



International Civil Aviation Organization

The Third Meeting of ICAO Asia/Pacific Air Traffic Flow Management Steering Group (ATFM/SG/3)

Singapore, 10 – 14 March 2014

Agenda Item 5: Development of Regional ATFM Framework

INTERIM REGIONAL FRAMEWORK FOR ATFM

(Presented by the Secretariat)

SUMMARY

This paper presents a proposed Interim Regional Framework for ATFM, to provide an early ATFM implementation framework and guidance to States, Air Navigation Service Providers, airspace users and other stakeholders during the development of the more comprehensive Regional Framework for Collaborative ATFM.

1. INTRODUCTION

1.1 The Second Meeting of the ICAO Asia/Pacific Air Traffic Flow Management Steering Group (ATFM/SG/2, Hong Kong, China, 1 to 4 October 2013) discussed the need for development of guidance material for implementation of interim ATFM procedures, given the time require for development of the broader Regional Framework for Collaborative ATFM. Development and promulgation of an Interim Regional Framework for ATFM would not only provide earlier benefit to airspace users, but would also provide States having little experience in ATFM the opportunity to gain knowledge and experience before embarking on the more complex implementation that would be driven by the broader ATFM framework.

2. DISCUSSION

2.1 The first draft version of the Regional Framework for Collaborative ATFM was circulated to the ATFM Specialist Team of ATFM/SG for comment and feedback. Following inclusion of received comment, a draft Interim Framework was developed.

2.2 The draft Interim Framework is constructed from extracts from the draft Regional Framework for Collaborative ATFM, and will be subsumed by that document in its final form.

2.3 The meeting is invited to consider and discuss the Interim Framework, taking note of that there are a number of appendices referenced in the document. The appendices will be discussed and developed under a separate working paper.

2.4 The final draft of the Interim Framework is expected to be made available for consideration by the ATM Sub-Group of APANPIRG in early August 2014. As there is likely to be some follow-up work to finalize the document after the ATFM/SG/3 meeting, it is proposed that any further development should be conducted by ATFM/SG Specialist Team and, once agreed by the Co-Chairs, presented to ATM Sub-Group.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

- a) note the information contained in this paper;
- b) add, amend or delete information in the Interim Framework as necessary
- c) agree that further work be conducted by the Specialist Team and, once agreed by the Co-Chairs, presented to ATM Sub-Group; and
- d) discuss any relevant matters as appropriate.

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INTERNATIONAL CIVIL AVIATION ORGANIZATION

D R A F T



**ASIA/PACIFIC REGION
INTERIM FRAMEWORK
FOR
AIR TRAFFIC FLOW MANAGEMENT**

DRAFT Version 0.1.1, MONTH YEAR

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

Approved by APANPIRG/XX and published by the
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CONTENTS

SCOPE OF THE INTERIM FRAMEWORK	1
DEVELOPMENT AND OBJECTIVES OF THE INTERIM FRAMEWORK	4
EXECUTIVE SUMMARY	5
ABBREVIATIONS AND ACRONYMS	8
BACKGROUND INFORMATION	11
CURRENT SITUATION	18
PERFORMANCE IMPROVEMENT PLAN	19
RESEARCH AND FUTURE DEVELOPMENT	25
APPENDIX X: ATFM Framework Principles	1
APPENDIX X: Collaborative ATFM Capability Elements	3

SCOPE OF THE INTERIM FRAMEWORK

Structure of the Interim Framework

1.1 The Asia/Pacific Region Framework for Collaborative Air Traffic Flow Management (ATFM), under development by the Air Traffic Flow Management Steering Group (ATFM/SG), will form part of a suite of global and regional air navigation planning documents relevant to the Asia/Pacific Region.

1.2 Global vision and strategy perspectives are provided by the *Global Air Navigation Plan* (GANP, Doc 9750), the *Global ATM Operational Concept* (Doc 9854) and the *Global Aviation Safety Plan* (GASP). The GANP includes the Aviation System Block Upgrade (ASBU) framework, its Modules and its associated technology Roadmaps.

1.3 Beneath this level is regional planning primarily provided by the Asia/Pacific Basic Air Navigation Plan (BANP, Doc 9673) and the Asia/Pacific Seamless ATM Plan (hereinafter referred to as the Seamless Plan) which, together with its contributory documents including the Framework for Collaborative ATFM and other guidance material, define goals and the means of meeting State planning objectives.

1.4 Now incorporated within the Seamless Plan are the Asia/Pacific ATFM Concept of Operations and Air Navigation Concept of Operations. The Asia/Pacific Region Interim Framework for Air Traffic Flow Management, hereinafter referred to as the 'Interim Framework' draws upon and aligns with guidance and recommendations of the Seamless Plan and ICAO Doc 9971 *Manual on Collaborative ATFM*.

