy perspectives are provided by the Global ATM Operational Concept (Doc 9854), Global Air Navigation Plan (GANP, Doc 9750), and Global Aviation Safety Plan (GASP, Doc 10004), as shown in Figure 1 above. The GANP includes the Aviation System Block Upgrade (ASBU) framework, its Modules and its associated technology Roadmaps.

1.11. Beneath this level is regional planning primarily provided by the Asia/Pacific Regional Air Navigation Plan (RANP, Doc 9673) and the Asia/Pacific Seamless ANS Plan which, together with its contributory documents, including this Framework, define goals and the means of meeting State planning objectives.

1.12. Now incorporated within the Seamless ANS Plan are the earlier Asia/Pacific ATFM Concept of Operations and Air Navigation Concept of Operations. The Framework draws upon and aligns with the guidance and recommendations of ICAO Doc 9971 Manual on Collaborative ATFM, and with the regional performance improvement expectations of the Seamless ANS Plan.

1.13. The Framework includes analysis of the current situation, a performance improvement plan, and considerations for research and future development.

1.14. The Framework includes reference to Asia Pacific Airport Collaborative Decision Making (A-CDM) Implementation Plan which was developed to foster harmonized and interoperable A-CDM Implementation in the region. The framework further elaborates on need for ATFM and A-CDM integration and requirements. A-CDM-related performance expectations at A-CDM airports are illustrated in the APAC A-CDM Implementation plan to map with APAC Seamless ANS Plan and Regional Framework for Collaborative ATFM expectations.

1.15. The performance objectives of the Framework are expected to be implemented in phases aligned, where practicable, with those of the Seamless ANS Plan. Having considered the Phased expectations of the Seamless Plan, Regional ATFM Capability is expected to be implemented in the following phases.

- Phase IA, expected implementation by 12 November 2015 (aligned with Seamless ANS Plan Phase I)
- Phase IB, expected implementation by 25 May 2017 and
- Phase II expected implementation by 07 November 2019 (Aligned with Seamless ANS Plan Phase II.)
- Phase III A expected implementation by November 2022
- Phase III B expected implementation by November 2025.

1.16. None of the above phases or any element of the Framework is binding on any State, and they should be considered as a planning framework. It is important to note that, like the Seamless ANS Plan, the Framework's Phase commencement dates are planning targets. They should not be treated as a 'hard' date such as the example of Reduced Vertical Separation Minimum (RVSM) implementation. In that case there was a potential major regional problem if all States did not implement at the same time by the specific agreed date, which is clearly not the case for the start of the Framework Phases.

1.17. In that regard, although it would be ideal if all States achieved capability on day one of Phase I, this is probably not realistic. States should, however, consider the impact on stakeholders and on the needed improvements in cross-border ATFM and the ATM system overall that would result from not achieving target implementation dates. The Seamless ANS Plan Phase dates, and hence the Framework dates, were chosen as being an achievable target for the majority of States. However the dates were not designed to accommodate the least capable State, otherwise the region as a whole would fall behind the necessary urgent ATM improvements required by the Directors General of Civil Aviation and APANPIRG.

Document Review

1.18. The Framework is intended to be reviewed following the planned review of the Seamless ANS Plan and thereafter each three years, following the regular review of the Seamless ANS Plan. Earlier or more frequent review and amendment will be conducted as recommended by ATFM/SG and agreed by APANPIRG, through its Air Traffic Management (ATM) Sub-Group (ATM/SG).

DEVELOPMENT AND OBJECTIVES OF THE FRAMEWORK

Framework development

2.1. The Asia Pacific Region Air Traffic Flow Management Steering Group (ATFM/SG) was formed by the Asia/Pacific Region Air Navigation Planning and Implementation Regional Group (APANPIRG) to inter alia, develop a common Regional ATFM framework which addresses ATFM implementation and ATFM operational issues in the Asia/Pacific Region.

2.2. The Version 3.0 of the Framework was developed over four meetings of the ATFM/SG, supported by offline work by a team of specialists drawn from within the Steering Group. The Framework was endorsed by the 26th Meeting of the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG/26, Bangkok, Thailand, 7 to 10 September 2015).

2.3. The Framework draws on relevant experience gained in Asia/Pacific States, and in other Regions. Key concepts used or adapted in the Framework include:

- A distributed multi-nodal cross-border ATFM network rather than a regionally centralized facility;
- An agreed model for ATFM information exchange;
- An agreed suite of ATFM terminologies for use in ATFM systems and processes, and in interfaces with other complementary systems;
- Meteorological forecasting information tailored for ATFM purposes; and
- Delay absorption intent, allowing aircraft operators to flexibly distribute their total ATFM delay across various phases of flight.

2.4. The performance objectives of the Framework are, wherever practicable, aligned with the ATFM-related objectives and implementation timelines of the Asia/Pacific Seamless ANS Plan.

Framework Objective

2.5. Having considered relevant documents such as the Global Air Navigation Plan (Doc 9750), the Asia/Pacific Region Seamless ANS Plan and the Manual on Collaborative Air Traffic Flow Management (Doc 9971), the objective of the Framework is to provide a regionally agreed framework for the harmonized implementation of networked, interoperable, multi-FIR, multi-State, cross- boundary collaborative ATFM capability

2.6. The Framework provides information, guidance and performance objectives including:

- ATFM principles;
- ATFM-related Aviation System Block Upgrades (ASBU);
- ATFM-related performance objectives / priorities of the Asia/Pacific Seamless ANS Plan;
- Distributed multi-nodal ATFM network concept;
- Collaborative decision-making (CDM);
- ATFM phases;
- Airspace and airport capacity improvement, planning, assessment and declaration;
- Airport Collaborative decision Making (A-CDM) and ATFM integration;
- ATFM daily plan;

- ATFM terminology, communications and information distribution;
- Meteorological information for ATFM;
- Training and competencies for ATFM personnel;
- Analysis of current ATFM capability in the Region
- A performance improvement plan with considerations to relevant performance objectives from the Asia/Pacific Seamless ANS Plan; and
- Considerations for research and future development.

Framework Update

2.7. The need for an update of the Regional Framework for Collaborative ATFM, was necessitated on account the following considerations:

- Alignment of the Regional ATFM Framework and Doc 9971 (3rd edition 2018);
- Global Air Navigation Plan 2019 update, including a major restructure of the ASBU framework;
- Asia/Pacific Seamless ATM Plan 2019 update;
- The new suite of basic phrases for Cross-Border GDP facilitation ;
- Development of ATFM Post Ops Analysis Framework;
- Introducing interoperability requirements between ATFM and A-CDM implementations in the APAC region;
- PfA to the Regional Framework – Origination of DLA Message ; and
- Rationalization of the document and its appendices, including the need to establish some large appendices as separate documents.

2.8. Taking into considerations of the above, this edition of Framework document has been reviewed and updated by the Air Traffic Flow management- Information Requirements- Small Working Group (ATFM/IR/SWG). The ATFM/IR/SWG consists of Subject matter Experts (SMEs) nominated by different APAC States and International Organizations (IO). The SWG held a series of virtual meetings and coordinated electronically to draft this edition.

EXECUTIVE SUMMARY

Development of Regional Framework for Collaborative ATFM

3.1 The Asia-Pacific (APAC) region is the world's largest market for air transport. Asia-Pacific countries jointly accounted for nearly 35 percent of the world's revenue passenger kilometres (RPK) in 2019, up from 24 percent in 2004, and six of the region's airports ranked among the world's 15 busiest airports by passenger throughput traffic compared to just two in 2004.

3.2 The coronavirus (COVID-19) pandemic has had a devastating impact on the aviation industry globally as nearly all air travel came to a halt in late March and April 2020. The impact in APAC region has been the most severe as virtually all scheduled international flights were suspended and several countries also implemented bans on domestic air travel in an attempt to contain the spread of COVID-19. In 2019, international travel within Asia represented 13.3 percent of global international travel, ranking it as second biggest market after the intra-Europe market. In 2021 Asia's share fell to 1.5 percent. Air Traffic in Asia-Pacific region is predicted to record the slowest improvement this year (2022), achieving only 62% of 2019 levels.

3.3 While recognizing that the first response to increased demand should always be an increase in capacity, the growing demand/capacity imbalance in the Region has resulted in increasing congestion, delays, costs and potential safety risks.

3.4 The need for a regional, network-based response to the challenges of increasing demand was recognized by APANPIRG/24 (June 2013) in its adoption of Conclusion 24/15: Asia/Pacific ATFM Steering Group, re-convening the ATFM/SG to develop a common Regional ATFM framework addressing ATFM implementation and ATFM operational issues in the Asia/Pacific Region. It was further recognized in the inclusion of the ASBU module B0-NOPS – Improved Flow Performance through Planning based on a Network- Wide View among the ten priorities and targets for the Asia/Pacific Region.

3.5 The scope of work of the ATFM/SG was further expanded by new terms-of-reference, endorsed by APANPIRG/25 (September 2014), which required the Steering Group to research and recommend appropriate ATFM guidance, and maintain an overview and review the effectiveness of Asia/Pacific CDM/ATFM programs.

3.6 The ATFM/SG developed the APAC Regional Air Traffic Flow Management Concept of Operation (ATFM CONOPS), version one, in 2015 and the Asia/Pacific Regional Framework for Collaborative ATFM in 2017.

3.7 With gathering pace of Airports Collaborative Decision Making (A-CDM) implementations across the APAC Region Airports, the Aerodrome Operations and Planning Group (AOPWG/4) recognized that benefits accrue by the implementation of Airport Collaborative decision Making (A-CDM) at high density aerodromes. States were facing implementation challenges which included lack of guidance materials and awareness, lack of coordination procedures, financial constraints and unavailability of IT supporting systems at the airports, training needs and lack of qualified human resources. Hence formation of a task force for development of guidance material was proposed.

3.8 APANPIRG/27 (September 2016) in Decision 27/2 approved the establishment of A-CDM Task Force (ACDM/TF). The Airport Collaborative Decision Making Task Force (ACDM/TF) was formed in 2017 . The ACDM Task Force objective was to assist States to overcome the challenges in A-CDM implementation.

3.9 The ACDM/TF focussed on reviewing the current status of A-CDM implementation in

APAC Region, the effectiveness of existing A-CDM programmes in the APAC Region and the degree of harmonization with global guidance material. The TF analysed the ICAO Global A-CDM guidance in Doc 9971 to determine the need for and develop any necessary APAC Regional implementation guidance. The ACDM/TF developed APAC A–CDM Implementation Plan, in July 2021.

3.10 In the APAC region, the SWIM Task Force (SWIM TF) has been established since 2017 to develop SWIM-related components and supporting materials required for the implementation in the APAC region. The work of SWIM TF also includes the coordination with other Working Groups/Task Forces under APANPIRG to ensure that the operational requirements, particularly the ones specific to the region, are reflected and incorporated accordingly in the regional implementation strategies. SWIM TF/3 held in May 2019 agreed that the SWIM implementation to support cross-border ATFM operation should be given high priority.

3.11 In the 11th meeting of ATFM/SG it was noted that the Asia Pacific Airport Collaborative Decision Making Task Force (ACDM/TF) had achieved its objectives and accomplished the most of the tasks assigned under its Terms of Reference and hence it was recommended that Airport Collaborative Decision Making (ACDM) Task Force – ACDM/TF be dissolved and tasks of ACDM/TF be included in the tasks list of ATFM/SG . The decision was later approved by APANPIRG/32 in December 2021.

3.12 ATFM/SG/11 meeting proposed to undertake review of the APAC Regional Collaborative ATFM Framework document by the ATFM Information Requirements -Small Working Group (ATFM/IR/SWG). The ATFM/IR/SWG functions through subject matter experts (SMEs) nominated by States and International Organizations. The ATFM/SG/11 meeting also agreed upon the scope of the work on the amendment of the Framework. The current edition is the product of the review thus undertaken.

Distributed Multi-Nodal Network ATFM Concept

3.13 The ATFM/SG/11 meeting also stressed that amendments to the Framework must remain aligned with the APANPIRG-approved Asia/Pacific ATFM Concept of Operations.

3.14 The core concept of the Framework is the Distributed Multi-Nodal ATFM Network, i.e. a network of Air Navigation Service Providers (ANSPs) and/or Sub-Regional Groups leading independent ATFM operation within their area of responsibility and connecting to each other through information sharing framework. The ATFM operations in each node will be based on regionally agreed principles and high-level operating procedures.

3.15 The concept has been accepted into the Asia/Pacific Regional Framework for Collaborative ATFM as a viable solution for the region.

3.16 A description of the concept is provided in **APAC ATFM Concept of Operations Document at https://www.icao.int/APAC/Documents/edocs/Regional ATFM Concept of Operations.pdf.**

Interoperability is the Key

3.17 The Framework takes into account the ATFM development initiatives undertaken by various States to balance demand and capacity within their airspaces. Recognizing the need to adopt a network wide view for improving the flow performance across the APAC region, the Framework has been developed in line with ATM performance improvement elements of Asia Pacific Seamless ANS Plan.

3.18 A key consideration in the development of Version 3.0 of the Regional Framework for

Collaborative ATFM was the interoperability of systems, procedures and practices to ensure not only regionally harmonized ATFM, but also the effective, complementary operation of other systems forming part of the gate-to-gate chain of air traffic management. It is vital that all systems and processes use common information, terminology and communications protocols to ensure common understanding and optimal outcomes. In particular, the interoperability of ATFM, Airport Collaborative Decision-Making (A-CDM), Arrival Manager (AMAN) and Departure Manager (DMAN) systems, and airspace user and ATM automation system interfaces, is critical to the success of a regional ATFM program and the optimized use of available capacity.

3.19 ATFM/SG addressed these issues in the development of harmonized ATFM terminology and the specification of automated system communications protocols, and through its linkage to the ICAO Asia/Pacific Region Aerodromes Operations and Planning Working Group (AOP/WG), Meteorological Sub-Group (MET SG) and APAC System Wide Information Management – Task Force (SWIM TF) .

3.20 In this edition, the interoperability requirements of ATFM and ACDM systems have been described.

ABBREVIATIONS AND ACRONYMS

AAR	Airport Arrival Rate
ADEP	Departure Airport
ADES	Destination Airport
ACDM	Airport Collaborative Decision Making
ATM	Air Traffic Management
ADS-B	Automatic Dependent Surveillance-Broadcast
ADS-C	Automatic Dependent Surveillance-Contract
AFP	Airspace Flow Program
AIDC	ATS Inter-facility Data Communications
AIGD	ICAO ADS-B Implementation and Guidance Document
AIM	Aeronautical Information Management
AIRAC	Aeronautical Information Regulation and Control
AIS	Aeronautical Information Service
AIXM	Aeronautical Information Exchange Model
AMAN	Arrival Manager
ANSP	Air Navigation Service Provider
AOM	Airspace Organization and Management
APAC	Asia/Pacific
APANPIRG	Asia/Pacific Air Navigation Planning and Implementation Regional Group
ASBU	Aviation System Block Upgrade
ATC	Air Traffic Control
ATFM	Air Traffic Flow Management
ATM	Air Traffic Management
CDM	Collaborative Decision-Making
CCO	Continuous Climb Operations
CDO	Continuous Descent Operations
CIBT	Calculated In Block Time
COM	Communication
CONOPS	Concept of Operations
COFT	Calculated Over Fix Time
CNS	Communications, Navigation, Surveillance
CPDLC	Controller Pilot Data-link Communications
CSP	Communication Service Provider
CTA	Control Area
CTR	Control Zone
CTOT	Calculated Take Off Time
COBT	Calculated Off_Block Time
CLDT	Calculated Landing Time
DGCA	Conference of Directors General of Civil Aviation
DMAN	Departure Manager
DME	Distance Measuring Equipment
DLA	Delay
EET	Estimated Elapsed Time
ETA	Estimated Time of Arrival
EST	Coordinate Estimate
FIR	Flight Information Region
FIRB	Flight Information Region Boundary
FMP	Flow Management Position
FOC	Flight Operations Centre
FUA	Flexible Use Airspace
GANP	Global Air Navigation Plan

GASP	Global Aviation Safety Plan
GBAS	Ground-based Augmentation System
GDP	~~Gross Domestic Product~~ Ground Delay Program
GSt	Ground Stop
GLS	GNSS Landing System
GNSS	Global Navigation Satellite System
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
IO	International Organizations
KPA	Key Performance Area
MIT	Miles-in-Trail
MINIT	Minutes-in-Trail
MET	Meteorological
METAR	Meteorological Aerodrome Report
MTF	Major Traffic Flow
OPMET	Operational Meteorological
PARS	Preferred Aerodrome/Airspace and Route Specifications
PASL	Preferred ATM Service Levels
PBN	Performance-based Navigation
PIA	Performance Improvement Areas
PKP	Passenger Kilometres Performed
RANP	Regional Air Navigation Plan
RPK	Revenue Passenger Kilometres
RNAV	Area Navigation
RNP	Required Navigation Performance
RVSM	Reduced Vertical Separation Minimum
SAR	Search and Rescue
SBAS	Space Based Augmentation System
SID	Standard Instrument Departure
SIGMET	Significant Meteorological Information
STAR	Standard Terminal Arrival Route or Standard Instrument Arrival (Doc 4444)
STCA	Short Term Conflict Alert
STS	Special Handling Status
SUA	Special Use Airspace
SUR	Surveillance
SWIM	System-Wide Information Management
TAF	Terminal Area Forecast
TBO	Trajectory Based Operations
TCAS	Traffic Collision Avoidance System
TMI	Traffic Management Initiative
TOC	Transfer of Control
UAS	Unmanned Aircraft Systems
UPR	User Preferred Routes
UTC	Coordinated Universal Time
VHF	Very High Frequency
VMC	Visual Meteorological Conditions
VOLMET	Volume Meteorological
VOR	Very High Frequency Omni-directional Radio Range
VVIP	Very-Very Important Person
WAFC	World Area Forecast Centre

APAC REGIONAL COLLABORATIVE ATFM FRAMEWORK -PRINCIPLES,

PROCEDURES AND PRACTICES

ATFM Principles

5.1 The major areas of Collaborative ATFM principles are mainly aligned with those of the Asia/Pacific Seamless ANS Plan (APSAP); People (human performance), Facilities (physical equipment), and Technology and Information. The APSAP describes 37 principles in respect of People, Facilities and Technology and Information covering the entire spectrum of ANS Services. The principles relevant to implementation of ATFM and ACDM are included **Appendix A**.

Aviation System Block Upgrades (ASBU)

5.2 At the Global level, ICAO started the ASBU initiative as a programme framework that developed a set of aviation system solutions or upgrades intended to exploit current aircraft equipage, establish a transition plan and enable global interoperability. ASBUs comprised a suite of modules organised into flexible and scalable building blocks, where each module represented a specific, well bounded improvement. The building blocks could be introduced and implemented in a State or a region depending on the need and level of readiness, while recognizing that not all the modules were required in all airspaces. ASBUs described a way to apply the concepts defined in the Doc 9854 with the goal of implementing regional performance improvements and were used in the new edition of the GANP to guide implementation.

5.3 ASBU are groups of operational improvements to advance air navigational capabilities and improve the performance of their air navigation system in a cost effect way. They are classified into three functional categories:

- Information;
- Operational; and
- CNS Technology and Services.

5.4 Within the ASBU framework in the Operational Category is the Module thread for Network Operations (NOPS), which aims to guide the development of air traffic flow management (ATFM) operation towards the envisaged end goal of shifting ATFM from trajectory management to airspace constraints management enabled by timely and precise information. The Global Air Navigation Plan (GANP-Ed.6,2019) also recognised Airport Collaborative Decision Making (A-CDM) as an important operational enabler for tactical flow management at airports and terminal airspace.

5.5 The 30th Meeting of the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG/30, 2019) endorsed 16 Priority-1(ASBU Block 0 and 1 and Regional) Elements , as recommended in the Asia Pacific Seamless ANS Plan Version 3.0., as follows:

a) Aeronautical Meteorology: AMET-B0/1 – 4;
b) Aeronautical Information Management: DAIM-B1/1 – 6*;
c) Airport CDM: ACDM-B0/1 – 2;
d) ANSP human and simulator performance (Regional);
e) ATS Inter-facility Datalink Communications: FICE-B0/1;
f) Ballistic launches/space re-entry management (Regional);
g) Civil-Military Special Use Airspace (SUA) management (Regional);
h) Civil-Military strategic and tactical coordination (Regional);

i) Core data communications: VDL Mode O/A and AMHS COMI-B0/3, 7;

j) Direct and Free Route Operations: FRTO-B0/1 – 4;

k) Enhanced SAR systems (Regional);

l) Ground-based Surveillance: ASUR-B0/1 – 4;

m) Network Operations: NOPS-B0/1 – 5;

n) Performance-based Navigation Approach Procedures: APTA-B0/1 – 2;

o) Runway Sequencing: RSEQ-B0/1 – 2; and

p) Safety Nets SNET-B0/1 – 4

5.6 The Asia Pacific Seamless ANS Plan has recommended implementation of A-CDM-B0/1-2 and NOPS-B0/1 – 5 as Priority 1, i.e., which is considered as critical upgrade assignment essential to achieve the service level required regionally and globally.

5.7 The Version 3.0 of the Framework had considered Network Operations-NOPS-B0/1-5 modules for developing guidance material on Regional ATFM Framework implementation. This version of the Framework document, in addition, has considered Airport CDM (A-CDM)-B0/1-2 modules for inclusion in the guidance material for Regional ATFM implementation so as to ensure harmonized and interoperable system implementation across Airports and Airspace.

Asia/Pacific Region ATFM Operational Concept

5.8 The Regional ATFM Concept of Operations is based on the Distributed Multi-Nodal ATFM Network concept, which exists as a network of ANSPs leading independent ATFM operations within their area of responsibility, and connected to other ANSPs and stakeholders through effective information sharing with collaborative decision-making mechanism. The concept, adopted by ATFM/SG as the foundation for a Regional ATFM concept and implementation strategy, with the implementation date of 7 November 2019 in alignment with the Seamless ANS Plan.

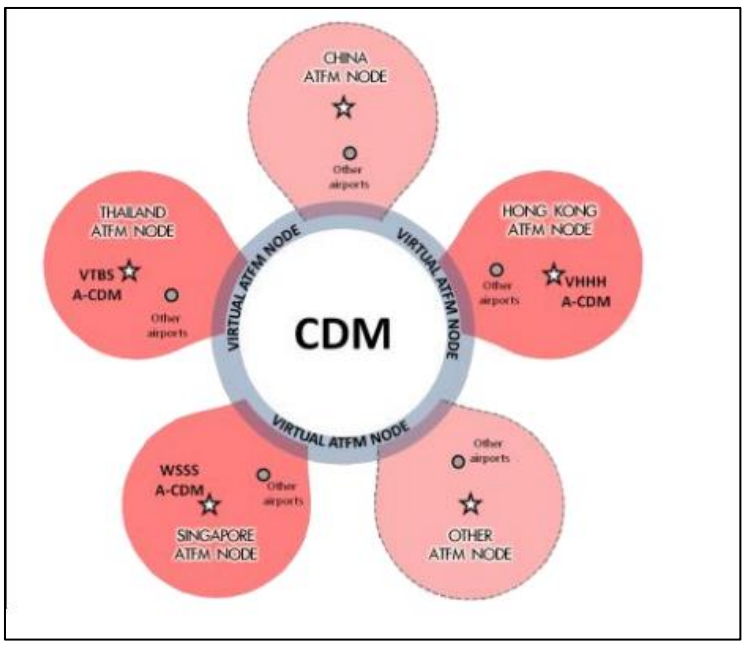


Figure 2: A Distributed Multi-Nodal ATFM Network

5.9 The concept recognizes that a centralized ATFM Unit (ATFMU) approach is not yet

practicable for the Asia/Pacific region. At the centre of the concept is the distributed multi-nodal ATFM network, illustrated in Figure 2.