1.5 The Interim Framework intended to provide an early ATFM implementation framework and guidance to States, Air Navigation Service Providers, airspace users and other stakeholders during the development of the more comprehensive Regional Collaborative Framework. ATFM implemented under the Interim Framework should optimize the use of limited resources to manage demand when it exceeds capacity.

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.*

ATFM Phases

1.6 ICAO Doc 9971 describes three phases of ATFM execution; *strategic, pre-tactical and tactical.*

1.7 The **Strategic ATFM** phase encompasses measures taken more than one day prior to the day of operation. Much of this work is accomplished two months or more in advance. Strategic ATFM includes the planning and execution of long-term demand and capacity balancing including arrival slot allocation at Coordinated Airports. The Interim Framework includes consideration of Strategic ATFM.

1.8 The **Pre-Tactical ATFM** phase encompasses measures taken up to one day prior to operations, with the main objective of optimizing capacity through an effective, dynamic organization of resources. Effective Pre-Tactical ATFM is normally dependent on CDM processes established between all stakeholders, and in the broader network sense requires significant network communications and information processing capability. The necessary inter-State network capability is not yet developed in the Asia/Pacific Region. Implementation guidance for networked ATFM is itself being developed for inclusion in the Regional Framework for Collaborative ATFM. Pre-Tactical phase ATFM measures are not included in the Interim Framework.

1.9 **Tactical ATFM** measures are taken on the day of operation, managing traffic flows and capacities in real time. Tactical ATFM practices, procedures and competencies should be the first priority for ATFM implementation, as they are critical to the real-time operational response to demand/capacity imbalance, and the improvement and maintenance of safety in the management of operational situations where traffic demand exceeds capacity. Tactical ATFM implementation is the primary focus of the Interim Framework.

The timely application of ATFM Measures requires a fundamental understanding of airport and airspace capacity, and the continuous assessment of capacity and the factors that impact upon it.

Determining the Need for ATFM Services

1.10 The Regional Collaborative Framework for ATFM is expected to include categories of airspace within which minimum ATFM capability will be defined. These categories may be based on the type of airspace, such as TMA serving high density airports, en-route airspace sectors containing major ATS routes between high density city pairs, etc.

1.11 The Interim Framework is intended to provide early benefits to States with little or no ATFM processes or experience, and to provide initial Regional ATFM direction during the development of the broader Regional Framework for Collaborative ATFM. As the ATFM services detailed in the Interim Framework are limited in their scope and complexity, the detailed categorization of airspace and definition of the specific services required in each category of airspace is not required

1.12 ATFM capability defined in the Interim Framework should as a minimum be implemented at all high density aerodromes, and in all airspace where ATS surveillance services are provided. This does not preclude implementation of ATFM measures listed in the Interim Framework at other airports or in other airspace where there may be an identified current or future need to manage demand.

Alignment with Regional Plans

1.13 Interim ATFM should be implemented in alignment with the ATFM-related provisions of the Seamless Plan's Preferred Aerodrome/Airspace and Route Specifications (PARS) and Preferred ATM Service Level (PASL) Phase 1, with expected implementation by **12 November 2015**.

Implementation Timelines

1.14 States should implement ATFM services defined in the Interim Framework as soon as possible, where required by traffic demand and subject to completion of normal project implementation activities including safety assessments. Implementation timelines should align with the timelines expected in the parent Regional Framework for Collaborative ATFM, when finalized, which will themselves be aligned where appropriate with Seamless Plan's Preferred Aerodrome/Airspace and Route Specifications (PARS) and Preferred ATM Service Levels (PASL).

Document Review

1.15 The Asia/Pacific Region Collaborative Framework for ATFM is currently under development, and is expected to be finalized in September 2015. Contributory to the Seamless Plan, it is intended to be reviewed each three years coincident with the regular review of the Seamless ATM Plan, or at more frequent intervals as determined by APANPIRG.

1.16 The Interim Framework is expected to be subsumed by the broader Regional Framework for Collaborative ATFM by the end of 2015. Regular scheduled review of the Interim Framework is therefore not required. The document may be reviewed whenever deemed necessary by APANPIRG, normally on the basis of recommendations by ATM Sub-Group or the ATFM/SG.

1.17 Appendices to the Interim Framework may be amended at any time by the Secretariat, subject to full consultation with ATFM/SG Co-Chairs and other appropriate subject matter experts.

1.18 All amendments shall be recorded in the Record of Amendments (Page ii).

DEVELOPMENT AND OBJECTIVES OF THE INTERIM FRAMEWORK

Interim ATFM Framework Objective

2.1 Having considered relevant documents such as the Global Air Navigation Plan (Doc 9750), the Seamless Plan and the ATFM Manual on Collaborative Air Traffic Flow Management (Doc 9971), the objective of the Interim Framework is to provide early benefits to States with little or no ATFM processes or experience, and to provide initial Regional ATFM direction during the development of the broader Regional Framework for Collaborative ATFM. The Interim Framework is intended to provide initial implementation guidance for the implementation of Tactical and Strategic ATFM, and the optimization of Tactical ATFM and ATS Route structures.

Interim Framework Development

2.2 The Asia Pacific Region Air Traffic 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.

2.3 The Second Meeting of the ATFM/SG (ATFM/SG/2, Hong Kong, China, 1 to 4 October 2013) agreed that, given the time required for the development of the proposed Regional Framework for Collaborative ATFM, there was also a need to develop guidance material for the implementation of interim ATFM procedures within a shorter timeframe, particularly in those cases where little if any organized or targeted ATFM was currently in place. The development and promulgation of regional guidance for interim ATFM solutions would not only provide earlier benefit to airspace users but would also provide States having little experience in ATFM the opportunity to gain knowledge and experience before embarking on the more complex implementation that would be driven by the broader ATFM framework.

2.4 The Interim Framework provides fundamental, introductory Tactical and Strategic ATFM guidance including:

- Demand and Capacity Analysis;
- Tactical ATFM Implementation;
- Strategic ATFM Implementation; and
- ATFM Airspace Optimization.

2.5 The Interim Framework was drafted by the ATFM/SG, and endorsed by the XXth Meeting of the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG/XX, Bangkok, Thailand, XX to XX XXXX 201X).

2.6 The Interim Framework for ATFM draws upon the guidance provided in ICAO Doc 9971 - *Manual on Collaborative Air Traffic Flow Management*. Relevant components of the Interim Framework will be included within or appended to the Regional Framework for Collaborative ATFM.

EXECUTIVE SUMMARY

Asia/Pacific Region Traffic Growth

3.1 ICAO data indicates that the Asia/Pacific Region in 2011 was the busiest in the world in terms of Passenger Kilometres Performed (PKP): 1,496 billion compared to 1,434 for North America and 1,385 for Europe, with growth rates of 8.0 - 8.8%, 2.3 - 3.5% and 4.2 - 4.8% respectively in each of the years from 2012-2014. In 2012, the Asia/Pacific region had the largest regional market share of total domestic and international Revenue Passenger Kilometres (RPK) at 30%, compared to 27% for both Europe and North America. **Figure 1 and Figure 2** indicate projected air traffic growth.

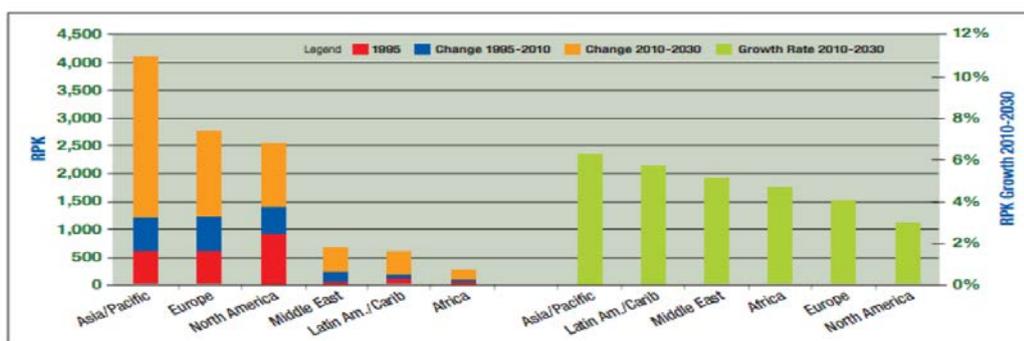


Figure 1: Passenger Traffic Forecasts – Top Traffic Flows in 2030 (ICAO 2010)

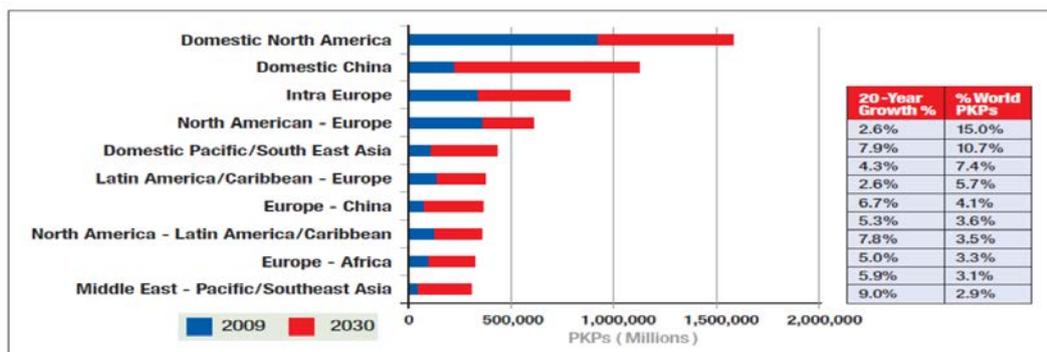


Figure 2: Top 10 Traffic Flows in 2030 (ICAO 2010)