5.10 The Regional ATFM Concept of Operations document is available at https://www.icao.int/APAC/Documents/edocs/Regional ATFM Concept of Operations.pdf .

Collaborative Decision Making

5.11 ICAO Doc 9971 defines Collaborative Decision Making:

> *CDM is a process applied to support other activities such as demand/capacity balancing. CDM can be applied across the timeline of activities from strategic planning (e.g., infrastructure investments) to real-time operations. CDM is not an objective but a way to reach the performance objectives of the processes it supports. These performance objectives are expected to be agreed upon collaboratively. Since implementing CDM likely will require investments, these will need to be justified in accordance with the performance-based approach.*

5.12 One key to the successful implementation of an effective ATFM service is achieving a robust coordination among aviation stakeholders. It is envisioned that ATFM is performed as a collaborative decision-making (CDM) process where aerodromes, ANSPs, airspace users (AUs) and other stakeholders work together to improve the overall performance of the ATM system. It is likewise envisioned that such coordination will take place within a flight information region (FIR), between FIRs and ultimately, between ICAO regions.

5.13 Key components and characteristics of the different ATFM/CDM concepts are shown below in Table 1:

Features	**Domestic ATFM**	**Regional ATFM**	**Regional ATFM Cross-Border Multi-Nodal**
Capability and Functionality	ANSP has an independent ATFM system.	Centralized ATFM organization for multiple ANSPs within a geographical region.	Each ANSP has an independent ATFM system which is connected in a distributed ATFM network sharing ATFM information.
	ANSP manages demand/capacity of its own airspace and airport(s).	Shared responsibility between each local FMU and central unit for management of demand/capacity of each ANSP's airspaces and airport(s).	ANSP independently manages demand/capacity of its own resources.
	Only domestic traffic is subject to ATFM measures.	Geographical region's flights subject to ATFM measures.	Flights participating in ATFM nodes within the region subject to ATFM measures.
Specify capacity and demand prediction	CDM is performed by stakeholders via software web interfaces or accepted messaging protocols.	Multi-level CDM processes and applications via web interfaces and accepted messaging protocols (legacy and SWIM messaging) applied in all	CDM is performed by stakeholders via software web interfaces or accepted messaging protocols.

		ATFM processes.	
	National procedures published by each State in the national regulations and AIP.	Common set of procedures for the geographical region's ATFM contained in the Regional Supplementary Procedures (Doc 7030) and common operations manual.	Individual procedures published by each ANSP, though normally coordinated and harmonized based on common operating procedures.
		Centralized compliance measurement and reporting.	
	Demand prediction – flight progress is via manual input or automated data feed (e.g., FDP, AMHS, or AFTN).	Demand prediction – centralized flight planning function ensures single and accurate demand picture throughout the region.	Demand prediction – flight progress is via manual input or automated data feed (e.g., FDP, AMHS or AFTN) to each node.
		ATFM measure assignments are automatically dispatched to all affected stakeholders and are visible via web interfaces and SWIM messaging.	
	Capacity management – inputs from FMP and FOC are via ATFM web-based interface.	Capacity management – inputs from FMP and FOC are via ATFM web-based interface. All constraints are reconciled to avoid conflicting measures.	Capacity management – inputs from FMP and FOC are via ATFM web-based interface. Conflicting ATFM measures must be manually resolved.
Evaluate Alternatives, Initiate/ Modify ATFM Measures	Aircraft operators perform CDM with airport operators for ground/surface delay intent.		
	ATFM slot assignments can be viewed via software, web interface and notifications.		

Table 1 : ATFM/CDM Concepts

5.14 Cross-border ATFM/CDM should provide opportunities for the efficient exchange of operational and strategic information for all stakeholders, ensuring strategic cooperation towards achieving the objectives of seamless ATM ANS and optimization of traffic flows across the region.

5.15 Regional ATFM in its basic principles, is no different from domestic ATFM: it relies on transparency, information exchange and collaboration. The difference arises from the number and variety of stakeholders. This generates additional complexity but yields a significant benefit as it allows providers from various States to collaborate and anticipate rather than be confronted with the consequences of ATFM measures implemented locally.

5.16 CDM partners and stakeholders should include:

- States, establishing regulations and overseeing safety and compliance;

- ANSPs, implementing ATFM capability;
- International Organizations such as ACI, CANSO, IATA and IFATCA;
- International ATFM Organizations (to share tactical flight data through ATFMU) – EUROCONTROL, FAA;
- Airport operators; and
- CDM-participating airlines.

5.17 Each State will develop ATFM capability according to its needs and requirements, and the overarching goal of seamless ATM across the Asia/Pacific Region.

5.18 The Regional concept for cross- border ATFM is based on a distributed multi-nodal ATFM network concept. Under this concept each State/Administration participating collaboratively in cross-border ATFM will form a node of the multi-nodal network and should be led by an agreed ANSP as the Node Leader.

5.19 Within an ATFM node there may be a number of airport operators, and airspace users and other stakeholders with a access to the node arranged by the Node Leader, facilitating their participation in the cross-border ATFM initiative.

5.20 The Node Leader should be responsible for engagement with the various Nodes stakeholders and ensuring the Node is ready and able to participate in the Regional Cross-b Border ATFM process. The processes within a node to enable this readiness may vary from node to node, and be applicable to the particular environment within the State(s). However, the readiness to engage with the regional cross- border multi- nodal system should be in accordance with the Regional Framework for Collaborative ATFM and its underlying distributed multi-nodal ATFM network concept, and any specific procedures identified and agreed by the multi-nodal participants. The Node Leader is responsible for ensuring compliance and therefore readiness to participate in the APAC cross-border multi-nodal ATFM initiative.

5.21 ANSPs and airspace users may participate in transition or trial participation leading to their full participation in the multi-nodal ATFM network. An example of tiered trial participation levels for ANSPs and airspace users is provided at **Appendix B**.

ATFM Phases

5.22 ICAO Doc 9971 describes a methodology to balance demand and capacity which can be accomplished through the application of an "ATFM planning and management". ATFM execution consists of three phases: strategic, pre-tactical, and tactical. These phases should not be considered as concrete steps, but rather as a continuous planning, action and review cycle that is fully integrated in the ATM planning and post-operations processes, three phases of ATFM execution; strategic, pre-tactical and tactical, illustrated in Figure 3.

5.23 The **Strategic ATFM phase** generally encompasses measures taken more than one week prior to the day of operation. Much of this work is accomplished two months or more in advance. This phase applies the outcomes of the ATM planning activities. It takes advantage of the increased dialogue between AUs and capacity providers, such as ANSPs and airports, in order to analyse airspace, airport and ATS restrictions, seasonal meteorological condition changes and significant meteorological phenomena. It also seeks to identify, as soon as possible, any discrepancies between demand and capacity in order to jointly define possible solutions which would have the least impact on traffic flows. These solutions are not set in stone and may be adjusted according to the demand foreseen in this phase.

5.24 The **Pre-Tactical ATFM phase** normally spans from one day to one week prior to operations. During this phase, the traffic demand for the day is analysed and compared to the predicted available capacity. The plan, developed during the strategic phase, is then adapted and adjusted accordingly. The main objective of the pre-tactical phase is to optimize capacity through an effective organization of resources (e.g., sector configuration management, use of alternate flight procedures).The work methodology is based on a CDM process established between the stakeholders (e.g., flow management unit (FMU), airspace managers, AUs

5.25 **Tactical ATFM solutions** and measures are adopted on the day of the operation. Traffic flows and capacities are managed in real time. The ADP is amended taking due account of any event likely to affect it. During this phase, any opportunity to mitigate disturbances should be used. The need to adjust the original ADP may result from staffing problems, significant meteorological phenomena, crises and special events, unexpected opportunities or limitations related to ground or air infrastructure, more precise flight plan data, the revision of capacity values, etc..

5.26 **Post-operations analysis is the final phase** in the ATFM planning and management process. During this phase, an analytical process is carried out to measure, investigate and report on operational processes and activities. This process is the cornerstone in developing best practices and/or lessons learned that will further improve the operational processes and activities. The process should also include an analysis of items such as anticipated and unanticipated events, ATFM measures and delays, the use of predefined scenarios, flight planning and airspace data issues.

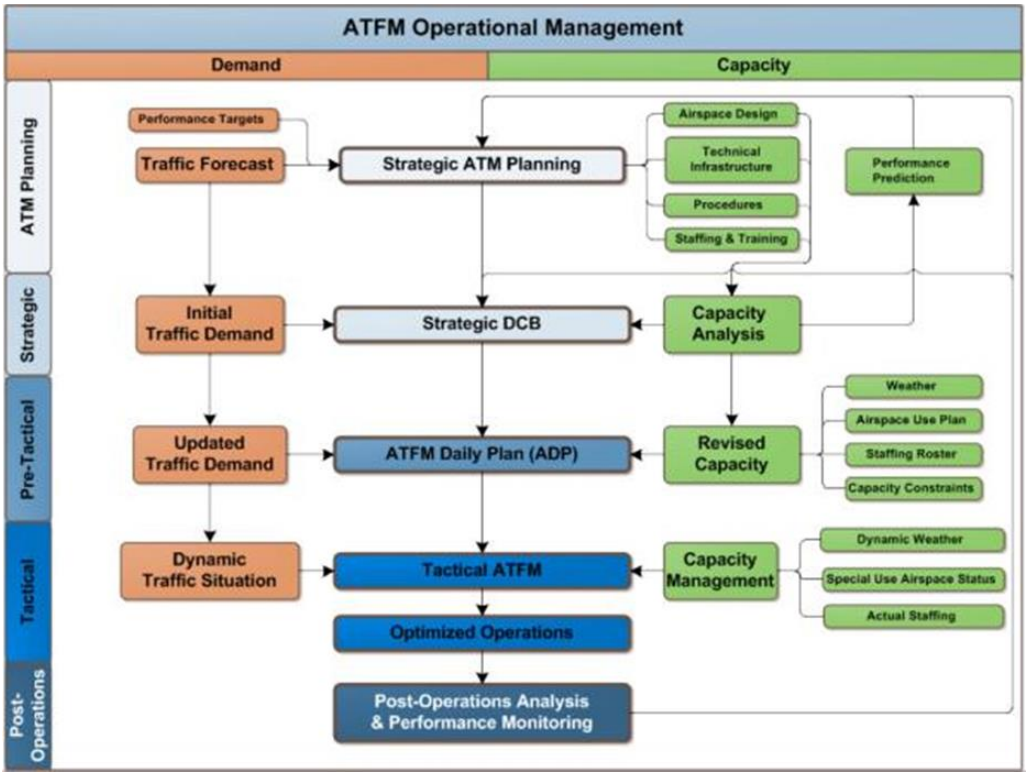


Figure 3: ATFM Operational Management

5.27 These phases of ATFM execution should not be considered as concrete steps, but rather as a continuous planning, action and review cycle that is fully integrated in the ATM planning and post-operations processes. The involvement of operational stakeholders in each phase is of utmost importance.

5.28 The timely application of measures in all three ATFM phases requires a fundamental

understanding of airport and airspace capacity, and the continuous assessment of capacity and the factors that impact upon it.

Capacity Planning, Assessment and Declaration

5.29 Annex 11 to the Convention on International Civil Aviation (Air Traffic Services) defines declared capacity as a measure of the ability of the ATC system or any of its subsystems or operating positions to provide service to aircraft during normal activities. It is expressed as the number of aircraft entering a specified portion of airspace in a given period of time, taking due account of weather, ATC unit configuration, staff and equipment available, and any other factors that may affect the workload of the controller responsible for the airspace.

5.30 The primary areas of capacity assessment and declaration for ATFM are Airport Arrival Rate (AAR), Airport Departure Rate (ADR), and airspace sector capacity. AAR and ADR are usually expressed in terms of movements per hour. Sector capacity may be expressed in terms of occupancy count and/or entry count.

5.31 ICAO Doc 9971 – Manual on Collaborative ATFM provides the following guidance on capacity planning and assessment:

- *Part II Chapter 3 and 4 – Capacity Determination and ATFM Phases and Solutions;*

- *Appendix II-B – Determining the Airport Arrival Rate – An example of a simplified methodology for determining the acceptance rate at an airport, based on scientific process developed by the Federal Aviation Administration (FAA).*

- *Appendix II-C – Determining Sector Capacity – An example of a simplified methodology for determining sector capacity at an area control centre (ACC), based on the process developed by the Federal Aviation Administration for establishing sector capacity.*

- *Appendix II-D – Capacity Planning and Assessment Process – Provides information developed by the European Organisation for the Safety of Air Navigation (EUROCONTROL) related to the ATFM capacity and planning assessment process.*

5.32 Detailed, high quality assessments of ATC sector capacity may also be conducted using fast-time simulations to analyse relevant data and the effects on capacity of proposed ATS changes or improvements. Data inputs include static infrastructure data, traffic data, ATC logic, procedures and task definition, and aircraft performance data.

5.33 Steps in a sector capacity assessment methodology utilizing fast-time simulations include:

i. Collect the necessary airspace and traffic data;
ii. Verify (with the support of local controllers) the traffic sample routes and the procedures used on a flow-by-flow basis;
iii. Correct, refine and insert the information into the model (done by the simulation experts). This includes the ATC procedures used in the sector, standard controller tasks, simulation parameters and aircraft performance parameters;
iv. Run an initial test-run of the model;
v. Verify flight profiles :The knowledge of local controllers can be used to adapt aircraft performance to local conditions, to define and verify sector specific controller tasks together with simulation parameters including conflict detection and resolution mechanisms;
vi. Consolidate a final model which is used to calculate results for all simulation scenarios, e.g. different sector configurations, different traffic samples, etc.;

vii. *Verify the simulation scenarios and the initial results, and if so required, do a fine-tuning of parameters.*

5.34 A fast-time simulation capacity assessment methodology should use a simulation engine that reproduces the ATC environment, and should follow a reiterative process of validation involving licensed ATC staff currently active on the sector/s under assessment. A fast-time simulation capacity assessment methodology should use a simulation engine that reproduces as truly as possible the ATC environment and should follow a reiterative process of validation involving licensed ATC staff currently active on the sector/s under assessment.

Airspace and Airport Capacity Improvement

5.35 Increased capacity is the primary and central method for managing increasing demand. Capacity increases may be achieved by improvements in infrastructure, airspace and ATS route design, procedures and stakeholder behaviours.

5.36 Airspace capacity improvements may be achieved by:

- Improved ATS route design including segregation of inbound, outbound and overflight traffic flows and, where supported by a business case, mandating of RNP specifications for ATS routes;
- Civil-military cooperation, including increased use of FUA to replace SUA;
- Improved ATC sectorization to more evenly apportion workload, including the capability for dynamic sector configuration;
- Segregation of SIDs and STARs in terminal areas to reduce ATC and pilot workload;
- ATM automation system enhancements including automated coordination and hand- off of aircraft between systems (AIDC) and sectors, and transition from paper flight progress-strips to automated, integrated electronic displays and flight plan interfaces;
- Implementation or extension of ATS surveillance services, and surveillance based separations specified in ICAO Doc 4444 (PANS-ATM);
- Implementation of RNP-based separations (RNP 4 or better) in non-surveillance airspace;

5.37 Airport capacity improvements may be achieved by:

- Improved airport design including additional runways, taxiways, parking stands and optimally positioned rapid-exit taxiways as per traffic mix and intensity;
- Harmonized AMAN, DMAN, A-CDM systems and ATFM systems;
- Analysis and improvement of runway occupancy times through enhancement of procedures and associated pilot practices;
- Implementation of precision approaches to all runways

5.38 The Seamless ANS Plan includes performance objectives aimed to improve airspace and airport capacity in the Asia/Pacific Region. The Performance Improvement Plan of this Framework includes capacity improvement objectives that are complementary to or expanding upon those of the Seamless Plan.

Demand Capacity Balancing (DCB)

5.39 Assessment of Capacity and Demand are integral part of ATFM process. The assessment process is carried out in different time spans as described in ATFM Phases above. Increase of (airport,

airspace) capacity to meet the forecast demand is the most preferred option. However, when most of the airports or airspaces are running at or near capacity, any capacity reducing event will create a demand-capacity imbalance. **Appendix C** provides a brief outlook on the DCB process and ATFM data requirements.

Airport Collaborative Decision Making (A-CDM)

5.40 Airport collaborative decision making is a process in which key stakeholders airport operators, airlines, other flight operators (e.g., general aviation), ground handlers, air navigation service providers (ANSPs)and air traffic flow managers - make joint operational decisions based on a shared set of operational data.

5.41 At its core, A-CDM is focused on enhancing the efficiency and utilization of airport, air traffic, and aircraft operator resources via collaborative and data-driven decision making. Often these decisions are associated with the real-time or near real-time sequencing of aircraft operations on the airfield in response to changing operational, environmental, or physical conditions at the airport or in the airspace near the airport.

5.42 In more advanced applications, A-CDM can also incorporate information regarding changing ATM network conditions—including airspace constraints in the enroute environment and conditions at other airports upstream and downstream from the airport of interest—and non-aeronautical constraints—including passenger processing or baggage handling constraints in airport terminals.

5.43 Regardless of the breadth of activities considered in a particular A-CDM implementation, the conceptual focus of the decision-making process is the same—determining how to equitably and efficiently sequence outbound (i.e., departing), inbound (i.e., arriving), and repositioning aircraft operations on the airfield to (1) reduce aircraft delays, (2) equitably distribute what delays cannot be eliminated, and (3) enhance the utilization of airport facilities, particularly aircraft parking stands.

5.44 Part III of Doc 9971 Manual on ATFM provides guidance on the implementation of A-CDM, It explains the basic concept of A-CDM, its benefits, basic elements such as variable taxi-time and coordination between ATFM and A-CDM systems. On the implementation of A-CDM, it explains how to engage with implementation partners, their roles, project, and manage the project, and highlights the importance of measuring the success of an A-CDM system with KPIs. Furthermore, in the form of appendices to it, Part III of Doc 9971 illustrates these concepts with practical examples such as an MOU template between A-CDM partners for cooperation, a template of generic AIP provided by Eurocontrol for States to implement A-CDM, a template MOU contributed by FAA of USA for data exchange, and a list of examples of KPI for the measurement of the effectiveness of A-CDM.

ATFM-ACDM Integration

5.45 Airport-CDM and ATFM systems should be integrated to facilitate collaboration, improve airport operations, especially for better capacity planning and operational performance at other airports. See chapter 8 of APAC A-CDM Implementation Plan for more information on integration between A-CDM and ATFM.

5.46 Airport-Collaborative Decision Making (A-CDM) and Air Traffic Flow Management (ATFM) are collaborative processes, with a common objective to optimize resources and improve efficiency in an airspace or airport. Through the integration of both systems, useful departure and arrival information could be exchanged to ensure that a common situational awareness is established for CDM stakeholders to enable effective decision-making.

Using the A-CDM milestones approach as a guideline for local ATFM-ACDM integration

5.47 The A-CDM milestones should be considered for the development and implementation of interoperability among A-CDM and ATFM systems. Each milestone could be a certain point in time or an operational event at the inbound, turn around or outbound phase of a flight. The definition and the associated actions of each milestone need to be defined and decided in accordance with local arrangements.

Formulation of baseline demand prediction for ATFM operations

5.48 The integration of ATFM and A-CDM Systems enables the sharing of schedule arrival and departure flight information from the A-CDM System to the ATFM System. The airport slot data in the ATFM System are automatically updated to obtain a reliable demand prediction. The data associated with flight intent that can be provided to ATFM services for use in demand predictions can be found in, Paragraph 5.4.4 on Data type description and harmonization Chapter 5 (ATFM service interfaces) of Doc 9971.

Information used to provide A-CDM in ATFM systems

5.49 The information that could be used to provide A-CDM in ATFM systems can be found in Doc 9971, Chapter 3, A-CDM methods and tools, Para 3.5.2, Groups/types of information. The figure 3 below provides the overview of the various information in A-CDM application.

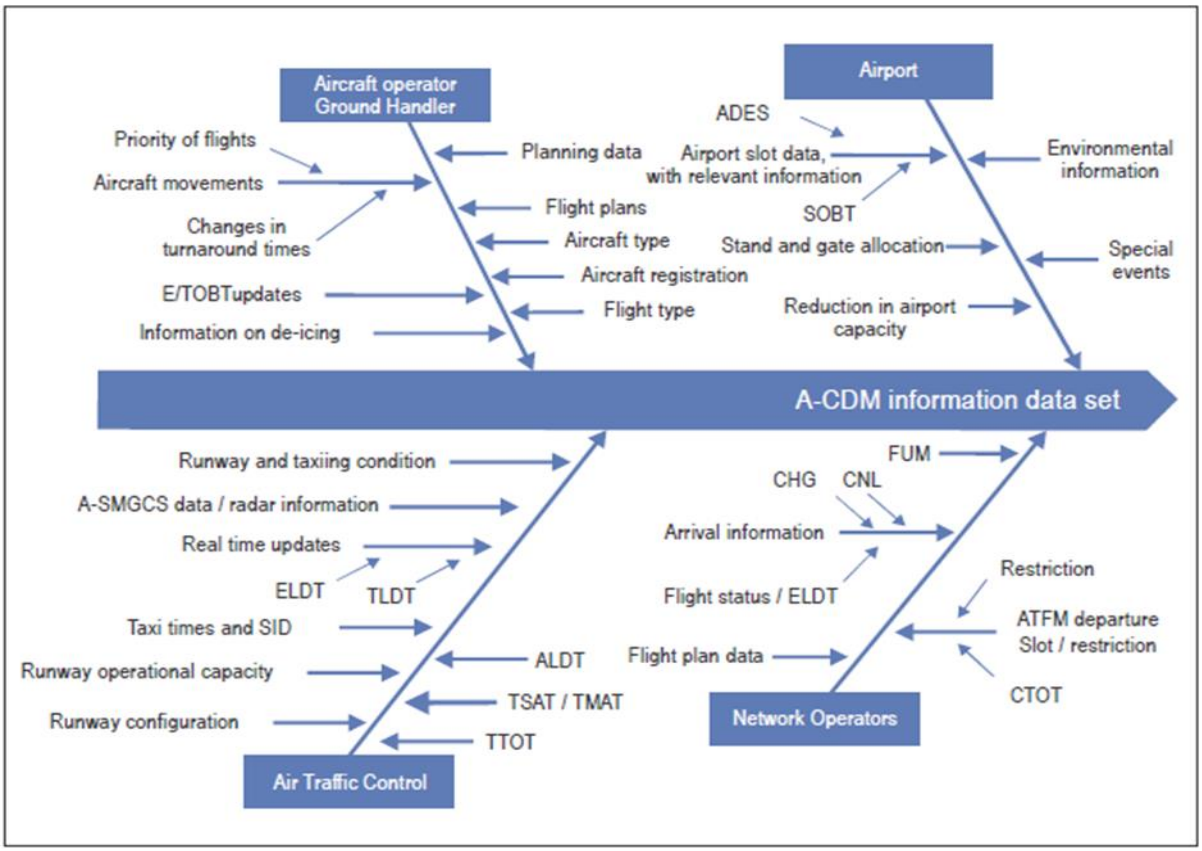


Figure 4: A-CDM Information data set

Sharing arrival information between ATFM and A-CDM Systems

5.50 The purpose of A-CDM during the inbound phase is to enhance the distribution and use of advance arrival information to/by stakeholders when the flight is inbound to the CDM airport. Flight Update Messages (FUM), or equivalent, are sent to the A-CDM System from the ATFM System to

update on the progress of a flight. The details on the distribution of information can be found in Doc 9971, Chapter 3 on A-CDM methods and tools; and Para 3.4.4 on the inbound phase.

Sharing departure information between ATFM and A-CDM Systems

5.51 The purpose of A-CDM for the outbound phase is to optimize planning of the departing flights. The details on the distribution of information can be found in Doc 9971, Chapter 3, A-CDM methods and tools; and Para 3.4.6, Departure- outbound phase.

Sharing ATFM Measure Information

5.52 ATFM Measures (CTOTs) affect departing flights from A-CDM Airport. Exchanging this information timely through integration between ATFM and A-CDM would enable pre-departure sequencer to generate TSATs accordingly. By sharing this information, stakeholders can have increased awareness about departure flow and restrictions.

ATFM Daily Plan

5.53 ICAO Doc 9971 – Manual on Collaborative ATFM states that the organization and structure of the CDM process depends on the complexity of the ATFM system in place, and must be structured to ensure that the affected stakeholders, service providers and airspace users can discuss airport and airspace capacity and demand issues through regular meeting sessions and formulate plans that aim to optimize the efficiency of the ATM system while balancing demand and capacity by taking all pertinent aspects and points of view into account.

5.54 Frequent tactical briefings and conferences can be used to provide an overview of the current ATM situation, discuss any issues, and provide an outlook on operations for the coming period. They should occur at least daily but may also be scheduled more frequently depending on the traffic demand and capacity situation (e.g. an evolving meteorological event may require that the briefing frequency be increased). Participants should include involved ATFM and ATS units, airspace user representatives, affected military authorities and airport authorities, as applicable.

5.55 The output of these daily conferences should be the publication of an ATFM daily plan (ADP) and should include subsequent updates. The ADP should include a proposed set of ATFM solutions (e.g. activation of routing scenarios, miles-in-trail (MIT), or ground delay program (GDP)) prepared by the ATFM unit and agreed upon by all partners concerned during the planning phase. The ADP should evolve throughout the day and be periodically updated and re-published as required.

5.56 In addition to the daily conferences, the ATFM unit should consider holding periodic and event-specific CDM conferences, with an agenda based on experience. The objective should be to ensure that the chosen ATFM measures are decided through a CDM process and agreed to by all affected stakeholders.

5.57 It is recommended that an ADP cover a 24-hour period, and may, however, cover a shorter period of time, provided that appropriate mechanisms are in place to update the plan on a regular basis. An ADP should include at minimum, the following items of information :

i. Aerodrome or Airspace Sector identification;

ii. Declared Capacity or Operational Capacity (airport and/or airspace sector capacity);

iii. Description of constraints;

iv. Time frame

v. Proposed ATFM measures; and

vi. Remarks/other relevant information

A template for the ATFM daily plan is provided at **Appendix D**.

5.58 To facilitate network-wide situational awareness in the Asia/Pacific region, and to ensure ADPs can be distributed and processed by regional stakeholders, the ADP exchange procedure has been developed. States/Administrations wishing to share ADPs should follow the procedure outlined in the Asia/Pacific ATFM Daily Plan (ADP) Exchange Procedure (working draft) accessible at ICAO Asia/Pacific Regional Office's eDocument webpage - https://www.icao.int/APAC/Pages/eDocs.aspx

5.59 An important component of the CDM process is post-operations analysis, including consideration of feedback from airspace users, airports operators, ATS and other ATFM units. The feedback can be used for the continuous improvement of pre-tactical and tactical planning. It can help identify the reason(s) for ATFM solutions and corrective actions that can be used to avoid reoccurrence and to improve upon the implemented solutions. It is recommended, therefore, that post-operations analysis result of the previous day's operations, if applicable, be shared during the daily teleconferences. Supplementary conferences focusing on assessing the outcomes of specific ATFM solutions can also be called when the ATFM programs are activated in response to abnormal situations.

Advance Notification of ATFM ~~Notification~~

5.60 Timely dissemination of ATFM information is critical to successful ATFM operations. Whenever possible, ATFM units should provide notice of ATFM measure activation as far in advance as is practicable, considering the balance between providing enough lead time for stakeholders to prepare for the measures and the accuracy of demand-capacity information available for advanced decision-making. ATFM measures activated "with immediate effect", especially ones with significant delay impacts, tend to have many repercussions and create challenges for stakeholders especially airborne aircraft and upstream ATS units. It is advisable, therefore, that ATFM units avoid such short-notice activation as much as practicable, and to open channels for CDM process to properly address the repercussions and challenges faced by stakeholders when these are activated.

5.61 Different ATFM measures require different lead time to activate, and ICAO Doc 9971 provides some guidance on choosing the appropriate ATFM measure given the lead time available. Post-operations analysis, with a focus on stakeholders' ability to comply with the ATFM measures, can be useful in determining whether the lead time provided is enough for stakeholders to respond to the requirements and should therefore be tracked and used to adjust the procedures.

ATFM Coordination Phrases and Terminology

5.62 Recognizing the lack of a current, globally standardized ATFM terminology, ATFM/SG considered the terminologies used by States and organizations advanced in ATFM implementation, both within and external to the Asia/Pacific Region.

5.63 The global development of ATFM has largely been undertaken in isolation by individual ANSPs, EUROCONTROL, ICAO Sub-Regions or other informal groups of States, or by ATFM system vendors. This has resulted in differences in concept development and consequently the technical terms used for operational and technical coordination of ATFM information.

5.64 ATFM/SG developed a set of standardized ATFM terminology for the Asia/Pacific Region to promote harmonization and interoperability of CDM/ATFM systems and procedures. The terminology set is referenced from ICAO Manual on Collaborative ATFM (Doc 9971, 3rd Ed.), adjusted to be appropriate for Asia/Pacific regional use.

5.65 The Asia/Pacific Region ATFM terminology for use in ATFM communications is provided at **Appendix E**.

5.66 In addition, the ATFM/SG also considered the need for a harmonized set of plain-language phrases for ATFM coordination between ATFM units, ATS units, and airspace users, especially as cross-border ATFM coordination generally occurs in plain-language English and many Asia/Pacific States and organizations do not have English as their official/first language. The harmonized set of coordination phrases helps form the starting basis for operational staff to communicate with one another in a cross-border ATFM environment with low risk of miscommunication. The Basic Phrases for Cross-Border ATFM Coordination (working draft) is provided in the ICAO Asia/Pacific Regional Office's eDocument webpage.

Note: The Basic Phrases are for use as an interim procedure, pending development of globally standardized ATFM-related phraseology

ATFM System Communications

5.67 Regional and Global interoperability of communications is critical to the implementation of effective, network-based cross-border ATFM.

5.68 Flight Information Exchange Model (FIXM) is one of the standardized information exchange models developed to enable the global interoperability for the ATM community. Particularly, it is to support the seamless exchange of flight-specific information among ATM stakeholders throughout a flight's lifecycle. FIXM is an equivalent to Aeronautical Information Exchange Model (AIXM) and ICAO Meteorological Information Exchange Model (IWXXM), both of which are developed to provide global standards for the sharing of aeronautical information and meteorological information, respectively.

Figure 5 illustrates the data-level interoperability among stakeholders achieved by FIXM

Figure 5: FIXM Interoperability among Stakeholders

5.69 FIXM is referenced in the FICE ASBU thread of Global Air Navigation Plan, especially in Block 2 and Block 3 timeframes:

- *FICE-B2*
  - *Introduce the FF-ICE Release 1, pre-departure trajectory coordination and synchronization;*

- *Provide mechanisms for collaborative flight information management, which is a basis for initial TBO, through the exchange of flight intent in FIXM format;*
- *Enable the improved capacity utilization based on timely and accurate flight information shared among ATM stakeholders.*

- *FICE B3*
  - *Introduce mechanisms to support the post-departure trajectory coordination and synchronization;*
  - *Enable trajectory management integrated with tactical ATC operations through capabilities to manage trajectory when there are dynamic resource, e.g. airspace, constraints.*

5.70 In November 2019, the FIXM version 4.1 Extension was adopted by APANPIRG/30 to be the Asia/Pacific FIXM version 4.1 Extension for use by Asia/Pacific States/Administrations to support the cross-border ATFM information exchange. With the release of FIXM version 4.2 in February 2021, the Asia/Pacific FIXM version 4.1 Extension have been updated to version 4.2. FIXM version 4.2 (or later), extended where necessary, to accommodate additional regional requirements, is therefore the agreed ATFM information exchange model for exchanging ATFM data between ATFM systems in the Asia/Pacific Region.

5.71 More information on FIXM is available at www.fixm.aero

ATFM Information Distribution

5.72 ATFM Daily Plans and ATFM Measures for individual aircraft may be distributed between ATFM units, ATS units, airport operators, and airspace users by the following means:

- Networked, web-based interface at ATFMU, ATSU and airspace user locations, each forming a node of a distributed multi-nodal ATFM platform; or
- Web-based interface at ATFMU, ATSU and airspace user locations, providing access directly to ATFM information provided by the ATFMU responsible for the initiation of ATFM measures for the destination airport or constrained airspace; or
- SWIM-based technologies to support the exchange of both flight-specific and non-flight-specific information (depending on the exchange model development progress); or
- AFTN/AMHS messages distributed to individual ATSUs and Airspace Users; or
- Email distribution; or
- Voice Coordination

5.73 Considering the scope and performance objectives of this Framework, and the stage of development of the Distributed Multi-Nodal ATFM Network concept, Table 2 outlines the minimum items of ATFM information that ATFM systems should be able to obtain, process, and – for some of the data elements – share with stakeholders.

Flight Event Times					
Applicability	**Flight Plan**	**System**	**Calculated (ATFM**	**Targeted**	**Actual**

		Estimated	**Measure)**	**(A-CDM)**	
Departure Terminal Gate (Airline Intention)	EOBT			TOBT	AOBT
Departure Terminal Gate (ATC Sequencing)				TSAT*	
Departure Runway		ETOT	CTOT*	TTOT	ATOT
RFIX or AFIX		ETO	CTO*		ATO
Arrival Runway		ELDT	CLDT*		ALDT
Arrival Terminal Gate					AIBT
Other Information					
ATFM Daily Plan (ADP)*					

***Note: Items marked with an asterisk (*) are items that should be shared with stakeholders.**

Table 2: Minimum ATFM Information for Distribution and Sharing

ATFM Communications by AFS

5.74 Recognizing that States' needs for ATFM may vary, where necessary ATSUs may participate in collaborative ATFM without having the need for dedicated ATFM systems or terminals. The Aeronautical Fixed Service (AFS) may provide a suitable method for distribution of ATFM measure information to such ATSUs.

5.75 Given that the main ATFM measure used in Asia/Pacific under the Distributed Multi-Nodal ATFM Network concept is the Ground Delay Program (GDP), the ability to exchange Calculated Take-Off Times (CTOTs) and other associated data elements in machine-readable formats over AFS (AFTN/AMHS) between not only ATFM systems but also ATM automation is critical. The ATFM/SG therefore studied the best practices from other regions on the topic, with particular attention paid to the EUROCONTROL Specification for ATS Data Exchange Presentation (ADEXP) which governs the AFS-based exchanges of ATFM slot-related messages within the European ATFM network.

5.76 The study culminated in the development of Asia/Pacific AFTN/AMHS-Based Interface Control Document for Air Traffic Flow Management, a document outlining the various AFTN/AMHS message formats to be used for information exchange during a Ground Delay Program.

5.77 In the interim before the implementation of System-Wide Information Management (SWIM) in the region, the AFTN/AMHS-Based ICD discussed above is the agreed format for ATFM message exchange in Asia/Pacific. The ICD can be found on the ICAO Asia/Pacific Regional Office's eDocument webpage.

Meteorological Information for ATFM

5.78 Where the capability exists, it is recommended that the ANSP collaborates with the State's dedicated meteorological services provider as well as meteorologists of major airspace users, to determine the projected meteorological impact on the available capacity. The upfront involvement of airspace users ensures transparency of the capacity planning process, and then forms the first step of CDM. This level of transparency can greatly assist the effectiveness of downstream CDM in the

operational realm, as early involvement in developing the operational plan results in less blaming between stakeholders and more constructive dialogue

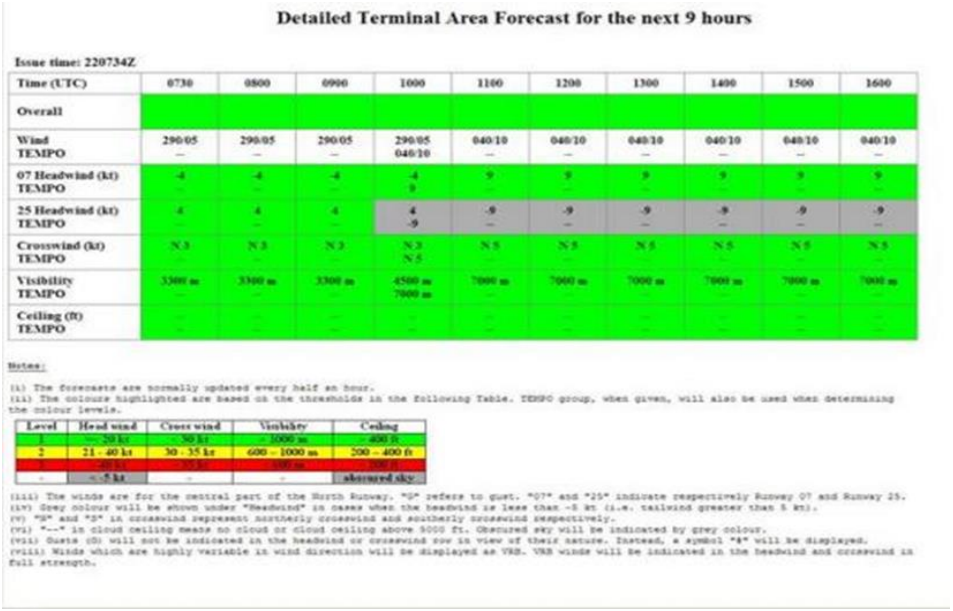
5.79 The accuracy of pre-tactical and tactical demand and capacity assessment is reliant on the predictability of events that will impact capacity. In the case of weather-related constraints, the traditional Annex 3 services in support of aerodrome operations and FIR/Global operations do not fully address the needs of ATFM. While globally, MET authorities are working steadily towards the institutional provision of Meteorological Services to support the Terminal Area (MSTA), there is a greater urgency for ATFM providers to collaborate closely with Met service providers to develop products that bridge the gap between the traditional information.

5.80 The provision of timely, accurate and targeted meteorological information is an important factor in making decisions for the determination of capacity at an aerodrome and/or airspace. Whilst, the weather forecasts and advisory services are expected to be accurate, timely and relevant, there are still uncertainties primarily due to the chaotic nature of the atmosphere. It is also inevitable that uncertainties would grow with forecast time. It is important to factor these in when making ATFM decisions. For determining an effective ATFM measure, in addition to the timing and the severity of a particular weather phenomenon, the probability of the occurrence is also essential to assist in capacity assessment.

5.81 When predicting the capacity of an airport with regard to forecast meteorological conditions, it is important to not only consider the runway/s and immediate airport surroundings, which are covered by the Aerodrome Forecast (TAF) to a distance of 8km, but to also take into consideration the ability for air traffic to flow via the terminal area on the normal arrival routes and instrument approach procedures to that airport. In particular, weather affecting the airspace in the vicinity of the primary holding areas and initial approach fixes can have a significant impact on the delivery of flights into the approach airspace and onto the runway.

5.82 The current Annex 3 provisions do not include provisions for meteorological information that specifically support the determination of weather impact on capacity. OPMET information is typically pilot and/or tactical ATC oriented, with limited ATFM orientation. , and are largely produced in coded text format, which makes rapid interpretation difficult for ATM officers.

5.83 ICAO Annex 3 requires that each Contracting Sate shall determine the meteorological service which it will provide to meet the needs of international air navigation, and that this shall consist of the provision of meteorological information to users that is necessary for the performance of their respective functions. Therefore, to enable rational and quantifiable capacity determination, ANSPs and Meteorological service authorities should collaborate closely to define meteorological services to be provided to support ATM and ATFM decisions, based on specific impact to operations. Such targeted MET information should address key thresholds for various weather criteria which have a quantifiable impact on airport and terminal airspace capacity, such as headwind, crosswind, visibility, ceiling, wind shear, and convective weather at the initial approach fix (IAF) or in the vicinity of critical arrival fixes, holding points and sequencing areas. An example of the simple type of matrix that could be produced, with intuitive colour coding for quick recognition by ATM staff, is shown in Figure 6. In terms of the wider Terminal area, similar defined criteria, thresholds and colour coding can enable rapid interpretation of impact on operations.



Detailed Terminal Area Forecast for the next 9 hours

Issue time: 220734Z

Time (UTC)	0730	0800	0900	1000	1100	1200	1300	1400	1500	1600
Overall										
Wind TEMPO	290/05 –	290/05 –	290/05 –	290/05 040/10	040/10 –	040/10 –	040/10 –	040/10 –	040/10 –	040/10 –
07 Headwind (kt) TEMPO	-4 –	-4 –	-4 –	-4 9	-9 –	-9 –	-9 –	-9 –	-9 –	-9 –
25 Headwind (kt) TEMPO	4 –	4 –	4 –	4 -9	-9 –	-9 –	-9 –	-9 –	-9 –	-9 –
Crosswind (kt) TEMPO	N 5 –	N 5 –	N 5 –	N 5 N 5	N 5 –	N 5 –	N 5 –	N 5 –	N 5 –	N 5 –
Visibility TEMPO	5000 m –	5000 m –	5000 m –	4500 m 7000 m	7000 m –	7000 m –	7000 m –	7000 m –	7000 m –	7000 m –
Ceiling (ft) TEMPO	– –	– –	– –	– –	– –	– –	– –	– –	– –	– –

Notes:

(i) The forecasts are normally updated every half an hour.
(ii) The colours highlighted are based on the thresholds in the following Table. TEMPO group, when given, will also be used when determining the colour levels.

Level	Head wind	Cross wind	Visibility	Ceiling
1	– 20 kt	30 kt	5000 m	400 ft
2	21 - 40 kt	30 - 35 kt	600 – 1000 m	200 – 400 ft
3	-20 kt	-35 kt	500 m	200 ft
-	+/-5 kt	-	-	obscured sky

(iii) The winds are for the central part of the North Runway. "0" refers to gust. "07" and "25" indicate respectively Runway 07 and Runway 25.
(iv) Grey colour will be shown under "Headwind" in cases when the headwind is less than -5 kt (i.e. tailwind greater than 5 kt).
(v) "N" and "S" in crosswind represent northerly crosswind and southerly crosswind respectively.
(vi) "---" in cloud ceiling means no cloud or cloud ceiling above 5000 ft. Obscured sky will be indicated by grey colour.
(vii) Gusts (G) will not be indicated in the headwind or crosswind row in view of their nature. Instead, a symbol "*" will be displayed.
(viii) Winds which are highly variable in wind direction will be displayed as VRB. VRB winds will be indicated in the headwind and crosswind in full strength.

Figure 6: Example Colour-Coded Matrix of Met Information

5.84 An example of IAF and holding stack prediction based on weather intensity and coverage area is shown in Figure 7, using similarly defined criteria and thresholds to facilitate rapid interpretation of the impact on operations.

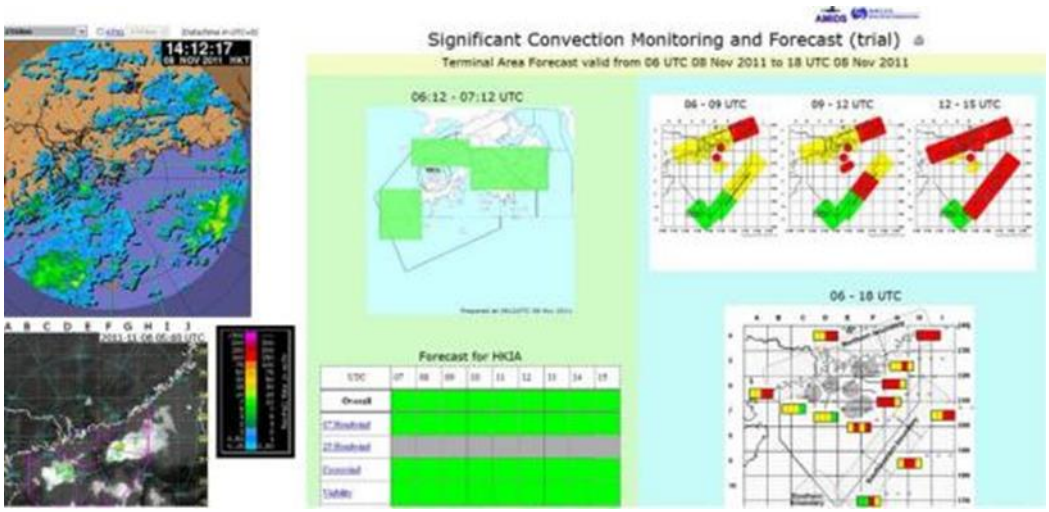


Figure 7: IAF and Holding Stack Weather Prediction

5.85 When identifying criteria to be used in determining MET services, consideration should be given to thresholds for meteorological elements that result in a change of runway operating mode, such as:

- a change of runway dependency;
- a change of spacing between arriving aircraft;
- a change in nominal aircraft approach speeds;
- an exceedance of aircraft operating limitations for significant numbers of aircraft (eg maximum crosswind component);

- an inability to commence an approach via the IAF; or
- an inability to hold in the primary published holding areas, etc.

5.86 When considering the lead time requirements for such forecast products, it is necessary to strike a balance between the desired probability and accuracy and the target ATFM aircraft population.

5.87 Given the direction towards Regional ATFM through ground delay programs, it is therefore desirable that the forecast period cover at least 6-8 hours ahead to encompass the majority of regional length flights with notification of ATFM measures an acceptable time before estimated off blocks time (EOBT).

5.88 In accordance with Annex 3 requirements, including the requirement that close liaison shall be maintained between those concerned with the supply and those concerned with the use of meteorological information on matters which affect the provision of meteorological services for international air navigation, States should ensure that the MET service provides sufficient detail and accuracy.

5.89 ICAO APAC Meteorological Requirements Task Force (MET/R TF) has developed specific regional guidance material necessary to assist States in developing and implementing tailored meteorological information and services to support effective ATM. The guidance captures most of the necessary processes from preparatory to operational phases. Furthermore, it provides detailed operational services, with specific examples and an operational scenario on ATM-tailored MET information and services. The *APAC- Regional Guidance for Tailored MET Information to Support ATM* is available at ICAO eDocuments website.

5.90 Joint post-operational analysis could be conducted between service provider (MET) and user (ATM) so as to enhance the effectiveness and reliability of MET information and services for supporting ATM operations. By collecting necessary operation logs and feedback from stakeholders on a daily basis, post-operational analysis can be conducted on a regular basis or as required for identifying room for improvement of MET information and services. Results of post-operational analysis are summarized as reports and reviewed in the meeting between MET and ATM so that a recommended practices can be integrated into the ATFM framework for daily operations.

Training, Competencies, and Qualification for ATFM Personnel

5.91 An ATFM service must be staffed by personnel with sufficient knowledge and understanding of the ATM system they are supporting and the potential effects of their work on the safety and efficiency of air navigation. To ensure this and within the framework of their training policy, States and ANSPs should establish training plans to ensure that ATFM service staff are properly trained.