3.2 A significant proportion of the current and forecast traffic growth is among low-cost carriers primarily using narrow body jet aircraft, resulting in an increase in aircraft movements that is disproportionate to the increase in passenger numbers and the consequent effects on air traffic demand and capacity.

ICAO Asia/Pacific Regional Air Traffic Flow Management Initiatives

3.3 The 18th Meeting of the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG/18, Bangkok, Thailand, 3 - 7 September 2007), APANPIRG/18 noted that regional development of ATFM had recently been added to its list of Key Priorities. Recognizing the need to actively endorse ATFM activities in the region, **Conclusion 18/7 – Conduct Regional ATFM Seminar** was adopted to enable parties experienced in the provision of ATFM to share knowledge and provide guidance to less experienced States, with the expectation that it would lead to wider implementation of ATFM regionally.

3.4 The 20th Meeting of the ICAO Asia/Pacific Air Navigation Planning and Implementation

Regional Group (APANPIRG/20, Bangkok, Thailand, 7 - 11 September 2009) responded to the outcomes and recommendations of the ATFM Seminar/Workshop, and adopted the following ATFM related conclusions:

- **Conclusion 20/11 – ATFM Steering Group and Concept of Operations**, forming a regional ATFM Steering Group tasked with preparing an Asia/Pacific Regional ATFM Concept of Operations;
- **Conclusion 20/12 – Adopt ATFM Communications Manual**, adopting the *Air Traffic Flow Management (ATFM) Communications Handbook* for the Asia/Pacific Region, as regional guidance material; and
- **Conclusion 20/13 – Conduct Regional ATFM Survey**, initiating a regional survey with the objective of benchmarking the current status of ATFM activities in the region;

3.5 The outcomes of the 1st Meeting of the Air Traffic Flow Management Steering Group (ATFM/SG/1, Tokyo, Japan, 8 - 10 December 2010) included the development and subsequent promulgation of the *Asia/Pacific Regional ATFM Concept of Operations*, and the review of the *ATFM Communications Handbook for the Asia/Pacific Region*¹.

3.6 The ATFM/SG/1 meeting broadly discussed the current Status of ATFM in the Asia/Pacific Region, including the Bay of Bengal Cooperative Air Traffic Flow Management System (BOBCAT), State requests for ATFM/SG guidance in ATFM implementation, Australia's utilization of a Required Time of Arrival scheme, the United States and Japan's formalized ATFM teleconference for managing North Pacific routes, and the future involvement of Russia in ATFM coordination with the USA, Philippines' plan for initial implementation of an airport/aerodrome ATFM for Manila, concentrating on scheduled domestic arrival and departure flights, and Hong Kong, China's ATFM procedures, principally used during the typhoon season.

3.7 The meeting considered that each of the MTF should have ATFM planning regardless of traffic density, to cater for contingency operations in addition to traffic loading. It was further suggested to the meeting that it may be better to concentrate on sub-regional strategies that focused on MTF, rather than a detailed regional ATFM concept which may be difficult to achieve.

3.8 ATFM priorities were discussed, and the meeting did not agree with references to a first-come-first-served basis for prioritization of traffic, as there were many instances where priorities based on economic necessity were in place, e.g. scheduled passenger carrying jets having priority over smaller non-scheduled aircraft).

3.9 The meeting agreed that civil/military coordination was a key enabler to effective ATFM,

¹ The guidance material provided in the *Asia/Pacific Regional ATFM Concept of Operations* and the *ATFM Communications Handbook for the Asia/Pacific Region* has been incorporated in the *Asia/Pacific Seamless ATM Plan* (adopted by APANPIRG/24), and in the final draft version of the *ICAO Manual on Collaborative Air Traffic Flow Management (ICAO Doc 9971)*, which is expected to be published during 1st Quarter 2014.

as was a common language for expressing ATFM measures. It was also noted that aerodrome operators had a role to play in ATFM Collaborative Decision Making (CDM).