5.92 ICAO Doc 9971, ICAO Manual on Collaborative Air Traffic Flow Management, recognizes the requirement for training all stakeholders in an ATFM service, i.e. those directly operation and ATFM function and all other ATFM stakeholders including airspace users and ATS personnel.

5.93 The APAC ATFM Training Guide is available on ICAO edocuments website.

5.94 To ensure an ATFM service is provided by personnel with sufficient competencies, States and ANSPs should consider establishing national ATFM service personnel qualification program that is appropriate to the local environment and the level of ATFM service to be provided. The qualification scheme established by States and/or ANSPs should include provisions for:

- Appropriate recruitment of candidates with requisite ATS/ATM background,
- Methodical training program, with varying methods of instructions to ensure effective achievement of desired competencies,

- Assessment program to evaluate candidates' competencies to function as ATFM personnel,
- Regular refresher/recurrent training to ensure up-to-date knowledge among the personnel,
- Recency of experience evaluation to be used before a return-to-service when a personnel has been absent from the function for an extended period, and
- (any other provisions appropriate to the local requirements)

5.95 Considering that ATFM is not a directly safety-critical service, albeit still a service that contributes to the planning of safety of air traffic services, the ATFM personnel qualification scheme may not need to be as rigorous as that of the air traffic service personnel licensing (e.g., air traffic controller licensing). It should, however, be at the appropriate level of rigor to ensure ATFM personnel are able to interface with each other, with ATS personnel, and with stakeholders effectively and professionally.

5.96 Considering also that ATFM operations in Asia/Pacific is largely cross-border in nature and ATFM personnel will be required to coordinate with international counterparts, States and ANSPs should also consider including appropriate level of English language proficiency into the ATFM qualification scheme.

5.97 Any qualification scheme established should be in line with the provisions in ICAO Annex 1 – Personnel Licensing

Regional ATFM Implementation Guidance

5.98 Under Phase II of the IATA Regional Air Traffic Flow Management Project, as agreed by ATFM/SG/4, IATA delivered the Regional ATFM Implementation Guidance document for consideration by ATFM/SG/6 (Bangkok, Thailand, June 2016). The guidance was included as an Appendix in version 3.0 of the Framework document as it was important to provide harmonized implementation guidance to assist States in the planning and execution of ATFM implementation projects, and to the future interoperability of State and Regional ATFM programs.

5.99 Subsequently Doc 9971, Manual on Collaborative ATFM , 3rd Edition published in 2018 further amplified the guidance document and included a comprehensive guidance on ATFM implementation in Chapter 8 of Part II. It includes information and guidance on:

- ATFM Implementation Steps;
- Operational Implementation;
- Implementation Risks and Mitigation;
- Post-implementation activities;
- Regulatory requirements; and
- Assessment of benefits.

5.100 The above guidance should, in conjunction with this document and the Asia/Pacific Regional ATFM Concept of Operations, be examined by all APAC Region States planning ATFM implementation.

Regional ATFM Implementation Monitoring

5.101 The Regional Framework for Collaborative Air Traffic Flow Management is one of several important plans that are subsidiary to the Seamless ANS Plan, namely:

- Asia/Pacific Search and Rescue (SAR) Plan;

- Asia/Pacific Region ATM Contingency Plan; and
- Asia/Pacific Regional Framework for Collaborative ATFM; and
- Asia/Pacific Collaborative Aeronautical Information Management (AIM) Plan ; and
- Asia/Pacific A-CDM Implementation Plan.

5.102 States report implementation of the performance expectations of the Seamless ANS Plan using an online reporting form. Monitoring and reporting schemes for subsidiary plans enhance the current Seamless ANS monitoring and reporting scheme.

5.103 A common reporting date of 28 February is proposed for implementation status reports provided against regional plans including the Regional Framework for Collaborative ATFM, Regional Plan for Collaborative AIM, Regional SAR Plan and Regional ATM Contingency Plan. This would ensure that the reported data is received sufficiently early to facilitate implementation reporting to the relevant technical group while allowing flexibility in the scheduling of technical meetings.

5.104 In addition, it is also proposed to standardise the reporting format of the forms to percentages for example: 20%, 50%, 72%, etc… for consistency and clarity (Appendix F).

5.105 The monitoring and reporting scheme for Regional collaborative ATFM implementation measures State implementation of the performance expectations specified in Section 7 of this document.

5.106 Asia/Pacific Administrations should report their implementation status to the ICAO Asia/Pacific Regional Office at least once annually, **by no later than 28th February each year**. Reported implementation status will be examined each year by the ATFM/SG, or other appropriate Regional body designated by APANPIRG, to measure, report and advance Regional implementation progress, and to recommend priority ATFM elements to be added to the Seamless ANS monitoring and reporting scheme.

5.107 It is expected that the relevant ATFM expert/s in each Administration will be responsible for the detailed reporting in the Regional ATFM Monitoring and Reporting form, and that these experts will then liaise closely with their Administration's Seamless ANS reporting point of contact to ensure the accuracy of the higher level reporting and consistency between the separate reporting levels.

5.108 The Regional ATFM Monitoring and Reporting Form is provided at **Appendix F**, and is available on the ICAO Asia/Pacific Regional Office eDocuments web-page at http://www.icao.int/APAC/Pages/edocs.aspx.

APAC REGIONAL ATFM IMPLEMENTATION – CURRENT STATUS

Background

6.1 The Fifth Meeting of the Air Traffic Management Sub-Group of APANPIRG (ATM/SG/5, Bangkok, Thailand, 31 July to 04 August 2017), agreed to the use of a Regional ATFM Monitoring and Reporting Form that would be used to analyse ATFM implementation against the performance objectives of the Regional Framework for Collaborative ATFM with the following Conclusion:

> ***Conclusion ATM/SG/5-3****: Asia/Pacific Regional Framework for Collaborative ATFM Amendment*
>
> *That,*
>
> *1 the Regional Framework for Collaborative ATFM be amended to include the information and performance objectives in Appendix D to the Report; and*
>
> *2. the ATFM Implementation Status Report form provided in Appendix E to the Report be included in the Regional Framework for Collaborative ATFM as an appendix and made available on the ICAO Asia/Pacific Regional Office website; and*
>
> *3. Asia/Pacific Administrations are urged to report their ATFM implementation status at least once annually by no later than 30 April each year, using the ATFM Implementation Status Report Form.*

6.2 The Regional ATFM Monitoring and Reporting Form is provided at Appendix F, and is available on the ICAO Asia/Pacific Regional Office eDocuments web-page at http://www.icao.int/APAC/Pages/edocs.aspx.

6.3 States report implementation of the performance expectations of the Regional Collaborative ATFM Framework using the above reporting form.

6.4 The reporting form provides evidence of implementation of ATFM, which States are obliged to implement in accordance with the standards of Annex 11. Non-reporting will be treated in the same way as non-implementation for the purpose of ICAO reporting to ATM/SG and APANPIRG.

6.5 The ATFM Implementation Status Report form provides for two tiers of status reporting:

> ***A****: Administrations that are expected, or intend, to implement and distribute cross-border ATFM measures under the terms of the Performance Improvement Plan of the Asia/Pacific Regional Framework for Collaborative ATFM; and*
>
> ***B:*** *Administrations that are not expected to implement and distribute cross-border ATFM measures as described in A.*
>
> *Note: Administrations that are not expected to implement and distribute cross-border ATFM measures are expected to implement a number of other elements of the Regional Framework for Collaborative ATFM in order to support regional cross-border ATFM..*

6.6 Administrations reporting against Tier B implementation should note the Regional Framework for Collaborative ATFM and Asia/Pacific Seamless ATM Plan elements referring to *ATFM Program Airports, High Density Airports and High-Density FIRs*, and commence reporting against Tier A elements where any of their aerodromes or FIRs met these criteria.

6.7 In alignment with the methodology applied to assessment of implementation status in a number of significant ATM technical fields in the APAC Region, implementation status of each Administration is assessed as Robust (90 – 100% implementation), Marginal (70 – 89%) or Incomplete (0 – 69%).

Analysis

6.8 The collated Regional ATFM implementation status data as reported in the last five years, is provided in **Table 3** below. It summarizes current implementation status. Administrations that have filed reports against the incorrect reporting tier, or have not reported at all, are indicated accordingly.

Note : The letters (A)/(B) indicate the tier of implementation status of the State (reported or otherwise).

Administration	Reports Received					Implementation Status
	2018	2019	2020	2021	2022	
Afghanistan (B)	no report	no report	no report	no report	no report	Did Not Report
Australia (A)	yes	yes	no report	yes	yes	Marginal
Bangladesh (B)	yes	yes	no report	yes	no report	Incomplete
Bhutan (B)	no report	no report	no report	no report	no report	Did Not Report
Brunei Darussalam (B)	no report	no report	no report	no report	no report	Did Not Report
Cambodia (A*)	yes	yes	no report	no report	no report	Did Not Report
China (A)	yes	yes	no report	yes	yes	Marginal
Hong Kong, China (A)	yes	yes	no report	yes	yes	Marginal
Macao, China (B)	yes	yes	no report	no report	no report	Incomplete
Cook Islands (B)	no report	no report	no report	no report	no report	Did Not Report
Fiji (B)	no report	no report	no report	no report	no report	Did Not Report
France (French Polynesia) (B)	no report	no report	no report	no report	no report	Did Not Report

DPR Korea (B)	no report	no report	no report	no report	no report	Did Not Report
India (A)	yes	yes	yes	yes	yes	Robust
Indonesia (A)	yes	yes	yes	yes	yes	Marginal
Japan (A)	yes	yes	no report	yes	yes	Marginal
Kiribati (B)	no report	no report	no report	no report	no report	Did Not Report
Lao PDR (A)	no report	no report	no report	no report	yes	Incomplete
Malaysia (A)	yes	yes	no report	no report	yes	Incomplete
Maldives (B)	yes	yes	no report	no report	no report	Did Not Report
Marshall Islands (B)	no report	no report	no report	no report	no report	Did Not Report
Micronesia (B)	no report	no report	no report	no report	no report	Did Not Report
Mongolia (B)	no report	no report	no report	yes	no report	Did Not Report
Myanmar (B)	yes	yes	no report	no report	no report	Did Not Report
Nauru (B)	no report	no report	no report	no report	no report	Did Not Report
Nepal (B)	yes	yes	no report	no report	no report	Did Not Report
New Caledonia (B)	yes	yes	no report	no report	no report	Did Not Report
New Zealand (A)	yes	yes	no report	no report	yes	Incomplete
Pakistan (B)	yes	yes	no report	yes	no report	Did Not Report
Palau (B)	no report	no report	no report	no report	no report	Did Not Report
Papua New	yes	yes	no	no	no	Did Not Report

Guinea (B*)			report	report	report	
Philippines (A)	yes	yes	no report	yes	yes	Incomplete
Republic of Korea (A)	yes	yes	no report	yes	yes	Marginal
Samoa (B)	no report	no report	no report	no report	no report	Did Not Report
Singapore (A)	yes	yes	yes	yes	yes	Robust
Solomon Islands (B)	no report	no report	no report	no report	no report	Did Not Report
Sri Lanka (B)	no report	no report	no report	no report	no report	Did Not Report
Timor Leste (B)	no report	no report	no report	no report	no report	Did Not Report
Tonga (B)	no report	no report	no report	no report	no report	Did Not Report
Thailand (A)	yes	yes	yes	yes	yes	Marginal
Tuvalu (B)	no report	no report	no report	no report	no report	Did Not Report
United States (A)	yes	yes	no report	yes	yes	Robust
Vanuatu (B)	no report	no report	no report	no report	no report	Did Not Report
Viet Nam (A)	yes	yes	no report	yes	yes	Incomplete

Table 3: ATFM Implementation Status

6.9 Out of 39 States and two Special Administrative Regions in APAC Region, 23 Administrations have reported ATFM implementation status at least once in the last five years. The ATFM implementation of only four Administrations; India, Singapore, Thailand and United States, have been assessed as Robust.

6.10 The COVID-19 pandemic has caused significant traffic downturn and consequently the needs for ATFM measures has reduced. However, the implementation of cross-border ATFM has resulted in a collaborative environment over the years across many States. The ATFM platform has enabled exchange of information through web conferences and electronic data exchanges. The ATFM infrastructure at many States has also contributed during large scale airspace contingency scenarios.

ATFM and ACDM Implementation Indicators

6.11 In the first ICAO's APAC Ministerial Conference on Civil Aviation in Beijing in January 2018, the Ministers in charge of civil aviation representing 36 governments endorsed the Beijing Declaration formalizing their shared commitments on high-priority aviation safety and efficiency objectives. Implementation of Air Traffic Flow Management (ATFM) and Airport Collaborative Decision Making (A-CDM) at all high density airports and airspaces by 2022 is accorded top priority in the Beijing Declaration.

6.12 The following two indicators have been considered to reflect on the current implementation status as of 2022.

- Number of international high density airports with Airport-CDM implemented (Figure 7) , and
- High density FIRs and FIRs supporting Major Traffic Flows and high-density aerodromes with ATFM/CDM implemented (Figure 8)

Note: High Density airport = airport with 100,000 scheduled movements per annum or more (Asia/Pacific Seamless ATM plan, V2.0, September 2016)

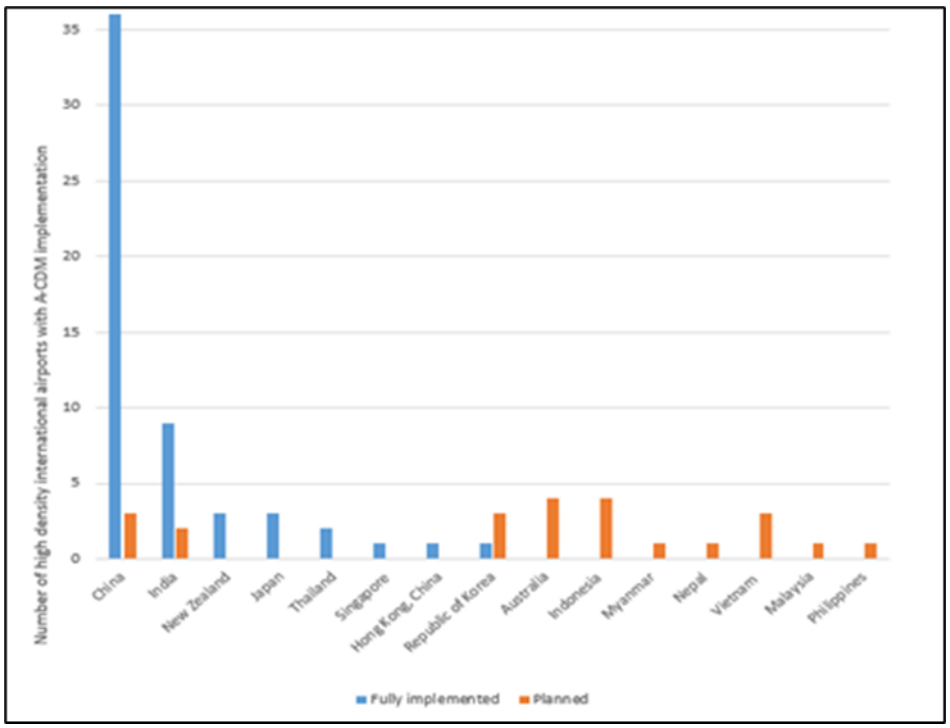


Figure 7: A-CDM Implementation in APAC Region Airports

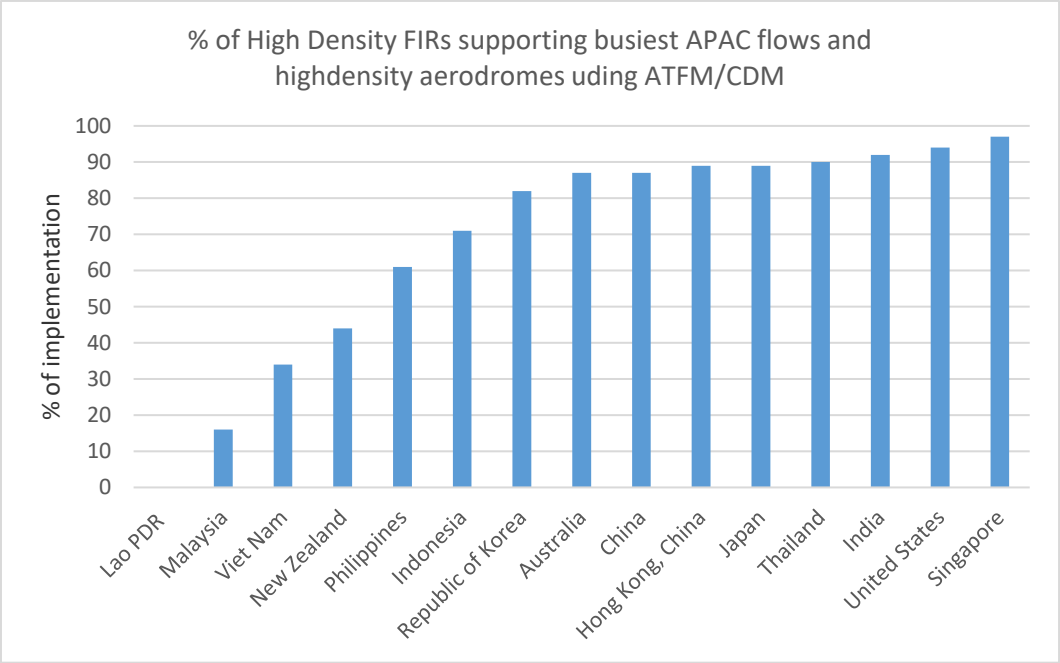


Figure 8: ATFM Implementation in High Density FIRs (as per APSAP Seamless Plan)

6.13 ATFM implementation is progressing in APAC but many efforts and collaboration among States are expected. Sub regional ATFM initiatives need to be harmonized to ensure full benefits of ATFM in APAC.

Multi-Nation, Cross Border ATFM Programs

6.14 Much progress has been made in multi-nation collaborative ATFM implementations, such as Asia Pacific Multi Nodal ATFM Collaboration (AMNAC) and Northeast-Asia Regional ATFM Harmonization Group (NARAHG). The following paras provide a brief update on each of the respective implementation programs.

Asia/Pacific Cross-Border Multi-Nodal ATFM Collaboration (AMNAC)

6.15 Following the development and adoption of Distributed Multi-Nodal ATFM Network concept as the foundation of regional ATFM in Asia/Pacific, several States/Administrations banded together for an Operational Trial project aimed at validating and operationalizing the concept in live environment. The initiative, originally named the Distributed Multi-Nodal ATFM Operational Trial, began in 2015 and followed a phased approach to methodically develop and validate cross-border distributed ATFM procedures for the region.

6.16 In the subsequent years, the initiative expanded both in terms of membership and operational experience. The initiative now comprises 11 Asia/Pacific States/Administrations with varying levels of ATFM maturity, structured such that they can contribute according to their needs and readiness. The expansion of membership has also allowed the initiative to introduce distributed ATFM measures in live environment, with network members utilizing the jointly developed Common Operating Procedure as a basis for administering and facilitating compliance to the measures. The ATFM measures, particularly the Ground Delay Programs (GDP), have been applied in various types of demand-capacity imbalances ranging from planned aerial events to unplanned capacity constraints at aerodromes or airspace and emergency infrastructure outages.

6.17 Recognizing the maturity of the initiative, members agreed to change the name of the

initiative to Asia-Pacific Cross-Border Multi-Nodal ATFM Collaboration (AMNAC) and to transition the focus from operational trials to full implementation. Current focus areas now include improving the common operating procedure, expanding the AMNAC network, providing operational inputs to the development of SWIM-based ATFM information exchange, supporting members in upgrading their ATFM maturity, and harmonizing with other ATFM initiatives in the region.

Northeast-Asia Regional ATFM Harmonization Group (NARAHG)

6.18 In 2014, to respond to the rapidly increasing demand for traffic in Northeast Asia, China, Japan and the Republic of Korea established a sub-regional ATFM group, "Northeast-Asia Regional ATFM Harmonization Group (NARAHG)". The objective is to achieve the implementation and harmonization of ATFM/CDM procedures and practices to support international flights in Northeast-Asia to promote regional air traffic safety, capacity, and efficiency with the development of a concrete operational improvement. Thus, this appropriate Demand and Capacity Balance (DCB) will contribute to the ATM operation for all stakeholders.

6.19 To achieve the above mentioned goal, NARAHG is manly working on:

- Sharing relevant and necessary information on the current air traffic situation;
- Developing an operational mechanism to support cross-border ATFM harmonization including regular joint ATFM post-operations analysis;
- Developing a harmonized technical and operational communication protocol/procedures/tools to support the associated agreed ATFM/CDM operations; and
- Coordinating the development of a technical and operational communications document defining the protocols and procedures for ATFM operations.

6.20 In addition, NARAHG is striving to operate a new conceptual ATFM measures by exchanging flight trajectory data in real time to mitigate the inefficiency caused by conventional ATFM measures such as MINIT, level capping or etc. In this regard, NARAHG members are cooperating to develop the operation procedure and ultimately promoting cross-border ATFM optimized for the environment and characteristics of the three States.

6.21 By continuously improving operating procedures and complementing the systems, sub-region can implement a harmonized seamless ATFM by an appropriate DCB. Maintaining an optimal DCB will contribute to the ATM operation for all stakeholders.

PERFORMANCE IMPROVEMENT PLAN

Note: prior to implementation, ATFM systems and procedures should be verified by safety assessment under State Safety Management Systems.

ATFM Related Performance Objectives of the Seamless ANS Plan

7.1 The Asia/Pacific Seamless ANS Plan, Version 3.0, November 2019 , specifies performance objectives under Preferred Aerodrome/Airspace and Route Specifications (PARS) and Preferred ANS Service Levels (PASL), to be implemented in four phases :

- PARS/PASL Phase I – had an expected implementation by 12 November 2015 (Phase I elements that had not been completed as at 2019 were moved to Phase II);
- PARS/PASL Phase II – had an expected implementation by 07 November 2019;
- PARS/PASL Phase III - expected implementation by 03 November 2022; and
- PARS/PASL Phase IV – expected implementation by 27 November 2025.

7.2 ATFM-related performance objectives of the Seamless ANS Plan, summarized as follows, were taken into account in the formulation of Regional ATFM performance objectives specified in this Framework:

7.1 All international aerodromes should enable, in accordance with an Airport Master Plan, aerodrome management and coordination services:

a) when traffic density requires, an appropriate apron management service to regulate aircraft operations in coordination with ATS;

c) regular airport capacity analysis, which included a detailed assessment of passenger, airport gate, apron, taxiway and runway capacity.

7.3 All international aerodromes should operate an A-CDM system for ACIS integrated with the ATM network function.

7.16 Civil-Military Airspace expectations are as follows:

b) SUA should be regularly reviewed to ensure the activities that affect the airspace, and size and timing of such activity are accurately reflected by the SUA type, dimensions, activation notice and duration of activation.

7.17 States should implement regulations supporting the integration of UAS operations in non-segregated airspace, using a risk-based approach and in accordance with the Asia/Pacific Regional Guidance for the Regulation of UAS, as a minimum.

7.32 All international aerodromes where ATFM facilities are required should be served by AMAN/DMAN facilities.

Note: All AMAN systems should take into account airport gates for runway selection and other aircraft departures from adjacent gates that may affect arriving aircraft.

7.36 ATC units should conduct Airspace Planning and enable systems that manage direct

and flexible routings where practicable, and the optimal operation of FUA.

7.37 All ATC Sectors should have a nominal aircraft capacity figure based on a scientific capacity study and safety assessment, to ensure safe and efficient aircraft operations.

7.38 All ACCs operating within FIRs where demand may exceed capacity should implement ATFM incorporating CDM to enhance capacity, using bi-lateral and multi-lateral agreements, initial integration of ASM with ATFM, Collaborative Network Flight Updates, Basic Network Operation Planning and Initial Airport/ATFM slots, A-CDM Network Interface and Dynamic Slot Allocation.

7.41 Aeronautical meteorological observations, forecast, warning, climatological and historical products (such as aerodrome meteorological forecasts and reports, aerodrome warnings and wind shear warnings) should be disseminated to users, and in accordance with global and regional guidance material. An agreement between the MET authority and the appropriate ATS authority should be established to ensure the appropriate exchange of meteorological information obtained from aircraft.

7.44 Civil-Military ATM expectations are as follows:

a) a national Civil-Military body should be formed to coordinate strategic civil- military activities (military training should be conducted in locations and/or at times that do not adversely affect civilian operations, particularly those associated with major aerodromes);

- *PARS/PASL Phase III*

7.18 All international aerodromes should operate an A-CDM system integrated with the ATM network, and an AOP and where practicable an APOC.

7.46 All ATC units providing services to international aerodromes should operate extended arrival metering.

7.51 ACCs should enable, where practicable, Free Route Airspace, RNP routes, Advanced FUA and Airspace Management (ASM), Dynamic Sectorisation, Enhanced Conflict Detection Tools and Conformance Monitoring and Multi-Sector Planner Function.

7.52 All ACCs operating within FIRs where demand may exceed capacity should operate systems that enable, where applicable, Short Term ATFM measures, Enhanced NOPS Planning, Enhanced integration of airport operations and NOPS planning, Enhanced Traffic Complexity Management, Full integration of ASM with ATFM, Initial Dynamic Airspace configurations, Enhanced ATFM slot swapping, Extended Arrival Management, ATFM Target Times and Collaborative Trajectory Options Programme supporting the integration of time-based management within a flow centric approach.

7.56 All States should ensure that aeronautical meteorological products supported by automated decision systems or aids using IWXXM.

7.3 The regional ATFM performance objectives specified in Section 7 of this framework – Performance Improvement Plan, complement and where necessary expand upon the performance objectives of the Seamless ANS Plan.

<u>Structure of the Performance Improvement Plan</u>

7.4 Regional collaborative ATFM performance objectives are arranged in Regional ATFM Capability phases aligned, where practicable, with Phases I – IV of the Asia/Pacific Seamless ANS Plan's Preferred Aerodrome/Airspace and Route Specifications (PARS) and Preferred ATM Service Levels (PASL):

- PARS/PASL Phase I – expected implementation by 12 November 2015; and
- PARS/PASL Phase II – expected implementation by 07 November 2019;
- PARS/PASL Phase III – expected implementation by 03 November 2022; and
- PARS/PASL Phase IV – expected implementation by 27 November 2025.

7.5 Recognizing the short lead time between the finalization of the Version 3.0 of the Framework and PARS/PASL Phase I, Regional ATFM Capability Phase I were further divided into sub-phases A and B, with expected implementation 12 November 2015 and 25 May 2017 respectively.

7.6 Recognizing also the substantial performance expectations in PARS/PASL Phase III, the different update cycles between the Asia/Pacific Seamless ANS Plan and the Framework, the significant impact due to COVID-19 pandemic, and the potential benefits of a more granular progress tracking, Regional ATFM Capability Phase III is further divided into sub-phases A and B, with expected implementation of 03 November 2022 and November 2025.

Note: No ATFM-related initiative is identified in PARS/PASL Phase IV of the Asia/Pacific Seamless ANS Plan, version 3.0 (November 2019).

7.7 Accordingly, the various phases of Regional ATFM Capability can be summarized as follows:

- Phase IA, expected implementation by 12 November 2015 (aligned with Seamless ANS Plan Phase I)
- Phase IB, expected implementation by 25 May 2017 and
- Phase II expected implementation by 07 November 2019 (Aligned with Seamless ANS Plan Phase II.)
- Phase III A expected implementation by November 2022
- Phase III B expected implementation by November 2025.

7.8 At the time of this edition (2022), the deadline for phases IA, IB, and II capability implementation has passed. The expected capabilities for those phases are still retained in the document for reference as States/Administrations may not have implemented all elements in those phases yet.

7.9 Performance objectives are presented under the following general structure for each Regional ATFM Capability Phase, where relevant:

- ATFM and Other Related Regulations
- ATFM System
- Strategic ATFM, Pre-Tactical ATFM or Tactical ATFM
    - Capacity and Demand Monitoring and Analysis
    - Capacity Improvement
    - ATFM Execution

- ATFM Measures

- Post-Operations Analysis
- ATFM/A-CDM Integration
- Civil-Military ATM Coordination

ATFM Program Airports

7.10 ATFM Program Airports~~,~~ referenced in the performance objectives~~,~~ are:

- Airports where strategic slot allocation is implemented; and
- All other airports designated by the relevant authority as requiring or potentially requiring ATFM implementation.

REGIONAL ATFM CAPABILITY PHASE IA

Expected implementation by 12 November 2015

ATFM Regulations

7.11 Air traffic flow management (ATFM) shall be implemented for airspace where air traffic demand at times exceeds, or is expected to exceed, the declared capacity of the air traffic control services concerned.

Annex 11 to the Convention on Civil Aviation section 3.7.5.1 refers.

Strategic Capacity and Demand Monitoring and Analysis

7.12 A regular program of bi-annual strategic airport and airspace capacity and demand analysis should be implemented for all international airports and associated terminal area airspace, and for all en-route ATC sectors supporting the homogeneous ATM areas and major traffic flows identified in the Asia and Pacific Regions[6] (Figure 13), including consideration of:

- CNS systems;
- ATC resources and capability;
- ATC separation standards and techniques;
- runway occupancy times;
- seasonal schedules; and
- historical traffic data and traffic growth forecasts

{ [6] Asia and Pacific Regions (APAC) Air Navigation Plan, Volume II, April 2022. }

7.13 Where strategic analysis indicates that demand does not yet exceed capacity, preparation for the implementation of ATFM capability should be based on careful analysis of current traffic and expected growth in the next 5 years;

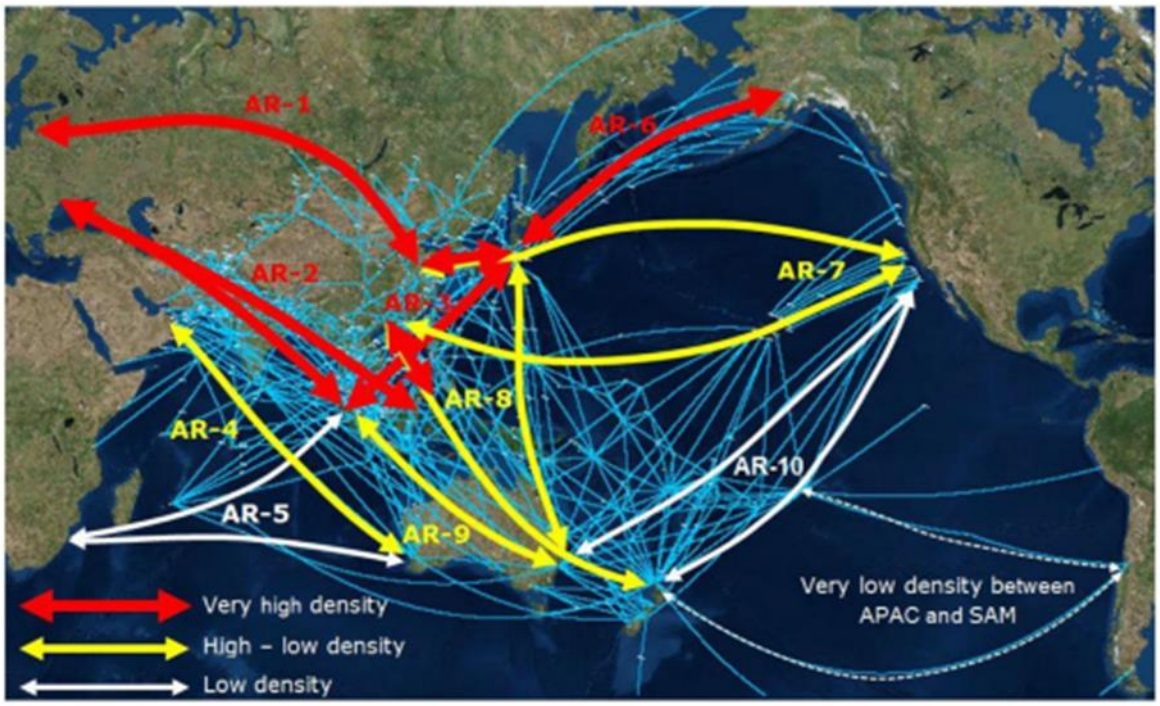


Figure 9 : Homogeneous ATM Areas and Major Traffic Flows Identified in the Asia and Pacific Regions *(Source: Asia and Pacific Regions (APAC) Air Navigation Plan, Volume II, April 2022)*

Pre-Tactical Capacity and Demand Monitoring and Analysis

7.14 Daily pre-tactical airport and airspace capacity and demand analysis should be conducted for all ATFM Program Airports and associated terminal area airspace, and for all en-route ATC sectors supporting the busiest Asia/Pacific city pairs, including consideration of:

i. expected runway and airspace configurations;

ii. forecast meteorological phenomena;

iii. ATC resources, facilities and equipment;

iv. other known or expected capacity constraints; and

v. updated flight schedule and flight plan information.

Pre-Tactical ATFM Execution

7.15 ATFM Daily Plan (ADP) for all ATFM Program Airports and associated terminal area airspace, including airport and airspace capacity declarations and related background information, should be prepared and distributed to all relevant stakeholders.

ADP should be distributed to stakeholders by either:

i. Web-based ATFM network; or

ii. Web-pages hosted by each participating ANSP; or

iii. Email distribution.

Relevant stakeholders include:

a) Neighbouring ATFMUs or, where not provided, ATSUs

b) ATSUs supported by the originating ATFMU;

c) Relevant airport operators; and

d) Participating aircraft operators.

7.16 ADP should be coordinated by the responsible ATFMU or ATSU and agreed with all relevant stakeholders, through chairing and/or participation in scheduled and, where necessitated by changes in airport or airspace capacity or other events, ad-hoc ATFM conferences for pre-tactical ATFM planning.

Post-Operations Analysis

7.17 The accuracy and effectiveness of capacity and demand analyses and ADP preparation and distribution, including supporting information listed in paragraph 7.7, should be verified through comparison with operational outcomes observed, and rectification of discrepancies included in planning for system and process improvements.

REGIONAL ATFM CAPABILITY PHASE IB

Expected implementation by 25 May 2017

ATFM Systems

7.18 Operational FPL and ATS message distribution systems and processes should be analysed and, where necessary, modified to ensure that FPL, CHG, DEP, DLA and CNL messages are originated, distributed and processed in accordance with the requirements specified in ICAO Doc.4444 PANS-ATM.

7.19 Requirements should be published in all relevant State AIP, specifying that, except where necessary for operational or technical reasons, FPL should be submitted not less than 3 hours prior to EOBT.

7.20 Where the delay is the result of a GDP, CTOT and other slot allocation information originated from the ATFM unit responsible for the destination airport shall be made available to the airlines, relevant ATS unit and ATFM units.

7.21 A DLA message should be transmitted when the departure of an aircraft, for which basic flight plan data FPL has been sent, is delayed by more than 15 minutes after the estimated off-block time contained in the basic flight plan data.

7.22 Subject to local ATFM procedures, the responsibility for the origination of DLA messages should be of the departure ATS Unit, the airspace user, or any other authorized unit. Subsequent transmission of the DLA message would be in accordance with the provisions of ICAO Doc 4444 PANS-ATM.

7.23 Appropriate procedures should be implemented to ensure that FPL are not discarded from other ATM systems as a consequence of ATFM delay.

7.24 ATFM, AMAN/DMAN and A-CDM systems should be integrated through the use of common fixes, terminology and communications protocols to ensure complementary operations. The implementation of an integrated ATFM and A-CDM network will complement each other and together create a seamless air traffic environment.

Note: FIXM version 3.0 or later, extended where necessary is the agreed format for exchange of ATFM information in the Asia/Pacific Region.

Remark : "The current version of FIXM core provision is version 4.2. The agreed ATFM information exchange model for in the Asia/Pacific region is therefore changed to FIXM version 4.2 (or later), extended where necessary. This expectation is reflected in the Regional ATFM Capability Phase IIIB"

Note: Where SWIM-based ATFM communications capability is not yet established, ATFM messages identified in the Asia/Pacific AFTN/AMHS-Based Interface Control Document for ATFM may be used for distribution of ATFM measure information via AFTN/AMHS in the interim.

Capacity Improvement

7.25 Airport and terminal airspace capacity should be increased through optimized ATC separation standards and techniques and reduced runway occupancy at all ATFM Program Airports and in associated terminal area airspace.

Strategic ATFM Execution

7.26 Implement strategic airport slot allocation at all international airports, for periods where demand significantly exceeds the airport's capacity.

Pre-Tactical Capacity and Demand Monitoring and Analysis

7.27 Pre-tactical modelling of expected airport and airspace configuration and traffic demand, and the effect of ATFM measures, should be implemented for all ATFM Program Airports and associated terminal area airspace.

Pre-Tactical ATFM Execution

7.28 CDM capability should be implemented, enabling the sharing of all relevant information with all stakeholders, providing continuous availability of information and common reference material for daily and ad-hoc ATFM conferences.

Tactical Capacity and Demand Monitoring and Analysis

7.29 Dynamic update of airport and airspace capacity constraints, capacity calculation, demand information using schedule, flight plan and ATS messaging, and ATM system information and modelling of tactical ATFM programs should be implemented.

Tactical ATFM Execution

7.30 Tactical ATFM at ATFM Program Airports should be implemented when required using:

- Ground Delay Programs (GDP) with the assignment of Calculated Take-Off Time (CTOT), or
- Minutes in trail (MINIT) or miles in trail (MIT) or other ATFM measures specified in ICAO Doc 9971 – Manual for Collaborative ATFM.

Note: MINIT and MIT can increase the workload of upstream ATSUs and can result in extensive and unpredictable delays as the requirements traverse many FIRs. Extended use of these measures should therefore be minimized.

7.31 All States should ensure that local ATC procedures and, where available, CDM processes facilitating compliance with received CTOT are implemented. (Refence to Appendix B)

Note 1: At controlled aerodromes, CTOT compliance should be facilitated through the cooperation of the aircraft operator and the issuance of ATC clearances. As a minimum, CTOT should be made available to the relevant ATC tower and the aircraft operator;

Note 2: For flights departing aerodromes where an ATC service is not provided, CTOT information should be made available to the aircraft operator and the first ATS unit providing services to the flight.

Note 3: States planning to implement ground delay programs should ensure adequate time is provided for local procedure development and promulgation at aerodromes where CTOT will be applied.

7.32 CTOT for individual aircraft should, where necessary, be revised or cancelled.

7.33 Tactical ATFM should be implemented for operations through constrained airspace sectors, only during periods affected by the constraint.

7.34 As far as practicable, individual aircraft should not be subject to more than one tactical ATFM measure per flight.

Post-Operations Analysis

7.35 Procedures and agreements should be developed to ensure post-operational analysis of cross-border ATFM programs, including the canvassing and consideration of feedback from airspace users, airports operators, ATS and other ATFM units. Daily collaborative conferences among stakeholders should be held, supplemented where necessary by ad-hoc conferences called to assess the outcomes of programs of ATFM measures responding to non-normal situations.

7.36 The results of post-operations analyses should be used for planning ATFM, airspace and ATS route improvements.

The Asia/Pacific ATFM Post-Operations Analysis Recommended Framework, which can be found at ICAO Asia/Pacific eDocument webpage, provides guidance on ATFM post-operations analysis.

REGIONAL ATFM CAPABILITY PHASE II

Expected implementation by 07 November 2019

ATFM Systems

7.37 ATFM information distribution capability utilizing FIXM Version 3.0 (or later)* should be implemented for the exchange of flight specific ATFM information including CTOT, CTO, and CLDT.

**Note : "The current version of FIXM core provision is version 4.2. The agreed ATFM information exchange model for in the Asia/Pacific region is therefore changed to FIXM version 4.2 (or later), extended where necessary. This expectation is reflected in the Regional ATFM Capability Phase IIIB"*

7.38 ATFM systems implemented should have the following capabilities

i. Capability to share ATFM Daily Plan (ADP) providing information on demand/capacity imbalance issues and planned/expected ATFM measures;

ii. Capability to allocate ATFM slots and distribute necessary information such as CTOT, CTO, and CLDT when slot-based measures such as Ground Delay Program are to be used;

iii. Capability for authorized users to manage ATFM slots through revision, cancellation, and swapping; and

iv. Capability to monitor or collect data for the purpose of monitoring and reporting ATFM slot compliance, whether real-time automated or as part of post-operations analysis process..

7.39 Full interoperability of cross- border ATFM, A-CDM, AMAN, DMAN, ATM automation and airspace user systems should be implemented, to provide seamless gate-to-gate collaborative ATFM operations

Pre-Tactical Capacity and Demand Monitoring and Analysis

7.40 Automated modelling of expected airport and airspace configuration and traffic demand, and the effect of ATFM measures, should be implemented for all ATFM Program Airports and associated terminal area airspace and, where possible, en-route airspace supporting the busiest Asia/Pacific Region city pairs and high density major traffic flows.

Tactical Capacity and Demand Monitoring and Analysis

7.41 Meteorological services to support ATM in the terminal area (MSTA) should be implemented, including near-term or now-casting forecasts of convective weather activity at or affecting ATFM Program Airports and associated instrument approach procedures, terminal area ATS routes and holding points and other significant locations.

Note: Annex 3 requires that States ensure the quality management of meteorological information.

Tactical ATFM execution

7.42 ATFM measures should be applied to flights through constrained airspace.

7.43 Ground Delay Programs utilizing CTOT should be applied when appropriate to:

i. aircraft destined for constrained ATFM Program Airports, that have not yet departed; and

ii. aircraft planned to operate through constrained airspace where tactical ATFM measure CTO at RFIX or AFIX is in place, that have not yet departed.

7.44 ATFM systems should have the capability to take into account long haul flights.

7.45 Systems should be in place to ensure the timely update of estimate information for airborne aircraft.

7.46 A-CDM-related performance expectations - A-CDM-related performance expectations at A-CDM program airports are illustrated in Chapter 10 of Asia/Pacific A-CDM Implementation Plan to map with APAC Seamless ANS Plan and Regional Framework for Collaborative ATFM expectations.

See Appendix III-D of Doc 9971 for a list of sample key performance indicators for A-CDM systems.

REGIONAL ATFM CAPABILITY PHASE IIIA

Expected implementation by 3 November 2022

Capacity and Demand Monitoring and Analysis

7.47 Regular reviews of airspace usage, including areas operated under the FUA concept, should be conducted; considerations should be given t identifying and mitigating bottlenecks using techniques including – inter alia – direct and flexible routings and optimal sharing of civil/military airspace based on up-to-date demand information.

ATFM/A-CDM Integration

7.48 A-CDM should be implemented at international aerodromes and, when implemented, should be integrated with ATFM operations with appropriate information exchange between the two systems and processes.

Civil-Military ATM Coordination

7.49 National Civil-Military ATM Coordination body should be established to enable strategic, pre-tactical, and tactical airspace management (ASM), allowing closer coordination between civil and military airspace authorities and effective usage of airspace appropriate to both civil traffic demand and military mission requirements.

7.50 Special Use Airspace (SUA) should be regularly reviewed under the auspice of Civil-Military ATM Coordination body to ensure optimal use of all airspace areas in accordance with the flexible use of airspace (FUA) concept.

REGIONAL ATFM CAPABILITY PHASE IIIB

Expected implementation by 2025

ATFM and Other Related Regulations

7.51 Appropriate regulations should be established to support the integration of UAS operations in non-segregated airspace to ensure the safe and efficient operations of manned aircraft, especially when ATFM measure is applied.

ATFM Systems

7.52 ATFM information distribution capability utilizing FIXM version 4.2 (or later), extended where necessary, should be implemented for the exchange of flight-specific ATFM information.

7.53 ATFM, AMAN/DMAN, and A-CDM systems should be integrated through effective cross-platform information exchange, utilizing FIXM version 4.2 (or later) with necessary extension to facilitate common-format exchanges.

Strategic Capacity Improvement

7.54 Techniques and tools to enhance ATC capacity including Free Route Airspace, RNP routes, ASM concept with FUA operations, dynamic sectorization, and enhanced conflict detection should be explored and implemented based on safety case and cost-benefit analysis.

Tactical Capacity and Demand Monitoring and Analysis

7.55 Meteorological information exchange with ATM and ATFM systems should be in IWXXM version 3.0 or later.

Tactical Capacity Improvement

7.56 Extended arrival metering for international aerodromes should be explored and, if deemed necessary, implemented in collaboration with adjacent States to increase predictability and enhance arrival management effectiveness across FIRs.

Tactical ATFM Execution

7.57 Advanced/enhanced ATFM-related solutions including – inter alia – ASM/ATFM full integration, dynamic airspace configurations, target time operations, and collaborative trajectory options should be explored and implemented based on stakeholders' needs, safety case, and cost-benefit analysis.

RESEARCH AND DEVELOPMENT POSSIBILITIES

Research and Development

8.1 Version 1.0 of the Regional Framework for Collaborative ATFM provides the initial framework for implementation of a distributed multi-nodal ATFM network, as envisaged in the Regional ATFM Concept of Operations. This concept, will continue to develop as experience is gained through trials and subsequent operational implementation. The Framework is therefore iterative in nature, and will require regular update in the medium term.

8.2 Further research and development of the distributed multi-nodal ATFM network concept will largely be conducted by ATFM/SG participating States through their operations trial programs, consistent with Principle 36 of the Asia/Pacific Seamless ATM Plan Principle 36 – 'Clustering' for the research, development and implementation of ATM projects. The outcomes of trials and lessons learned from operational deployment will be considered by ATFM/SG for the improvement and updating of the Framework.

ATFM information sharing

8.3 To achieve a seamless information sharing among ATFM Nodes, while at the same time being able to maintain the flexibility to accommodate new users and additional customized functions of individual ATFM systems, a system-to-system connection designed according to ICAO System-Wide Information Management (SWIM) concept has been identified as viable and suitable solution for the Distributed Multi-Nodal ATFM operation.

8.4 SWIM Task Force along with ATFM technical team has undertaken work towards drafting the technical specifications for system-to-system connection and the exchange of ATFM data over a regional SWIM infrastructure (CRV).

8.5 To support the ATFM information exchange for cross-border ATFM operations and ATFM/A-CDM integration in the Asia/Pacific Region, the Asia/Pacific SWIM Task Force (SWIM TF), developed the Flight Information Exchange Model (FIXM) version 4.1 Extension. Currently FIXM version 4.2, extended where necessary, is the agreed *ATFM information exchange model for exchanging ATFM data between ATFM systems in the Asia/Pacific Region*

8.6 Subject to the availability of the baseline SWIM specifications for ATFM service and CRV connectivity, further review of the feasibility of system technical trials on CTOT Distribution, CTOT Revision, CTOT Cancellation, and CTOT Request to enable its long-term development of ATFM SWIM-based technical specifications will be required.