3.10 The ATFM/SG/1 meeting closed with no outstanding tasks

3.11 The 24th Meeting of APANPIRG (APANPIRG/24, Bangkok, Thailand, 24 - 26 June 2013) considered ATFM in the Asia/Pacific Regions, including the relatively small FIRs in South East Asia and the corresponding low flight transit times, often in the order of 10 to 20 minutes, and the effects on other FIRs of any ATFM measures or procedures applied. Flow management in the region had until recently been based on local actions restricting volumes rather than a wider network view that optimized available capacity on a sub-regional basis. Network-based ATFM was a key element in ASBU Block Zero, which was identified as a critical element in the Asia/Pacific Seamless ATM Plan.

3.12 It was noted that a centralized ATFM Unit (ATFM) approach was not practical for the Asia/Pacific Region at this time, and a more pragmatic approach would be to concentrate on and support sub-regional multi-State programs.

3.13 The collaborative effort by Hong Kong China, Singapore and Thailand to develop a sub-regional ATFM concept was also considered by the meeting. Recognizing the need to research and develop a CDM/ATFM concept that could be implemented at a sub-regional level, a sub-regional ATFM concept comprised of independent virtual CDM/ATFM nodes supported by interconnected information sharing framework had been developed by these administrations.

3.14 APANPIRG/24 adopted several ATFM-related Conclusions regarding ATFM flow management capacity assessments and information sharing, and the re-convening of the ATFM/SG.

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.

3.15 The 2nd Meeting of the Asia/Pacific ATFM Steering Group (ATFM/SG/2, Hong Kong, China, 1 – 4 October 2013), in formulating its work plan to develop the *Regional Framework for Collaborative ATFM*, recognized that there was a need for early promulgation of initial guidance for ATFM, particularly in cases where there was little or no targeted ATFM in place. The meeting subsequently agreed to develop this document, the *Interim Regional Framework for ATFM*, to provide earlier benefit to airspace users, and also to provide States having little experience in ATFM the opportunity to gain knowledge and experience before embarking on the more detailed implementation that would be driven by the broader framework.

3.16 The Interim Framework is primarily based on the guidance provided in the draft ICAO Doc. 9971, *Manual on Collaborative Air Traffic Flow Management*, and will itself provide a basis for development of the broader *Regional Framework for Collaborative ATFM*, eventually being incorporated into that document.

ABBREVIATIONS AND ACRONYMS

To be rationalized after ATFM/SG agreement on terminologies.

AAR	Aerodrome Arrival Rate or Airport Acceptance Rate
ATM	Air Traffic Management
ABI	Advanced Boundary Information (AIDC)
ACAS	Airborne Collision Avoidance System
ACC	Area Control Centre
ACP	Acceptance (AIDC)
ADOC	Aircraft Direct Operating Cost
ADS-B	Automatic Dependent Surveillance-Broadcast
ADS-C	Automatic Dependent Surveillance-Contract
AIDC	ATS Inter-facility Data Communications
AIGD	ICAO ADS-B Implementation and Guidance Document
AIM	Aeronautical Information Management
AIRAC	Aeronautical Information Regulation and Control
AIRD	ATM Improvement Research and Development
AIS	Aeronautical Information Service
AIXM	Aeronautical Information Exchange Model
AMAN	Arrival Manager
ANSP	Air Navigation Service Provider
AN-Conf	Air Navigation Conference
AOC	Assumption of Control (AIDC)
AOM	Airspace Organization and Management
APAC	Asia/Pacific
APANPIRG	Asia/Pacific Air Navigation Planning and Implementation Regional Group
APCH	Approach
APEC	Asia Pacific Economic Cooperation
APSAPG	Asia/Pacific Seamless ATM Planning Group
APV	Approach with Vertical Guidance
APW	Area Proximity Warning
ASBU	Aviation System Block Upgrade
ASD	Aircraft Situation Display
ASEAN	Association of Southeast Asian Nations
ASMGCS	Advanced Surface Movements Guidance Control Systems
ATC	Air Traffic Control
ATCONF	Worldwide Air Transport Conference
ATFM	Air Traffic Flow Management
ATIS	Automatic Terminal Information Service
ATS	Air Traffic Services
ATSA	Air Traffic Situational Awareness
ATM	Air Traffic Management
CANSO	Civil Air Navigation Services Organization
CARATS	Collaborative Actions for Renovation of Air Traffic Systems
CDM	Collaborative Decision-Making
CCO	Continuous Climb Operations
CDO	Continuous Descent Operations
CFIT	Controlled Flight into Terrain
CLAM	Cleared Level Adherence Monitoring

COM	Communication
CONOPS	Concept of Operations
CNS	Communications, Navigation, Surveillance
CPAR	Conflict Prediction and Resolution
CPDLC	Controller Pilot Data-link Communications
CPWG	Cross-Polar Working Group
CSP	Communication Service Provider
CTA	Control Area
CTR	Control Zone
DARP	Dynamic Airborne Re-route Planning
DGCA	Conference of Directors General of Civil Aviation
DMAN	Departure Manager
DME	Distance Measuring Equipment
EST	Coordinate Estimate
FAA	Federal Aviation Administration
FDPS	Flight Data Processing System
FIR	Flight Information Region
FIRB	Flight Information Region Boundary
FL	Flight Level
FLAS	Flight Level Allocation Scheme
FLOS	Flight Level Orientation Scheme
FRMS	Fatigue Risk Management System
FUA	Flexible Use Airspace
GANIS	Global Air Navigation Industry Symposium
GANP	Global Air Navigation Plan
GASP	Global Aviation Safety Plan
GBAS	Ground-based Augmentation System
GDP	Gross Domestic Product
GLS	GNSS Landing System
GNSS	Global Navigation Satellite System
GPI	Global Plan Initiative
HF	High Frequency
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
IMC	Instrument Meteorological Conditions
INS	Inertial Navigation Systems
IO	International Organizations
IPACG	Informal Pacific ATC Coordinating Group
ISPACG	Informal South Pacific ATS Coordinating Group
ITP	In-Trail Procedure
KPA	Key Performance Area
LNAV	Lateral Navigation
LVO	Low Visibility Operations
MET	Meteorological
METAR	Meteorological Aerodrome Report
MLAT	Multilateration
MSAW	Minimum Safe Altitude Warning
MTF	Major Traffic Flow
NextGen	Next Generation Air Transportation System
OPMET	Operational Meteorological
OLDI	On-Line Data Interchange
OTS	Organised Track System

PACOTS	Pacific Organized Track System
PARS	Preferred Aerodrome/Airspace and Route Specifications
PASL	Preferred ATM Service Levels
PBN	Performance-based Navigation
PIA	Performance Improvement Areas
PKP	Passenger Kilometres Performed
PVT	Passenger Value of Time
RAIM	Receiver Autonomous Integrity Monitoring
RAM	Route Adherence Monitoring
RANP	Regional Air Navigation Plan
RPK	Revenue Passenger Kilometres
RNAV	Area Navigation
RNP	Required Navigation Performance
RVSM	Reduced Vertical Separation Minimum
SAARC	South Asian Association for Regional Cooperation
SATVOICE	Satellite Voice Communications
SAR	Search and Rescue
SBAS	Space Based Augmentation System
SCS	South China Sea
SESAR	Single European Sky ATM Research
SHEL	Software, Hardware, Environment and Liveware
SID	Standard Instrument Departure
SIGMET	Significant Meteorological Information
SPECI	Special Weather Report
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
TAWS	Terrain Awareness Warning Systems
TBO	Trajectory Based Operations
TCAC	Tropical Cyclone Advisory Centre
TCAS	Traffic Collision Avoidance System
TOC	Transfer of Control
UAS	Unmanned Aircraft Systems
UAT	Universal Access Transceiver
UPR	User Preferred Routes
VHF	Very High Frequency
VMC	Visual Meteorological Systems
VNAV	Vertical Navigation
VAAC	Volcanic Ash Advisory Centre
VMC	Visual Meteorological Conditions
VOLMET	Volume Meteorological
VOR	Very High Frequency Omni-directional Radio Range
VSAT	Very Small Aperture
WAFC	World Area Forecast Centre

BACKGROUND INFORMATION

Principles

5.1 The major areas of regional collaborative ATFM planning are aligned with those of the Asia/Pacific Seamless ATM Plan; People (human performance), Facilities (physical equipment), and Technology and Information. The xx principles within these areas, as agreed by ATFM/SG and endorsed by APANPIRG, are included at **Appendix X**.

Note: The principles in this document may include those that do not necessarily fall within the scope of the Interim Framework, but will serve to alert States and Administrations to the intended future direction of Regional collaborative ATFM.

Aviation System Block Upgrades (ASBU)

5.2 The ICAO ASBU initiative is intended to provide a set of aviation system solutions or upgrades aimed at exploiting current aircraft equipment and capability, and establishing a transition plan enabling global interoperability. The ASBUs comprise a suite of modules organized into flexible and scalable building blocks where each module represents a specific, well-bounded improvement. The modules may be introduced and implemented in a State or region depending on the need and level of readiness. It is recognized that all the modules are not required in all airspaces. The ASBUs describe a way to apply the concepts defined in Doc 9854 *Global Air Traffic Management Operational Concept* with the goal of implementing regional performance improvements, and are used in Doc 9750 *Global Air Navigation Plan (GANP) Edition 4*.

5.3 ATM modernization is a very complex but necessary task, given the benefits as traffic levels increase. It is clear that to safely and efficiently accommodate the increase in air traffic demand — as well as respond to the diverse needs of operators, the environment and other issues, it is necessary to renovate ATM systems, in order to provide the greatest operational and performance benefits.