Collaborative ATFM Concept Developments

8.7 The following concepts should be researched, and developed, for implementation in the Asia/Pacific Region:

a. Delay Absorption Intent – included in the Regional ATFM Concept of Operations, provides aircraft operators with the flexibility to choose how to distribute the delay assigned by an ATFM measure to various phases of flight. Not yet included in the ATFM Performance Improvement Plan, this concept has the potential to improve outcomes by increasing the number of aircraft participating in the program, through the application of ATFM delays to longer distance flights that are currently exempt from ground delay programs. The development of this concept will be undertaken in trials before then being potentially included in the broader Framework.

b. The ASBU module NOPS Block 1 aims to introduce enhanced processes to manage flows and improve overall fluidity. One of the main features of ATFM in Block 1 includes the development of "management of arrival/overfly times Targeted time of arrival (TTA)/ Targeted time over (TTOs)". With TTA/TTOs, it is envisaged that the intended ATFM measures would be more encompassing, increasing dynamism of flow management, while ensuring equity in delay management. This enhanced ability must be complimented by continuous developments on the reliable and precise information sharing, and exchange mechanism, which eventually will also form the foundation for implementation of System Wide Information Management (SWIM) and Flight and Flow in Collaborative Environment (FF-ICE).

c. Application of ATFM Measures to Long Range Flights – will improve equity in ATFM processes, and contribute to better outcomes in those ATC sectors where long range flights are currently exempt from all but minimal en-route delays. This will require further development of ATFM measures the CTO ATFM measure, and the formulation of regionally agreed limits on the total ATFM+AMAN delay that may be applied to long range and ultra-long range flights. The LR-ATFM trials in the future could also provide the opportunity to experiment with inter-airline ATFM slot negotiation as airlines would have the best knowledge of their business model and operating cost index.

d. Interoperability of ATFM, AMAN/DMAN and A-CDM systems – will require ANSPs and airport operators to collaboratively develop their local operational letters-of-agreement to incorporate procedures and practices optimizing gate-to-gate flow management of flights.

e. Development and implementation of interoperability among A-CDM and ATFM platforms should incorporate considerations of relevant milestones involved, open standards for sharing data with systems across border, alignment of compliance criteria in A-CDM and ATFM, and coordinated timing for data exchange matched with data availability timeline. Further exploration will be needed on A-CDM and ATFM enabling systems and integration solutions including SWIM concepts and infrastructure and how SWIM and existing XMLs can support connecting the two disciplines for an overall improvement in benefits for service providers and aircraft operators. Specifically, the developments related to ACDM B1 modules on Airport Operations Plan data sharing which support strategic flow management and refinement of ATFM Daily Plan will need to be explored.

f. Collaborative Trajectory Options – provide for flexible routing options that permit aircraft operators to elect to re-route flights via longer trajectories to avoid constrained airspace and take advantage of the reduction or removal of ground delay (or en-route delay, where implemented) that would be imposed if the flight continued through the constrained airspace. A collaborative trajectory options program would significantly improve the safety and efficiency of ATM in cases of large scale weather deviations (LSWD) such as those experienced in the cyclonic weather season in the Bay of Bengal and South China Sea areas, and contingency operations including the avoidance of airspace that is either unsafe (e.g. volcanic ash cloud) or unavailable. A collaborative trajectory options program would first require a full understanding of airspace capacity, which should be supported by a comprehensive study.

g. The development of a collaborative trajectory options program in the Asia/Pacific Region, particularly in South East Asia, will require a coordinated multi-partite effort to improve the regional ATS route network and ATS surveillance/communications infrastructure, and to provide sufficient ATS route options for the program. ATS route

specification and implementation of surveillance and communications infrastructure are included in the performance objectives of the Seamless ATM Plan.

h. Network Collaborative Decision-Making – to provide mechanisms within the distributed multi-nodal ATFM network for the formulation of executive flow management decisions in the event of competing stakeholder priorities. This will require research and development of network- suitable automated decision-support tools and associated business rules. Operational experience in the distributed multi-nodal ATFM network environment will be key to identifying the potential challenges, and formulating and testing strategies.

i. Harmonization of Multiple Flow Management Programs – will ensure that all ATFM measures applied are collaboratively managed to ensure that individual flights are not unduly penalized by multiple measures in one flight, and that ATFM network outcomes are more predictable. Currently aircraft may be subject to independently applied en-route and airport ATFM delays, resulting in potentially unreasonable cumulative delay over the course of a flight. A significant amount of research is being conducted, and needs to be conducted, into the effects and harmonization of multiple flow programs in multiple FIRs.

j. Development of SWM-based MET information services specifically addressing the needs of ATFM in the APAC region – APAC MET R WG is developing use cases and user requirements for SWIM-based MET information services supporting ATFM in the APAC region. It will also look into assisting the SWIM TF in identifying and developing specifications of information services for exchange of MET information supporting ATFM operations.

9. MILESTONES, TIMELINES, PRIORITIES AND ACTIONS

Milestones and Timelines

9.1 Section 7 (Performance Improvement Plan) provides milestones and timelines for a number of elements generally aligned with the Asia/Pacific Seamless ANS Plan PARS and PASL Phase I and II, being effective 12 November 2015 and 09 November 2018 respectively:

Regional ATFM Capability Phases	Expected Implementation of ATFM	Expected Implementation as per APAC ACDM Implementation Plan	Harmonized Milestones
Phase 1 A	12 November 2015	-	2015
Phase 1 B	25 May 2017	-	2017
Phase 2	07 November 2019		2019
Phase 3 A	2022	2022	2022
Phase 3 B	2024	2025	2025

9.2 States that have not yet implemented collaborative ATFM, or having implementations that are not in accordance with the provisions of this Framework, should commence planning from the date of its approval by APANPIRG.

9.3 It should be noted, however, that the ATFM capability outlined in the Framework should be implemented as early as possible. The Framework timelines should under no circumstances be interpreted as limiting or deferring ATFM implementation where there is a current or expected need for it in an earlier timeframe than outlined.

Priorities

9.4 While it is a matter for each State to determine priorities in accordance with its own economic, environmental, safety and administrative drivers, States should be aware of the Asia/Pacific Regional Priorities adopted by APANPIRG, including ASBU B0-NOPS, and the Annex 11 requirement for States to implement ATFM where there is a current or expected imbalance of demand and capacity.

Actions

9.5 This Plan is iterative in nature, and will require further development as experience is gained in operational trials of the distributed multi-nodal ATFM network concept. ATFM/SG, under its terms of reference, should continue to oversee and coordinate the development of the concept and subsequent amendment of the Framework, facilitate the coordination and alignment of CDM/ATFM programs being conducted within the Region, and review the effectiveness of existing and planned ATFM programs.

APPENDIX A: COLLABORATIVE ATFM FRAMEWORK PRINCIPLES

People: Cultural and Political Background

1. High-level political support (including development of educational information for decision-makers) to support Seamless ANS initiatives, including military cooperation and AIM.

2. Education and implementation of non-punitive reporting and continuous SMS improvement systems

Aviation Regulations, Standards and Procedures

3. Harmonised regional or sub-regional rules and guidelines, modelled on the regional application of common regulations incorporated by reference into local legislation.

4. Shared ATM operational standards, procedures, guidance materials through common manuals and templates.

6. An emphasis on delivery of ATM services based on CNS capability, resulting in flexible, dynamic systems.

ATM Coordination

8. Sub-regional ATFM based on system-wide CDM serving the busiest terminal airspace and MTF.

9. Cross-border/FIR cooperation for use of aeronautical facilities and airspace, collaborative data sharing, airspace safety assessment and ATM Contingency planning.

10. Encouragement of military participation in civil ATM meetings and in ATS Centres where necessary.

Airspace Organisation

11. Promoting flexible use airspace arrangements and regular review of airspace to ensure it is appropriate in terms of purpose, size, activation and designation.

12. The optimisation of airspace structure through amalgamation and use of technology.(Asia/Pacific Seamless ANS Plan V3.0)

Facilities: Aerodromes

13. To encourage aerodrome operators to actively participate in ATM coordination in respect of Airport CDM development and operational planning, including aerodrome complexity and capacity.

14. Planning and coordination with local authorities and government agencies to take into account environmental issues, obstacles, aerodrome and PBN development

ATS Units

15. Collaboration by ANSPs for evaluation and planning of ATM facilities.

16. Optimization of ATM facilities through amalgamation and the use of technology, including automation, satellite-based systems and remote facilities.

Aeronautical Data

30. Early implementation of AIM, including cooperative development of aeronautical databases and SWIM to support interoperable operations.

APPENDIX B: CDM/ATFM TRIAL TIERED PARTICIPATION LEVELS

ANSPs play a key role as Node Leaders in the ATFM Operations. Accurate traffic demand prediction and ATM resource outlook, effective issuance of ATFM measures, and coordination of CDM web/teleconference are important elements provided by ATFM Units and ATS Units within each ANSP. The Distributed Multi-nodal ATFM model has adopted a tiered participation level approach to provide the opportunity for ANSPs to participate based on their readiness and capability. The different participation levels also provide an avenue for ATFM Nodes to upgrade to a higher level as ATFM implementation becomes more ready and capable. It is recommended that ATFM nodes endeavour to be at Level 3 to implement Regional ATFM. The following tables outline responsibilities on the part of ANSPs at various participation levels**.**

Table 1: Level-3 ANSP Responsibilities

Level 3 ANSPs	
Responsibilities	**Descriptions**
General ATFM Responsibilities	
Demand-Capacity Prediction and Monitoring	• Predict traffic demand at ATM resources within the node through a range of data sources including schedules, airport slots, flight plans (FPLs) and ATS messages or other forms of flight progress updates • Predict capacities at ATM resources within the node • Assess demand-capacity imbalance • Monitor the accuracy of demand and capacity predictions
Local CDM Conference	• Host scheduled CDM conference with local stakeholders to prepare ATFM measures
Cross-Border CDM Conference	• Host or participate in cross-border CDM conference with other node leaders
ATFM Daily Plan (ADP)	• Generate ADP to outline ATM situation for the day
ATFM Measure Execution	• Ensure the effective implementation / revision / cancellation of ATFM measures in collaboration with local FMP/ATS units • Provide information on ATFM in a timely manner to relevant stakeholders in accordance to the cross-border procedures developed
ATFM Measure Effectiveness Monitoring	• Monitor ATFM measure effectiveness and revise as appropriate to the developing situations
ATFM Post-Operations Analysis	• Lead the collaborative effort to perform post-operations analysis after each round of ATFM program
Responsibilities Specific to GDP	
CTOT Distribution	• Generate CTOTs and distribute via appropriate channels preferably no less than 90 minutes before Estimated Off-Block Time (EOBT) to support stakeholder's advance planning
Slot Management	• Provide platform or protocol for slot management process (change, swap, remove, add)
Adherence to CTOT in departure management	• Manage departure traffic in adherence to CTOT within the CTOT compliance window
	• Include CTOT information as part of the air traffic control clearance when a given flight is subject to CTOT *Ref: ICAO Doc 9971, 3rd Ed., Part II, Chapter 6*
	• Ensure that local ATC procedures and CDM processes facilitating compliance with received CTOT are implemented

Table 2: Level-2 ANSP Responsibilities

Level 2 ANSPs	
Responsibilities	**Descriptions**
General ATFM Responsibilities	
Cross-Border CDM Conference	• Participate in cross-border CDM conference with other node leaders
ATFM Post-Operations Analysis	• Participate in the collaborative effort to perform post-operations analysis by providing information from departure side
Responsibilities Specific to GDP	
Adherence to CTOT in departure management	• Manage departure traffic in adherence to CTOT within the CTOT compliance window
	• Include CTOT information as part of the air traffic control clearance when a given flight is subject to CTOT *Ref: ICAO Doc 9971, 3rd Ed., Part II, Chapter 6*
	• Ensure that local ATC procedures and CDM processes facilitating compliance with received CTOT are implemented

Table 3: Level-1 ANSP Responsibilities

Level 1 ANSPs	
Responsibilities	**Descriptions**
General ATFM Responsibilities	
Participation in Project Updates	• Participate in regular project meetings to keep up to date with latest developments
ATFM Education	• Educate local stakeholders and personnel on ATFM in preparation for capability upgrade
ATFM Information Distribution	• Distribute information about ATFM initiatives to local stakeholders, e.g. information about an active ATFM measure in the region, to ensure stakeholders are aware of the project progress and implementation elsewhere
Planning for Capability Upgrade	• Study the concept of ATFM and Distributed Multi-nodal ATFM operations • Assess the needs and plan for capability upgrade, especially if supplying traffic to FIRs serviced by Level-3 ANSPs

APPENDIX C: DEMAND-CAPACITY BALANCING

General Principle

1. The implementation of Air Traffic Flow Management (ATFM) manages air traffic demand over airport or airspace where demand at times exceeds or is expected to exceed the capacity of the Air Traffic Control (ATC) services, to ensure that traffic demand is compatible with ATC capacity. The implementation of ATFM also facilitates and contributes to a safe, orderly, and expeditious flow of air traffic by ensuring that ATC capacity is optimised and utilised to the maximum extent possible.
2. In the APAC region, the regional concept for cross border ATFM is based on a Distributed Multi-Nodal ATFM Network concept, whereby each node is led by an agreed Air Navigation Service Provider (ANSP) as the Node Leader. The Node Leader is responsible for Demand-Capacity Monitoring and Balancing at ATM resources such as airports or airspace.
3. Demand and Capacity Balancing can be performed during the different ATFM phases, and it can start as early as during the strategic phase, to the pre-tactical phase and finally the tactical phase. More details on the individual ATFM phases can be found in Asia/Pacific Framework for Collaborative ATFM under the section of Background Information.

Establishment of an accurate prediction for traffic demand

4. As specified in Chapter 5 of ICAO Doc 9971, an accurate picture of the expected traffic demand can be established when reliable and accurate flight intent data are provided for ATFM services. These data can be provided by the various organisations responsible for the authorisation or execution of flights. The following data associated with flight intent can be provided to ATFM services for use in demand predictions:
   a. Airspace User (AU) marketing schedule data;
   b. airport strategic slot data from the airport slot coordination process;
   c. AU flight intent updates;
   d. ANSP ATM automation system data (e.g., ATS messages via aeronautical fixed telecommunication network (AFTN) or ATS message handling systems (AMHS), or data provided by the flight data processing (FDP) component) including:
      i. flight plans (FPL ATS message or comparable data);
      ii. flight plan amendments (CHG ATS message or comparable data);
      iii. flight plan cancellation (CNL ATS message or comparable data);
      iv. indication of departure (DEP ATS message or comparable data)
      v. indication of arrival (ARR ATS message or comparable data);
      vi. indication of flight delay (DLA ATS message or comparable data); and
      vii. flight coordination (CPL and EST ATS messages or comparable data);
   e. aerodrome departure planning and arrival information;
   f. correlated surveillance data (e.g., ADS-B, SSR, WAM, MLAT); and
   g. aircraft position report (airspace user provided position report).

Planning, assessment and declaration of capacity

5. The assessment and declaration for the various types of capacities can be referenced from Asia/Pacific Framework for Collaborative ATFM, para 5.27 to 5.36.

Addressing demand and capacity imbalance

6. ATFM measures should generally be applied during periods when demand exceeds capacity. They are techniques used for the management of air traffic demand according to system capacity and should not be applied on a routine basis.

7. During the ATFM strategic phase, discussions should be conducted between Airspace Users (AUs) and capacity providers such as ANSPs and airports for the analysis of airspace, airport and ATS restrictions. In addition, significant meteorological phenomena and changes in seasonal meteorological condition should also be discussed. From these discussions, discrepancies between demand and capacity can be identified, and possible solutions can be jointly developed to address the demand capacity imbalance.

8. If demand-capacity imbalances cannot be resolved in the strategic phase, pre-tactical and tactical ATFM measures may be required. Table 1 sets out the various types of ATFM measures which can be adopted during the ATFM pre-tactical and tactical phases. The table also outlines how these measures are applied, as well as the associated timeframe for its application. The list is not exhaustive and provides guidance on where the measures lie on the ATFM timeline.

9. For an effective provision of ATFM service, data exchange is required. As depicted in Figure 1, the data to be shared include information related to the flight intent, capacity, aerodrome, and airspace demand, ATFM measures, and CDM actions for the purpose of cooperation and coordination of air traffic flow management activities between ATFM stakeholders. There is also a requirement for the ATFM function to be regularly updated with information on the overall ATM resources (e.g., airspace status and aerodrome infrastructure) to understand the impact on the available capacity.

ATFM measure	*Constraint*			*Control mechanism*	*Time frame*	*Requirements to be effective*
	Airport arrivals	*Airport departures*	*Airspace*			
GDP	X	X	X	CTOT	Pre-tactical and tactical	Participation in percentage and distance
Re-route			X	Flight path change to avoid constraint	Pre-tactical and tactical	Access to airspace and published routes
Ground stop	X			Prevent departures from specific aerodromes to address existing tactical load on an arrival aerodrome	Tactical	
MIT/MINT	X		X	Time- or distance-based separation on a single stream of traffic	Tactical	
MDI	X		X	Time-based separation from departures from the same aerodrome	Tactical	
Fix balancing	X		X	Flight path change to avoid	Tactical	
Level capping			X	Flight path change to avoid	Tactical	

Table 1 Summary of ATFM Measures

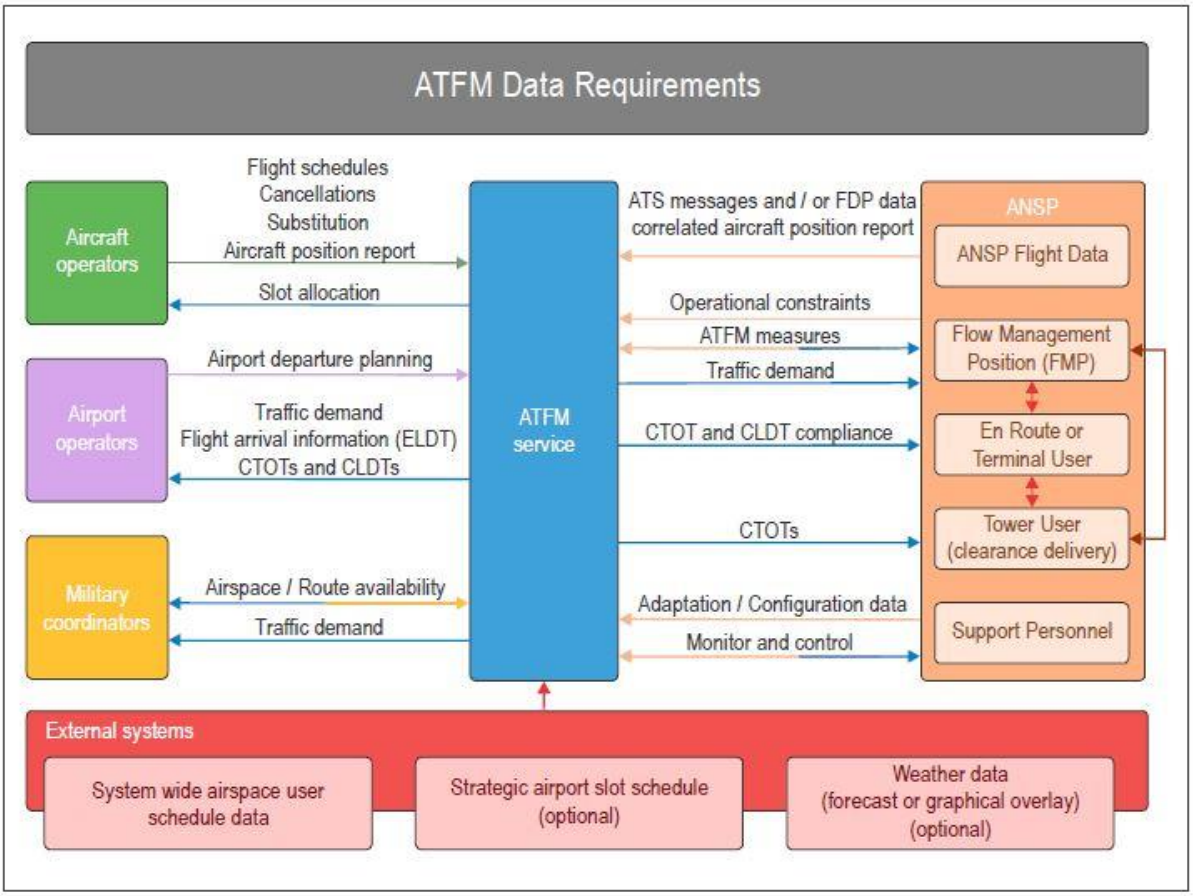


Figure 1 ATFM Data Requirements

APPENDIX D: ATFM DAILY PLAN SAMPLE TEMPLATE

ATFM DAILY PLAN	[ANSP or ATFM Unit Name]
DATE / TIME OF ISSUE	[Date]/[Time of issuance]
STATUS / REFERENCE	[Status of the ADP, e.g., *New*, *Revision 1*, etc.]/ [FIR Name_YYYYMMDD_version]

CONSTRAINTS AND IMPACT					
LOCATION	APPLICABLE PERIOD (UTC)			REMARK	EXPECTED ARRIVAL DELAY (AVERAGE)
[Constraint Loc]	[Date]	[Start]	[End]	[Constraint/Issue]	[Expected Delay]

ATFM MEASURE					
LOCATION	ATFM MEASURE PERIOD (UTC)			ATFM MEASURE	CAPACITY IMPACT
[Constraint Loc]	[Date]	[Start]	[End]	[ATFM measure]	[Capacity number]

OTHER INFORMATION
[Pertinent weather information]
[Additional instruction, e.g., CTOT compliance windows]
[Contact information, web-conference address]
[Additional remarks]

EXAMPLE ATFM DAILY PLAN

ATFM Daily Plan	RJJJ	1504022000 - 1504031959

CAPACITY and CONSTRAINTS			
Location (AD or SECT)	**APPLICABLE PERIOD**	**AAR (landings per hour)**	**CONSTRAINT/REMARK**
RJCC	2100 – 2300	04 – 06	LVP
RJTT	0200 – 0300	10	RWY34L/16R CLSD 0200 – 0245 CONST
RJTT	0300 – 0500	14	FLTCK RWY22 ILS
SECT 1	0130 – UFN	-	Developing CB

ATFM MEASURES		
Location (AD or SECT)	**APPLICABLE PERIOD**	**MEASURE REMARKS**
RJTT	2330 – 0140	CTOT DEST RJCC
SECT 12	2300 – 0005	3 MINIT DEP RJAA/RJTT
SECT 12	0130 – UFN	G585 8 MINIT AT [WAYPOINT] WB FOR ZMUB REGARDLESS OF FL

POSSIBLE/DEVELOPING ISSUES		
Location (AD or SECT)	**APPLICABLE PERIOD**	**MEASURE REMARKS**
RJAA	0300 – 0500	15 MIT, 250KT AT [WAYPOINT] [WAYPOINT]
RJTT	0300 – UFN	CTOT

APPENDIX E: ATFM TERMINOLOGY AND COMMUNICATIONS

ATFM Terminology – General

Acronym	Term	Definition
AAR	Airport Arrival Rate	Runway arrival capacity of an airport normally expressed in movements per hour
ADR	Airport Departure Rate	Runway departure capacity of an airport normally expressed in movements per hour
ASD	Aircraft Situation Display	ATC Aircraft/Traffic Situation Display
AFIX	Arrival Fix	A waypoint during the arrival phase of a flight. In the context of ATFM it could be a waypoint where an ATFM Measure may be applied
CDM	Collaborative Decision-Making	Process which allows decisions to be taken by amalgamating all pertinent and accurate sources of information, ensuring that the data best reflects the situation as known, and ensuring that all concerned stakeholders are given the opportunity to influence the decision. This in turn enables decisions to best meet the operational requirements of all concerned.
CDR	Conditional Route	ATS route that is available for flight planning and use under specific conditions
DFIX	Departure Fix	The first published fix/waypoint used after departure of a flight.
DMAN	Departure Manager	A planning system to improve the departure flows at an airport by calculating the Target Take-Off Time (TTOT) and Target Startup Approval Time (TSAT) for each flight, taking multiple constraints and preferences into account
FCA	Flow Constrained Area	A sector of airspace where normal flows of traffic are constrained, which could be caused by meteorological conditions, military exercise etc.
FMP	Flow Management Position	A position that monitors traffic flows and implements or requests ATFM measures to be implemented
GDP	Ground Delay Program	An ATFM measure where aircraft are held on the ground in order to manage capacity and demand in a specific volume of airspace or at a specific airport. In the process, departure times are assigned. These departure times correspond to available entry slots into the constrained airspace or arrival slots into the constrained airport
GSt	Ground Stop	A tactical ATFM measure where some selected aircraft remain on the ground at the departure airport due to severe constraint either in downstream airspace sector or an arrival airport
MINIT	Minutes in Trail	A tactical ATFM measure expressed as the number of minutes required between successive aircraft at an

		airspace boundary point. It is normally used in airspace without air traffic surveillance or when transitioning from surveillance to non-surveillance airspace, or even when the spacing interval is such that it would be difficult for a sector controller to measure it in terms of miles
MIT	Miles in Trail	A tactical ATFM measure expressed as the number of miles required between successive aircraft (in addition to the minimum longitudinal requirements) to meet a specific criterion which may be separation, airport, fix, altitude, sector or route specific. MIT is used to organize traffic into manageable flows as well as to provide space to accommodate additional traffic (merging or departing) in the existing traffic flows. It will never be less than the separation minima.
RFIX	En-route Fix	A waypoint during the en-route phase of a flight. In the context of ATFM it could a waypoint where an ATFM Measure may be applied
-	ATFM Measure	ATFM solution which will balance demand against capacity or facilitate the safe, orderly, and expeditious flow of air traffic

ATFM Terminology – Phase of Flight

Acronym	**Term**	**Definition**
SOBT	Scheduled off Block Time	The time that an aircraft is scheduled to depart from the parking position
EOBT	Estimated Off Block Time	The estimated time that an aircraft will start movement associated with departure; normally this should match the SOBT at airports with Strategic Slot Coordination Process
TOBT	Target Off - Block Time	The time that an Aircraft Operator or Ground Handler estimates that an aircraft will be ready to receive start-up approval/push-back clearance
TSAT	Target Start up Approval Time	The time provided by ATC taking into account TOBT, CTOT and/or the traffic situation that an aircraft can expect start-up/push-back approval
COBT	Calculated Off Block Time	A time calculated and issued by an ATFM Unit, as a result of tactical ATFM slot allocation, at which a flight is expected to push back / vacate parking position so as to meet a CTOT, taking into account start and taxi time.
AOBT	Actual Off Block Time	The time the aircraft pushes back / vacates parking position (Equivalent to Airline / Handlers ATD – Actual Time of Departure & ACARS=OUT)

TTOT	Target Take-Off Time	The Target Take-Off Time of an aircraft taking into account the TOBT/TSAT plus Estimated Taxi-Out Time
CTOT	Calculated Take off Time	A time calculated and issued by an ATFM Unit, as a result of tactical ATFM slot allocation in a Ground Delay Program, at which a flight is expected to become airborne
ETOT	Estimated Take Off Time	The Estimated Take-Off Time of an aircraft, taking into account EOBT plus Estimated Taxi-Out Time
ATOT	Actual Take Off time	The time that an aircraft takes off from the runway (Equivalent to ATC ATD–Actual Time of Departure, ACARS = OFF)
ETO	Estimated Time Over	Estimated time at which an aircraft would be over a fix, waypoint or particular location typically where air traffic congestion is expected
CTO	Calculated Time Over	Time calculated and issued by an ATFM Unit, as a result of tactical ATFM slot allocation, at which a flight is expected to be over a fix, waypoint or particular location typically where air traffic congestion is expected
TLDT	Target Landing Time	Targeted Time from the Arrival Management process at the Threshold, taking runway sequence and constraints into account; Progressively refined planning time used to coordinate between arrival and departure management processes
CLDT	Calculated Landing Time	A landing time calculated and issued by an ATFM unit, as a result of tactical ATFM slot allocation at which a flight is expected to land on a runway
ELDT	Estimated Landing Time	The estimated time that an aircraft will touch- down on the runway
ALDT	Actual Landing Time	Actual time an aircraft lands on a runway (Equivalent to ATC ATA –Actual Time of Arrival = landing, ACARS=ON)
SIBT	Scheduled In Block Time	The Time that an aircraft is scheduled to arrive at its first parking position
CIBT	Calculated In Block Time	An in-block time calculated and issued by an ATFM unit, as a result of tactical ATFM slot allocation at which a flight is expected to be at its first parking position.
AIBT	Actual In Block Time	The time that an aircraft arrives in-blocks (Equivalent to Airline/Handler ATA –Actual Time of Arrival, ACARS =

		IN)

ATFM Terminology Map

Phase of Flight	**Scheduled**	**Flight Plan**	**System Estimate**	**Target (Airline)**	**Target (A-CDM)**	**ATFM Measure**	**Estimated**	**Actual**
Off-Block Time (OBT)	SOBT	EOBT		TOBT	TSAT	COBT		AOBT
Take-Off Time (TOT)			ETOT		TTOT	CTOT	ETOT	ATOT
Time Over (TO)			ETO			CTO	ETO	ATO
Landing Time (LDT)			ELDT		TLDT	CLDT	ELDT	ALDT
In-Block Time (IBT)	SIBT					CIBT		AIBT

ATFM Phraseology

Note: The following phrases are suggested for use as an interim procedure, pending the development of globally standardized ATFM –related phraseology

Circumstance	Phraseology
Calculated take-off time (CTOT) delivery resulting from a slot allocation. The CTOT shall be communicated to the pilot at the first contact with ATC.	CTOT (*time*)
Change to CTOT resulting from a Slot Revision.	REVISED CTOT (*time*)
CTOT cancellation resulting from a Slot Cancellation	CTOT CANCELLED, REPORT READY
Start-up requested too late to comply with the given CTOT.	CTOT EXPIRED, REQUEST A NEW CTOT
Denial of Start-up when requested too late to comply with the given CTOT. (Where supported by State regulation or procedure)	UNABLE TO APPROVE START-UP CLEARANCE DUE CTOT EXPIRED, REQUEST A NEW CTOT
Start-up requested too early to comply with the given CTOT.	REQUEST A NEW CTOT
Denial of Start-up when requested too early to comply with the given CTOT. (Where supported by State regulation or procedure)	UNABLE TO APPROVE START-UP CLEARANCE DUE CTOT (*time*), REQUEST START-UP AT (*time*)

……

APPENDIX F: ATFM MONITORING AND REPORTING FORM

ATFM PERFORMANCE INDICATORS

The following indicators are based on the Performance Improvement Plan of the Asia/Pacific Regional Framework for Collaborative ATFM, which should be read in conjunction with this form. The information provided will be used by the relevant Regional bodies to assess individual Administration and overall regional compliance with the Framework, and may be used by Administrations to internally evaluate their implementation status.

INSTRUCTIONS

A	If your administration **is expected, or intends, to implement and distribute cross-border ATFM measures** under the terms of the Performance Improvement Plan of the Asia/Pacific Regional Framework for Collaborative ATFM: 1-42

B	If your Administration **is <u>not</u> expected to implement and distribute cross-border ATFM** as described above, answer questions 43 to 61.

Indicate against each Performance Expectations: **Fully Implemented – 100%; Partially Implemented – 50%– ; Not Implemented / Not Applicable – 0%**

A. Administrations Distributing ATFM Measures
Indicate whether your administration has:

Number	Regional ATFM Framework Performance Expectations	Response
1.	Enacted regulations for the implementation of ATFM	
2.	Implemented a program of bi-annual strategic airport and airspace capacity, and strategic demand analysis	
3.	Performed an analysis of current traffic demand and expected growth for the next 5 years (rolling)	
4.	Commenced daily pre-tactical airport and airspace capacity-demand analysis for ATFM Program airports and associated terminal airspace as well as enroute ATC sectors supporting the homogeneous ATM areas and major traffic flows identified in the Asia and Pacific Regions	
5.	Made arrangements for relevant ATFMU to chair and/or participate in regularly scheduled ATFM conferences for pre-tactical ATFM planning	
6.	Commenced ATFM post-operations analysis and rectification, taking guidance from the Asia/Pacific ATFM Post-Operations Analysis Recommended Framework as starting point	
7.	Ensured the origination, distribution and processing of FPL and ATS messages in accordance with ICAO Doc 4444 PANS-ATM and the Regional Framework for Collaborative ATFM	
8.	Enacted requirements to ensure FPL is submitted no less than 3 hours prior to EOBT except where necessary for operational or technical reasons	
9.	Enacted requirements to ensure a DLA message is transmitted when the departure of an aircraft for which basic FPL has been sent is delayed by more than 15 minutes after the EOBT specified in that basic FPL	
10.	Ensured that, when there is a delay from a GDP, CTOT and other slot allocation information originated from the ATFMU is communicated to all relevant stakeholders	
11.	Implemented or designed systems to ensure that FPL are not discarded from relevant ATM systems as a consequence of ATFM delay.	
12.	Implemented common fixes, terminology and communications in ATFM, AMAN/DMAN and A-CDM systems	
13.	Optimized ATC separation and reduced runway occupancy times at all ATFM program airports and in associated terminal airspace	
14.	Implemented strategic airport slot allocation at all international airports where demand significantly exceeds airport capacity	

15.	Implemented pre-tactical modelling of airport and airspace configuration and traffic demand, and the effect of ATFM measures	
16.	Implemented tactical ATFM measures for flights inbound to ATFM program airports	
17.	Enabled sharing of relevant information between all stakeholders through implementation of CDM	
18.	Implemented dynamic updating of airport and airspace capacity constraints, capacity calculations and demand information	
19.	Implemented local procedures for ATFM operations and communication, including phraseology and terminology for ATFM Units, ATS Units, airspace users, and airport operators, drawn from ICAO Doc. 9971	
20.	Established ATFM capability with appropriately trained staff and operating procedures	
21.	Developed procedures for ATFMU, ATS Units, airspace users, and airport operators when ATFM program is active	
22.	Implemented local ATC procedures and, where available, CDM processes facilitating compliance with received CTOT	
23.	Implemented tactical ATFM measures for flights inbound to constrained airspace	
24.	Ensured tactical ATFM measures are only applied during periods of constraint	
25.	Promulgated procedures to avoid subjecting individual flights to more than one tactical ATFM measure	
26.	Developed procedures and agreements for post-operational analysis of cross-border ATFM with stakeholders	
27.	Ensured post-operations analyses are used for planning ATFM, airspace and ATS route improvements	
28.	Commenced daily preparation and sharing of an ATFM Daily Plan (ADP) for all ATFM Program airports and associated terminal airspace	
29.	Promulgated procedures for tactical management of ATFM measures, including revision, cancellation where necessary	
30.	Ensured interoperability of implemented ATFM, A-CDM, AMAN, DMAN, ATM automation systems and airspace user systems where operational interfaces exist or are planned	
31.	Implemented meteorological services to support ATM in the terminal area (e.g. Meteorological Service in Terminal Area -MSTA)	
32.	Implemented distributed multi-nodal ATFM information distribution capability	
33.	Ensured ATFM systems take long haul flights into account in demand predictions	
34.	Ensured ATM and ATFM systems provide timely update of estimate information for airborne aircraft	

35.	Implemented A-CDM at international aerodrome and integrated with ATFM operations with appropriate information exchange between the two systems and processes	
36.	Established national civil-military ATM coordination body to enable strategic, pre-tactical, and tactical airspace management (ASM)	
37.	Established a civil-military ATM coordination body to regularly review the use of Special Use Airspace (SUA) to ensure optimal usage all airspaces based on the FUA concept	
38.	Established regulations to support a safe integration of UAS operations in non-segregated airspace	
39.	Implemented ATFM information distribution capability utilizing FIXM v4.2 (or later), extended where necessary, to enable the exchange of flight-specific ATFM information	
40.	Integrated ATFM, AMAN/DMAN, and A-CDM systems through cross-platform information exchange based on FIXM v4.2 (or later) with appropriate extension	
41.	Established research and development programs to explore novel capacity enhancement techniques such as free route airspace, extended arrival metering, dynamic airspace configurations, target time operations, and collaborative trajectory options, with an emphasis on needs, safety case, and cost-benefit analysis	
42.	Implemented Meteorological information exchange with ATM and ATFM systems using IWXXM v3.0 (or later)	

B. States/Administrations *Facilitating* ATFM Measures (but not expected to implement and distribute cross-border ATFM)

Indicate whether your administration has:

Number	Regional ATFM Framework Performance Expectations	Response
43.	Implemented a program of bi-annual strategic airport and airspace capacity, and strategic demand analysis	
44.	Performed an analysis of current traffic demand and expected growth for the next 5 years (rolling)	
45.	Made arrangements for relevant personnel from ATSU to participate in regularly scheduled ATFM conferences for pre-tactical ATFM planning	
46.	Ensured the origination, distribution and processing of FPL and ATS messages in accordance with ICAO Doc 4444 PANS-ATM and the Regional Framework for Collaborative ATFM	
47.	Enacted requirements to ensure FPL is submitted no less than 3 hours prior to EOBT except where necessary for operational or technical reasons	
48.	Enacted requirements to ensure a DLA message is transmitted when the departure of an aircraft for which basic FPL has been sent is delayed by more than 15 minutes after the EOBT specified in that basic FPL	
49.	Ensured local stakeholders are able to access CTOT information readily, either directly from the ATFMU distributing it or through local dissemination	
50.	Implemented or designed systems to ensure that FPL are not discarded from relevant ATM systems as a consequence of ATFM delay.	
51.	Optimized ATC separation and reduced runway occupancy times at all ATFM program airports and in associated terminal airspace	
52.	Enabled sharing of relevant information between all stakeholders through implementation of CDM	
53.	Implemented local procedure with regards to ATFM operations and communication, including phraseologies, among ATFMU, ATS Units, airspace users, and airport operators drawn from ICAO Doc 9971	
54.	Developed procedures for ATS units, airspace users, and airport operators when ATFM program is active	
55.	Implemented local ATC procedures and, where available, CDM processes facilitating compliance with received CTOT	
56.	Developed ATFM post-operations analysis workflow among ATFMU, ATS units, airspace users, and airport operators to ensure proper and timely feedback mechanism can be distributed to ATFMU originating the ATFM measures	
57.	Developed procedures and agreements for post-operational analysis of cross-border ATFM with stakeholders	

58.	Ensured post-operations analyses are used for planning ATFM, airspace, and ATS route improvements	
59.	Ensured capability to receive ATFM Daily Plan (ADP) from Administrations distributing the ATFM measures and to distribute it among local stakeholders for situational awareness	
60.	Ensured ATM systems provide timely update of estimate information for airborne aircraft	
61.	Educated ATM staff and stakeholders on the basic of ATFM and its connection with ATS	

ATFM TRAINING GUIDE

Chapter 1 - Introduction

General

Air Traffic Flow Management (ATFM) is an enabler of Air Traffic Management (ATM) efficiency and effectiveness. ATFM contributes to the safety, efficiency, cost effectiveness and environmental sustainability of an ATM system. ATFM enhances safety by balancing traffic demand against available capacity, thereby enabling the safe management of air traffic especially in a constrained environment.

As traffic grows, an increasing number of States begin to implement ATFM. As ATFM becomes more widely adopted, it is worth remembering that ATFM's effects are trans-boundary in nature and therefore the operation needs to be coordinated between States. Therefore, ATFM systems need to be compatible and interoperable, with the development of coordinated and harmonized training requirements being the first step in ensuring harmonized ATFM implementation.

In developing a training program, it is important to recognize that ATFM provides a vital support to Air Traffic Control (ATC) services and affects the operations of all ATM stakeholders. ATFM service should therefore be provided by personnel with sufficient knowledge and understanding of an ATM system in which they operate. The comprehensive effects of ATFM on all stakeholders also means that suitable ATFM knowledge should be provided for all stakeholders, not just ATFM service personnel. This is in line with the *ICAO Manual on Collaborative Air Traffic Flow Management (Doc 9971)* which suggests that other non-ANSP stakeholders should also be made aware of and understand the ATFM services and the specific roles they carry in the process.

This document provides guidance for States/ANSPs in systematically developing their ATFM training programs through a set of harmonized training requirements. It describes the requirements for ATFM staff and stakeholder training at various levels befitting the role they play in an ATFM environment. The proposed training requirements are designed to support both local application of ATFM and ATFM operations at the regional level.

Note that the material in this document is a general guidance focusing on ATFM concepts, principles, and procedures. Each State/ANSP will have to add locally specific training requirements and materials especially in relation to the specific ATFM system, equipment, and local procedures used.

ICAO and EUROCONTROL sources were consulted for the development of the training concepts and methodology presented herein. The proposed training syllabus is derived with the support of in-depth ATFM service expertise.

Purpose and Scope of the Document

The purpose of this document is to provide a guideline for the development of ATFM training process and materials by States/ANSPs, and to ensure regional ATFM service personnel and stakeholders have a similar level of knowledge and experience in ATFM.

In many cases, an individual may already possess the required competence and experience in a particular domain and may not need to follow a formal training course on the subject. Nevertheless, a process to confirm the individual's competence should still be followed. The document addresses the following:

- Who is to be trained?
- What pre-requisite skills are required or can be obtained?
- What are the job responsibilities and required competencies?
- What is the required content of ATFM training?
- What is the level of training depending on the level of responsibilities to be exercised?

Structure of the Document

This ATFM training guide consists of 3 chapters and 2 attachments:

- Chapter 1 – Introduction
- Chapter 2 – ATFM Training Structure
- Chapter 3 – Job Responsibilities, Competencies, Training Requirements

- Attachment 1 – Recommended Training Modules (Ab-Initio and Basic)
- Attachment 2 – Example Training Program: Japan

Chapter 2 – ATFM Training Structure

A Model of ATFM Training

ATFM training is the method by which ATFM staff can obtain the appropriate skills to operate an ATFM system and provide ATFM services that are effective, harmonized, and consistent. The training should be provided not only to ATFM unit staff but also to other stakeholders who will need to operate in an ATFM environment, to ensure that all relevant personnel are aware of and understand their roles and responsibilities within an ATFM process. Operational personnel to whom ATFM training should be provided, in addition to the ATFM unit staff, therefore include:

- ANSP
  - ATCs
- Airspace Users
  - Flight Operations/Dispatch Staff
  - Pilots
- Airport Operators
  - Airside Operations Staff
  - Ground Handling Agents
- Military
  - Military ATCs
  - Military Pilots
- Regulatory Body (CAAs and equivalent)
  - Regulators
  - Auditors

An ATFM service is provided by staff at different levels, each with its own training requirements. The different levels of ATFM responsibilities include operations management and supervision, ATFM planning and execution, and essential support staff. Other support functions, CDM partners, and general ATM personnel should also be considered when developing training requirements.

This guidance proposes six-level (taxonomy levels) training objectives as a basis for training requirement development. Different ATFM or ATFM-related personnel can then be assigned the training courses that will provide the required levels of knowledge in various areas appropriate to their functions within the ATFM process. The six levels are:

Level	Objective
Level 0	Learners to be aware of the materials
Level 1	Learners to possess the basic knowledge of the subject and to be able to memorize and retrieve the essential points
Level 2	Learners to have the ability to understand and discuss the subject intelligently, and able to apply the knowledge in certain events
Level 3	Learners to possess thorough knowledge of the subject and the ability to apply it in the development and execution of plans

Level	Objective
Level 4	Learners to be able to integrate the knowledge and establish action plans/methods to resolve a problem in a familiar situation
Level 5	Learners to be able to analyze new situations/complex problems and apply the learned principles to develop resolution strategies

(Source: EUROCONTROL Specification for the ATCO Common Core Content Initial Training)

A matrix should be constructed to determine the level of training and competency required for personnel responsible for the various ATFM function. A partial matrix template is shown below, with the levels shown for illustrative purpose.

Personnel / Subject	Ops Manager	Supervisor	ATFM Planner	ATFM Execution	Ops Support	CDM Partner	General ATM Personnel
ATM	2	2	2	2	2	1	1
ATFM	2	3	4	3	2	2	1
ATC Ops	2	2	2	1	1	1	1
Airport Ops	2	2	2	2	1	1	1
Airline Ops	2	2	2	2	1	1	1
Meteorology	2	2	3	3	2	1	1
ICAO Provisions	3	2	2	2	2	1	1
ATFM Tools	2	2	3	3	3	2	1
Capacity Assessment	2	2	2	1	1	1	1
Airspace Design	2	2	2	1	1	1	1
...	...	...	...	...	...		...

Phases of ATFM Training

ATFM training can be divided into several phases. This document concentrates on training requirements for Ab-Initio and Basic training; other phases are only discussed briefly.

Ab-Initio Training

Ab-initio training is intended to ensure that new ATFM staff possess the necessary contextual knowledge in order to follow the more detailed job-related training. In many cases, staff may already possess some knowledge (e.g. ATC staff will possess the necessary ATC knowledge, airline operations personnel the necessary aircraft operations knowledge). The possession of the necessary ab-initio subject knowledge should be assessed upon recruitment / assignment. In cases where staff already possess the necessary contextual knowledge, they may be exempted in whole or in part from elements of the ab-initio training.

Basic Training

Basic training is the main phase during which the core ATFM and associated operational topics are covered comprehensively. Basic training also covers more detailed knowledge of subjects related to ATFM than in the ab-initio training. At the successful completion of basic

training, the staff member should have all the relevant knowledge to proceed to on-the-job training before performing his/her roles in the ATFM operation.

On-the-Job Training

For an ATFM staff to be able to apply the knowledge from the basic training course in an operational environment, supervised practice in the form of an on-the-job training (OJT) is required. The main purpose of OJT is to reinforce the theoretical knowledge and to help assure staff member's competency to perform the ATFM functions to the required standards. OJT can also follow advanced or refresher training.

Advanced Training

As ATFM functions develop, several advanced ATFM analysis and application techniques are used. Some staff, having progressed in their ATFM careers, will also require a higher level of knowledge and skills for their functions. The advance training modules will therefore be required. The purpose of advanced training is to augment the skills and knowledge of ATFM personnel in dealing with either more specific complex problems or with a wider breadth of issues.

Recurrent/Refresher Training

It is essential that ATFM personnel update his or her competencies in accordance with the latest operational requirements, procedures, and new methodology/technologies through regular recurrent training. ATFM personnel can also be absent from their function for an extended period; recurrent/refresher training should also be administered prior to return-to-service for this case as well.

Training Requirements for ATFM Instructors

To ensure effective provision of ATFM training, ATFM instructors must not only possess thorough knowledge of the subject matters but must also be able to convey the knowledge in a structured and comprehensible way. Where possible, ATFM instructors should also be trained on the principles and methods of effective teaching.

If a State is implementing the ATFM service for the first time and therefore do not have instructors with the expertise needed to provide the training, different solutions should be considered. A *train-the-trainers* package can be provided by the ATFM system provider if a software/system were to be procured.. For more in-depth knowledge of the procedures and processes involved, staff responsible for the training may also be sent to attend courses given by trainers having the experience required to train ATFM staff at training institutions elsewhere.