5.4 ASBU are comprised of a suite of modules, each having the following qualities:

- a clearly-defined measurable operational improvement and success metric;
- necessary equipment and/or systems in the aircraft and on the ground along with an operational approval or certification plan;
- standards and procedures for both airborne and ground systems; and
- a positive business case over a clearly defined period of time.

5.5 ASBU are divided into four Performance Improvement Areas (PIA):

- PIA 1: Airport Operations;
- PIA 2: Globally Interoperable Systems and Data – *Through Globally Interoperable System Wide Information Management*;
- PIA3: Optimum Capacity and Flexible Flights – *Through Global Collaborative ATM*; and
- PIA 4: Efficient Flight Path – *Through Trajectory-based Operations*.

Asia/Pacific Seamless ATM Plan - ASBU Implementation

5.6 ASBU Block 0 modules are incorporated into the Asia/Pacific Seamless ATM Plan. **Table X** provides a summary of the Block 0 elements, and the expected priority for implementation within the Asia/Pacific region as defined in the Seamless ATM Plan. The allocation of priority was based on factors including each module's importance in promoting Seamless ATM (Priority 1 = critical upgrade, Priority 2 = recommended upgrade, Priority 3 = may not be universally implemented).

PIA	Element	Economic Analysis	Priority
PIA 1	B0-APTA Optimization Of Approach Procedures Including Vertical Guidance	-	2
	B0-WAKE Increased Runway Throughput Through Optimized Wake Turbulence Separation	-	3
	B0-RSEQ Improve Traffic Flow Through Runway Sequencing (AMAN/DMAN)	-	2
	B0-SURF Safety and Efficiency Of Surface Operations (A-SMGCS)	Yes	3
	B0-ACDM Improved Airport Operations Through Airport-Collaborative Decision-Making (A-CDM)	-	2
PIA 2	B0-FICE Increased Interoperability, Efficiency And Capacity Through Ground-Ground Integration (AIDC)	-	1
	B0-DATM Service Improvement Through Digital Aeronautical Information Management	-	1
PIA 3	B0-FRTO Improved Operations Through Enhanced En-Route Trajectories (CDM, FUA)	-	1
	B0-NOPS Improved Flow Performance Through Planning Based On A Network-Wide View	-	1
	B0-ASUR Initial Capability For Ground Surveillance	Yes	1
	B0- ASEP Air Traffic Situational Awareness (ATSA)	-	2
	B0-OPFL Improved Access To Optimum Flight Levels Through Climb/Descent Procedures Using Automatic Dependent Surveillance – Broadcast (ADS-B)	-	3
	B0-ACAS ACAS Improvements	Yes	2
	B0-SNET Increased Effectiveness Of Ground-based Safety Nets	-	2
	B0-AMET Meteorological Information Supporting Enhanced Operational Efficiency and Safety	-	2
PIA 4	B0-TBO Improved Safety And Efficiency Through The Initial Application Of Data Link En-Route	-	1
	B0-CDO Improved Flexibility And Efficiency In Descent Profiles (Continuous Descent Operations - CDO)	-	2
	B0-CCO Improved Flexibility And Efficiency Departure Profiles - Continuous Climb Operations (CCO)	-	2

Table X: Seamless ATM Plan ASBU Block 0 Implementation Priority

Interim ATFM-Related ASBU Upgrades

5.7 The meeting of the Chairpersons of APANPIRG Sub-Groups held in Hong Kong, China,

16 to 17 January 2014, agreed to the highest priority regional targets for ASBU implementation and the implementation priorities for ASBU and Seamless ATM Plan elements. Based on these priorities ATFM/SG established a concept of an ASBU implementation structure to support and guide regional ATFM implementation. **Table X** lists the ASBU elements relevant to the Interim Framework.

Note: The identification of 'critical' elements and a recommended order of priority for implementation does not suggest that they have a higher priority than safety critical improvements.

ATFM-related ASBU Modules	Chairs' Priority
B0-NOPS Improved Flow Performance Through Planning Based On A Network-Wide View	1
B0-ASUR Initial Capability For Ground Surveillance	1
B0-FICE Increased Interoperability, Efficiency And Capacity Through Ground-Ground Integration (AIDC)	1
B0-TBO Improved Safety And Efficiency Through The Initial Application Of Data Link En-Route	1
B0-APTA Optimization Of Approach Procedures Including Vertical Guidance	1
B0-RSEQ Improve Traffic Flow Through Runway Sequencing (AMAN/DMAN)	2
B0-CDO Improved Flexibility And Efficiency In Descent Profiles (Continuous Descent Operations - CDO)	2
B0-CCO Improved Flexibility And Efficiency Departure Profiles - Continuous Climb Operations (CCO)	2
B0-ACDM Improved Airport Operations Through Airport-Collaborative Decision-Making (A-CDM)	2
B0-SURF Safety and Efficiency Of Surface Operations (A-SMGCS)	3

Table X: ATFM-Related ASBU Elements.