Chapter 3 – Job Responsibilities, Competencies, Training Requirements

General

Introduction

The first steps in the process of designing detailed training requirements are to:

- Identify job responsibilities and associated performance and measurement criteria,
- Identify the competencies required to meet these job responsibilities and performance.

With full understanding of job responsibilities, it is possible to determine what the competencies are of a fully competent staff member. Items that may be needed to perform this analysis include:

- the specific job or position description or summary,
- specific ATFM organization performance requirements or competencies, and
- standard operating procedures that apply to an individual's position or responsibilities.

When the pre-requisites described above are identified and analyzed, it is possible to design the training required to address the gaps through the development of learning objectives for each competency area. Based on the identification of the learning objectives, a curriculum can then be designed.

Linkages between ATC and ATFM

Before looking at the job responsibilities of an ATFM Unit, it is crucial to understand ATFM linkage with ATC operations. ATFM is a cross-domain activity, and with its comprehensive focus on demand/capacity balancing activity, there is a very strong linkage between ATC operations and ATFM service.

In general, an ATC supervisor is accountable for the provision of ATC services within an area (enroute sector, TMA, aerodrome) for which this service is being provided. As part of that responsibility, he/she is normally also accountable for all strategic and tactical ATFM decisions. In a smaller ATC unit, the supervisor may keep that responsibility, whereas in a larger unit, this can be delegated to an *Airspace Manager*, either being the Flow Management Position (FMP) within the unit or the supervisor of a separate ATFM Unit (ATFMU).

For the airspace manager, either the FMP or the ATFMU supervisor, to be able to make strategic and tactical ATFM decisions, a large measure of ATC knowledge and preferably ATC background is necessary. While the requirement for the airspace managers to have an ATC background may be less critical as ATFM operations mature and issues well documented, it is still important that the training provided ensures the staff fully understand and are able to discuss ATC operations so that the expected outcomes can be achieved.

Over time, the objective should be to develop the ATFMU to become an integral part of ATC operations so that the unit is seen as the manager of the airspace, responsible for the delivery of the right amount of demand and the optimal use of capacity.

Tasks and Competencies

Main Tasks of an ATFM Unit

The main objective of an ATFM unit is ensuring an effective management of airspace availability and capacity, through the optimization of traffic demand and complexity against the ATC capacity.

Such objective requires that the ATFMU maintains a strategic and tactical overview of the network (airspaces and airports within and adjacent to its area of responsibility), being responsible for the development of tactical ATFM strategies in response to demand and capacity issues.

The main tasks of an ATFM unit therefore include:

- Receiving and analysing all ATFM data and associated parameters,
- Planning and coordinating capacity adjustment,
- Developing and distributing ATFM Daily Plan,
- Coordinating tactical ATM resource capacity adjustments in consultation with ATC Supervisors,
- Managing proper execution of ATFM measures,
- Ensuring proper integration of traffic demand inputs,
- Ensuring proper configuration of ATFM support systems,
- Ensuring optimisation of resources through effective CDM process,
- Providing focus and specialist expertise for planning, coordinating, and implementing capacity management and contingency measures, and
- Conducting post operations analysis of ATFM operations.

Competencies for ATFM Staff

To perform the ATFM tasks discussed above, staff needs to possess a number of competencies. They need to have full knowledge of the FIR and/or airports for which the service is provided. They also need to understand the factors impacting ATM resource capacity, as well as the impacts of the ATFM solutions they propose. Most importantly, they need to be able to coordinate and cooperate closely with ATCs, airport operators, airspace users, and other relevant stakeholders effectively.

The required competencies for ATFM staff should include the ability to:

- Determine an accurate picture of air traffic demand,
- Receive, verify, evaluate, enter, and store all relevant ATFM data,
- Monitor the evolution of demand versus capacity,
- Identify all shortfalls and opportunities for capacity optimization,
- Determine the need for ATFM measures in all phases of ATFM,
- Develop and publish ATFM plans with all relevant information,

- Create, maintain, monitor, and adjust all relevant ATFM scenarios and measures,
- Ensure that stakeholders – especially Airspace Users – are provided with advice and guidance for minimising delays and disruption, and
- Know and adhere to all relevant operational instructions, procedures, and letters of agreement.

Training Requirements

This section provides a set of requirements for Ab-Initio and Basic training phases, which can be used by States/Administrations/ANSPs as bases for their training program development.

Ab-Initio ATFM Training

Ab-Initio Training is intended to ensure that new ATFM staff possess the necessary contextual knowledge to follow the more detailed job-related training. In many cases, staff may already possess some knowledge (e.g., ATC staff will possess the necessary ATC knowledge, airline operations personnel the necessary aircraft operations knowledge). The possession of the necessary ab-initio subject knowledge should be assessed upon recruitment / assignment. In cases where staff already possess the necessary contextual knowledge, they may be exempted in whole or in part from elements of the ab-initio training.

Basic Requirements

There are several basic requirements or pre-requisites for the successful conduct of ab-initio ATFM training, including:

- Pre-requisite skills and experience (e.g. experience in ATM, aircraft operations, airport operations),
- Complementary skills (IT, written and oral communication, operations analysis, statistics experience),
- Medical requirements,
- Language requirements

These basic requirements should normally be assessed as part of the ATFM staff recruitment process. Detailed definition of these basic requirements is beyond the scope of this document. However, materials are readily available in the public domain from other ATM-related functions that can be adapted for ATFM recruitment.

Training Content

The focus of ab-initio training should be on the Level-1 and Level-2 understanding of ATFM principles and other related materials. The modules recommended to be covered during the ab-initio training is provided in ***Attachment 1*** to this guidance. As ATFM is a collaborative process involving not just the ANSP but also other stakeholders (airspace users, airport

operators), these stakeholders and their operations should also be part of the training content.

Basic ATFM training

Basic training is the main phase during which the core ATFM and associated operational topics are covered comprehensively. Basic training also covered more detailed knowledge of subjects related to ATFM than in the ab-initio training. At the successful completion of basic training, the staff member should have all the relevant knowledge to proceed to on-the-job training before performing his/her roles in the ATFM operation.

When deciding on training content for a specific Basic Training course, it is important to consider:

- the position that the trainees are going to be trained for, i.e., the job responsibilities,
- the competencies required to carry out the tasks, and
- the background of the trainees, i.e., the competency level.

Recommended Training Modules

Based on the requirements for Ab-Initio and Basic trainings discussed above, ***Attachment 1*** to this guidance provides a set of recommended modules that can be considered by States/Administrations/ANSPs when designing their ATFM training program. Note that the document does not provide a detailed curriculum since it has to be individually prepared to match the needs of specific local environments. States/Administrations/ANSPs should use the set of recommended modules as a starting point and tailor their training programs to be suitable for their needs.

Additionally, ***Attachment 2*** to this guidance provides a description of how one State (Japan) has organized its training for ATFM positions, including the items to be demonstrated by the trainee during the OJT period. This is given as an example for other States/Administrations/ANSPs for the development of their ATFM training programs.

Attachment 1 – Recommended Training Modules

General

This attachment provides a set of recommended training modules that can be adapted by States/Administrations/ANSPs in developing their Ab-Initio and Basic training programs. Note that the document does not provide a detailed curriculum since it has to be individually prepared to match the needs of specific local environments. States/Administrations/ANSPs should use the set of recommended modules as a starting point and tailor their training programs to be suitable for their needs.

Ab-Initio ATFM Training Modules

Training Area	Subject	Objective	Topics	References
Regulatory Framework	Aviation Law & Institutional Background	To understand the regulatory context of national, regional, and global aviation; particularly in relation to the ATM environment	International Aviation Structure & Organizations National Aviation Structure National Regulatory Framework	Chicago Convention, Annex 11 Local legislations & rules
	Local & Regional ATFM Arrangement	To understand the regulatory framework of air traffic flow management (ATFM) at the national and regional levels	National ATFM Infrastructure Asia/Pacific Regional ATFM Arrangement	Local legislations & rules Asia/Pacific Seamless ANS Plan Asia/Pacific Framework for Collaborative ATFM
Air Traffic Management	Air Traffic Management (ATM) Basics	To understand the basic principles of air traffic management and all the underlying services	Air Traffic Services (ATS) - Air Traffic Control Services - Advisory Services - Flight Information Services - Alerting Services	Annex 11 - ATS Doc 4444 - PANS-ATM
			Air Traffic Flow Management (ATFM) - ATFM Background & Concept	Doc 9971 - Manual on Collaborative ATFM

Training Area	Subject	Objective	Topics	References
			Airspace Management (ASM) - ASM Background & Concept	Circular 330 (?)
	Aeronautical Information Service (AIS) Basics	To understand the basic principles of aeronautical information service	Flight Plan Management	
			Aeronautical Information Management - AIP, AIC - NOTAM	
	Communications, Navigation, Surveillance (CNS) Basics	To understand the basic principles of communications, navigation, and surveillance systems as well as the modern CNS concepts including PBN and PBCS; and to appreciate how the loss of these systems can affect ATM capacity, necessitating the use of ATFM solutions	Communication Systems - VHF, HF, UHF - CPDLC	
			Navigation Systems - NDB, VOR, DME - ILS, MLS - GNSS	
			Surveillance Systems - PSR, SSR - ADS-B, ADS-C	
			Modern CNS Concepts - PBN - PBCS	
Air Traffic Flow Management	Air Traffic Flow Management Introduction	To understand the basic principles of air traffic flow management and collaborative decision making, and be ready to further the knowledge in the next phase of training	ATFM Background	Doc 9971 - Manual on Collaborative ATFM
			ATFM Objectives	
			ATFM Benefits	
			ATFM Principles	
			CDM Concept & Processes	

Training Area	Subject	Objective	Topics	References
Meteorology	Meteorology for Aviation	To understand the basic principles of meteorological phenomena and their impacts on flight and ATM operations. To understand also the aviation meteorological information services and their products, which are essential to the safe flight operations	Basics of Meteorological Phenomena	
			Aviation Meteorology Products - METAR, TAF - SIGMET, AIRMET - Significant Weather Charts - Satellite & Radar Images	
			Meteorological Impacts on Aviation - Impacts on Flights - Impacts on ATM System Capacity	
Stakeholder Operations	Airport Operations	To understand the basic principles of airport management and operations, and to appreciate the need for coordination between ATFM service provider and airport operators	Aerodrome Infrastructure	
			Aerodrome Maintenance	
			Aerodrome Capacity Management	
			Airport Scheduling and Slot Coordination	
			Disruption/Crisis Management	
	Airline Operations	To understand the basic principles of airline management and operations, and to appreciate the need for coordination between ATFM service provider and airspace users	Airline Management and Infrastructure	
			Airline Operating Models	
			Airline Flight Scheduling	
			Flight Planning	
			Flight Operations	

Basic ATFM Training Modules

Training Area	Subject	Objective	Topics	References
Regulatory Framework	Local & Regional ATFM Arrangement	To understand the regulatory framework of air traffic flow management (ATFM) at the national and regional levels	National ATFM Infrastructure	Local legislations & rules
			Asia/Pacific Regional ATFM Arrangement	Asia/Pacific Seamless ANS Plan Asia/Pacific Framework for Collaborative ATFM
Air Traffic Management	(n/a)	(n/a)	(n/a)	(n/a)
Air Traffic Flow Management	Foundation of ATFM	To understand the foundations of air traffic flow management, including the philosophy, objectives, and benefits of ATFM operations, and to introduce basic terms and definitions related to ATFM	ATFM Philosophy	Doc 9971 - Manual on Collaborative ATFM
			ATFM Objectives	
			ATFM Benefits	
			ATFM Principles	
			Linkages with other services/processes (ATS, ASM, A-CDM)	
	Foundation of CDM	To understand and appreciate the principle of collaborative decision making (CDM) and to understand the means by which all ATFM stakeholders can collaborate and coordinate	Principles of CDM: Objectives, Benefits, and Requirements	Doc 9971 - Manual on Collaborative ATFM
			ATFM Stakeholders, Roles, and Responsibilities	
			Stakeholder Communications in ATFM Process	

Training Area	Subject	Objective	Topics	References
	ATM Planning	To understand the concept of capacity, factors impacting capacity, and capacity optimization solutions	Concepts of Capacity - Baseline/Declared Capacity - Operational Capacity	Doc 9971 - Manual on Collaborative ATFM
			Factors Impacting Capacity	
			Capacity Assessment Process	
			Capacity Optimization Techniques & Solutions	
	ATFM Process	To understand the various phases of ATFM operations and relevant processes, outcomes, and roles and responsibilities of ATFM service personnel and stakeholders; and to also understand the requisite information for each ATFM phase	Overview of the ATFM Process	Doc 9971 - Manual on Collaborative ATFM Asia/Pacific Framework for Collaborative ATFM Local ATFM Operating Procedure
			Strategic ATFM Operations	
			Pre-Tactical ATFM Operations	
			Tactical ATFM Operations	
	ATFM Solutions	To understand the various demand-capacity balancing solutions that can be applied in various ATFM phases, along with the required supporting infrastructure - such as data exchange agreement and operating procedures - to enable their usage	Capacity Optimization Solutions (e.g. Resectorization, Dynamic sectorization)	Doc 9971 - Manual on Collaborative ATFM
			Demand Distribution Solutions (e.g. Rerouting, Fix Balancing, Level Capping)	
			Demand Regulation Solutions (e.g. Ground Delay Program, Ground Stop, Minimum Departure Intervals)	

Training Area	Subject	Objective	Topics	References
	ATFM Operations Analysis	To understand the framework for ATFM post-operations analysis, and how the analysis can be used to identify challenges and areas for improvements in ATFM operations	ATFM Post-Operations Analysis - Impact Assessment - Compliance Monitoring - Effectiveness Analysis	Asia/Pacific ATFM Post-Operations Analysis Recommended Framework
			ATFM Benefits Analysis	
			Stakeholder Engagement Analysis	
	ATFM Tools	To know how to use the ATFM support systems to carry out ATFM operations	ATFM Data and Data Exchange	Local ATFM Operating Procedure
			ATFM Support Systems	
	ATFM in Contingency Situation	To understand how appropriate ATFM solutions can be used to manage contingency situations	ATM Contingency Plans and Procedures	Local ATFM Operating Procedure
			Adverse Weather Operations	
			ATFM in Adverse Conditions	
	Foundation of A-CDM	To understand the basic concept of A-CDM and relevant processes, and to also understand the linkages between ATFM operations and A-CDM process	A-CDM Concept & Processes	Doc 9971 - Manual on Collaborative ATFM CANSO Guide on A-CDM CANSO Guide on ATFM/A-CDM Integration
			Linkages between ATFM & A-CDM	
			A-CDM Support Tools	
			ATFM/A-CDM Integration	
Meteorology	(n/a)	(n/a)	(n/a)	(n/a)
Stakeholder Operations	(n/a)	(n/a)	(n/a)	(n/a)

Attachment 2 – ATFM Training for ATM Officers in Japan

The **Air Traffic Management Center (ATMC)** is the organization of Japan Civil Aviation Bureau (JCAB) providing ATFM services to the aircraft flying Fukuoka FIR. As soon as he or she is transferred into the ATMC, a rookie ATM officer starts initial training for an assistant position. The training course includes, but are not limited to:

- Concept of Air Traffic Management
- Organizational structure and regulatory bases of ATMC
- Outline of ATM services (i.e., ASM, ATFM, Oceanic ATM, and CDM)
- Knowledge and understanding of the present ATM environment (i.e., FIRs, Sectors of ACCs, TMAs, ATS routes, Training/Restricted areas, Navigational aids, Operations and performances of aircraft, Information processing system/tool/network related to ATM services, Communication procedures, etc.)

The special training for ATFM positions is scheduled following the initial training. The ATFM training consists of two parts. The first part consists of classroom lectures and practical simulator trainings. The second part consists of on-the-job trainings.

The ATFM training starts from the classroom lectures and practical simulator trainings, which are typically programmed as follows:

Day	**Topics**
Day 1	ATFM system and other associated equipment (*management and coordination procedures of standard routes and alternative routes*)
Day 2	Capacity value calculation procedures (*weather and ATFM*)
Day 3	Monitoring and prediction of traffic volume (*flow control procedures*)
Day 4	Algorithm of Expected Departure Clearance Time (EDCT) calculation (*handling procedures related to diversions at major airports*)
Day 5	Cross border ATFM (*characteristics of traffic flow and ATC operating procedures in ACC sectors*)
Day 6	Specifications of airports/aerodromes and ATC operating procedure (*ATM operations plan (OP) and CDM*) (*simulator: extracting relevant information/lists, setting capacities*)
Day 7	Regulations and agreements on ATFM (*simulator: flow management of ACC sectors*)
Day 8	In-house operating procedures (*simulator: flow management of RJTT/RJAA*)
Day 9	Recently introduced/amended procedures (*simulator: flow management of international ATS routes*)
Day 10	Case studies (*final checks*)

The on-the-job training (OJT) is phased and standardized. The trainee and the training supervisors are required to use “OJT check sheet” so that the trainee can master all required skills for ATFM services systematically. The check sheet used in Japan is provided herewith.

Note 1: In the OJT check sheet, the acronym “EDCT” is used. EDCT stands for Expected Departure Clearance Time, which is equivalent to the commonly known Calculated Take-Off Time (CTOT). EDCT is specific to the ATFM system used in Japan.

Note 2: JCAB is developing a new ATM training program that will comply with the competency-based training and assessment method following PANS-TRG procedures. Once developed, the current training program discussed here will be replaced and this document will be updated accordingly.

OJT check sheet				phase A ▪B ▪C	month	Starting date of the phase												
ATFM		crew	graduating class	name		A:			B:				C:					
					Number of mark" 4" earned by previous month	date	date	date	date	date	date	date	date	date	date	date	date	date
						hour	hour	hour	hour	hour	hour	hour	hour	hour	hour	hour	hour	hour
						SV	SV	SV	SV	SV	SV	SV	SV	SV	SV	SV	SV	SV
phase					4	d1	d2	d3	d4	d5	d6	d7	d8	d9	d10	d11	d12	d13
			Monitoring traffic volume															
A			able to manipulate TEAM and display necessary information timely															
A			able to calculate workload value of sectors per aircraft															
A			able to extract relevant departure flight plans for flow control initiatives															
A			able to evaluate EDCT flow controls before starting/ending the initiatives															
A			able to make the intended target highlight on the screen															
	B		able to evaluate EDCT flow controls including a groundstop															
	B		able to evaluate flow controls thru assignment of departure intervals															
	B		able to evaluate flow controls thru assignment of inflow intervals															
	B		able to except particular aircraft from flow controls or demand tallying process before/during initiatives															
	B		able to monitor airports/sectors with traffic flow characteristics taken into account															
	B		able to analyze flight plans correctly															
	B		checking combine/de-combine status of sectors and conditions of inflight aircraft by manipulating FPVD															
	B		able to plan and input the pre-tactical operation of variable sectors															
		C	able to perceive RWY operation patterns of RJTT/RJAA and input correctly															
		C	able to input capacity values correctly in accordance with present MET conditions or RWY in use															
		C	able to change capacity values in accordance with expected scenarios															
		C	able to predict the change of traffic demand graph and cope with it when traffic is surged against prediction															
		C	able to evaluate intended flow controls with the initiatives planned in the other ATFM position taken into account															
		C	able to cope with the unexpected, such as RWY closure															

			Flow control procedures															
A			able to figure out and input FROM-TO of EDCT flow controls															
A			able to figure out and input START-END of EDCT flow controls															
	B		able to coordinate about the start of flow controls with related ATC facilities															
	B		Conveying just enough information (i.e. flow controlled area, measure, start time, end time, FROM-TO, max demand value, capacity value) to an ATM supervisor before starting initiatives timely															
	B		able to make flow controls on inflight aircraft (i.e. assigning inflow intervals, specifying airspeed/altitude/route, assigning airborne holding)															
	B		able to make flow controls on departures by assigning departure intervals															
	B		able to figure out appropriate FROM-TO of flow controls on airports															
	B		able to figure out appropriate FROM-TO of flow controls on sectors															
	B		able to figure out appropriate FROM-TO of flow controls on ATS routes															
	B		able to adjust EDCT appropriately as needed															
	B		balancing the amount of delay of EDCT and arising no reverse in departure sequence in the respective airports															
	B		able to evaluate and decide the end time of flow controls appropriately															
	B		able to coordinate about the end of flow controls with related ATC facilities															
	B		able to cope with the change in ending time of flow controls (including input timing of "TO")															
	B		able to cope with EDCT exceeding the ending time of flow controls															
		C	able to cope with reversed departure sequence arisen by the capacity change during EDCT flow controls															
		C	able to make flow controls on departures by using the groundstop feature															
		C	able to conduct time frame coordination															
		C	able to make a judgement on whether ongoing ATC restrictions should be changed to ATFM initiatives, and able to cope with the change															

[Marks] 1: incapable/unknowing 2: lack of skill/understanding 3: barely able 4: able 5: well enough

The mark "4" indicates 70-80%, and "5" indicates beyond 80%, which are acceptable level.

When marking "5", the training supervisors should fill in own initials to the right colomn. The "5" marked training items will be exempted in the subsequent OJT.

The training items rarely happen can be substituted by oral tests in the OJT. The mark through oral tests shall be expressed by an encircled number.

Acquiring "4" three times or more, or acquiring "5" can complete the training item. After completing all the training items of the phase, the OJT moves on to the next phas

[Abbreviations] TEAM : Trajectorized Enhanced Aviation Management ⋯Japanese ATM systems that calculate the required delay and assign EDCTs to appropriate aircraft, EDCT: Expected Departure Clearance Time,

ATFM

phase				4	d1	d2	d3	d4	d5	d6	d7	d8	d9	d10	d11	d12	d13
			Cross Border ATFM														
A			able to extract aircraft groups bound for particular destination via particular ATS route														
	B		able to adequately communicate with foreign ANSPs														
	B		able to make a judgement on whether the ATFM initiatives are consistent with the stipulations of LOA (i.e. flow controlled airport, reason, lead time for coordination, measure)														
	B		able to coordinate with related ATC facilities about the flow controls on G585 (SAPRA) requested from Incheon ACC														
	B		able to coordinate with related ATC facilities about the flow controls requested from Taipei ACC														
		C	able to cope with the unexpected or any change in ATFM initiatives requested by foreign ANSPs														
			Operating procedures for handling diversions														
A			able to notify facilities concerned without omission in accordance with the phase of diversions														
A			able to input start/end diversion to TEAM														
A			able to display number of spots available all day in the phase 1														
	B		able to allocate airports for diversion appropriately in response to requests														
	B		able to manage the case when aircraft request diversion to RJOO														
	B		able to manage the case when the width or length of diverting aircraft is unclear (including A346, B777, B773, B77W, etc)														
	B		able to manage the case when aircraft request diversion to RJTY or RODN														
		C	able to manage the case when aircraft request diversion to airports not registered in TEAM														
		C	able to manipulate TEAM when aircraft canceled diversion														
		C	able to make a judgement and coordination about ending respective phases of diversion														

			Acquiring/providing adequate information																	
A			able to extract necessary NOTAMs quickly																	
A			able to display MET data of particular airports																	
	B		Keeping good watch on the situations being faced in the other ATFM positions																	
	B		able to get information about restricted areas, training/testing areas, etc																	
		C	able to exchange information with the other ATFM positions that will be affected by the own flow controls decided and being started shortly																	
			Miscellaneous																	
	B		able to take over the ongoing ATFM services accurately																	
		C	able to handle rarely happened situations																	

[Marks] 1: incapable/unknowing, 2: lack of skill/understanding, 3: barely able, 4: able, 5: well enough

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