5.8 The above table includes some ATFM-related ASBU which are outside the scope of the Interim Framework, but will support the Regional Framework for Collaborative ATFM.

5.9 **B0-ASUR** *Ground-Based ATS Surveillance*: ADS-B, MLAT. Recognizing the principle that increasing capacity is central to the management of increased demand, this module provides States with the means to improve ATC capacity in en-route airspace sectors through the application of PANS/ATM-defined surveillance separation standards. ADS-B technology is an initial step in creating a more flexible, higher capacity air transportation system that will create seamless surveillance and shared situational awareness picture for both ground and air operations. ADS-B data may be readily shared between neighbouring ATSUs, enhancing safety, increasing capacity and efficiency and facilitating seamless ATM operations.

5.10 **B0-RSEQ** *Runway Sequencing*: Arrival Manager (AMAN), Departure Manager (DMAN). AMAN/DMAN procedures are designed to provide automation support for synchronisation of arrival sequencing, departure sequencing and surface information. Training and competency standards for automation support, operational standards and procedures are necessary.

5.11 **B0-TBO** *En-route Data-link*: Automatic Dependent Surveillance-Contract (ADS-C), Controller Pilot Data-link Communications (CPDLC). Data-link application for ATC surveillance and communications supports flexible routing, optimized separation (and thus increased capacity) and improved safety in areas where technical constraint or cost-benefit analysis does not support the use of ground-based surveillance (SSR, ADS-B or MLAT). In these cases ADS-C and CPDLC provide for greater accuracy and update in aircraft position and estimate information for aircraft outside the coverage of ground-based surveillance systems than is provided in voice AIREP, and automated update of ATC information, hence permitting earlier inclusion in FLOW/sequence planning and application of ATFM measures and the timely, reliable and accurate transmission of ATFM measure instructions to such aircraft.

5.12 **B0-FICE** *Ground – Ground Integration and Interoperability*: ATS Inter-facility Data Communications (AIDC). AIDC application exchanges information between ATS units in support of critical ATC functions, including notification of flights approaching a Flight Information Region (FIR) boundary, coordination of boundary-crossing conditions, and transfer of control. AIDC application improves the overall safety of the ATM system, as well as increasing airspace capacity, as it permits the controller to simultaneously carry out other tasks. AIDC provides for the necessary improvements in the accuracy and update of aircraft position and estimate information that permit earlier inclusion in sequence planning and application of ATFM measures.

5.13 **B0-CDO**: *Improved Flexibility and Efficiency in Descent Profiles* CDO and Standard Instrument Arrival (STAR). These arrival procedures allow aircraft to fly their optimum profile, taking into account airspace and traffic complexity, and permit the maximum use of aircraft capability to meet Calculated Times Over (CTO) and Calculated Times of Arrival (CTA) during the descent phase of flight. This element has been accorded a high priority by ICAO HQ, due to the improvement in safety regarding Controlled Flight into Terrain (CFIT) and greater efficiency in terms of fuel usage and emissions.

5.14 **B0-CCO** *Flexible and Efficient Departure Profiles* Continuous Climb Operations (CCO), SID. These procedures have been accorded a high priority by ICAO HQ due to greater efficiency in terms of fuel usage and emissions. They also optimize ATFM outcomes by segregating departing/climbing traffic from inbound/descending traffic, and facilitating higher runway departure rates by segregating the departure routes of aircraft different speed and climb performance characteristics.

5.15 **B0-ACDM** *Airport CDM*: The decision making process at the airport is enhanced by sharing up-to-date relevant information and by taking into account the preferences, available resources and the requirements of the stakeholders at the airport. Airport CDM improves the outcomes of collaborative ATFM by facilitating the timely positioning of aircraft in order to comply with DMAN-generated ATFM measures such as Calculated Take-Off Time (CTOT).

5.16 **B0-SURF**: *Improved Runway Safety*: Advanced Surface Movements Guidance Control Systems (ASMGCS), where warranted by weather conditions and capacity. While Implementation of ASMGCS may not be a high priority in the Asia/Pacific except at high density aerodromes where the cost benefits of mandating this were positive, it would improve ATC capability to ensure the efficient positioning of aircraft to comply with DMAN-generated ATFM measures.

5.17 **B0-APTA: Airport Accessibility:** Performance-based Navigation (PBN) procedures with vertical guidance. The optimal use of appropriate PBN specification is a key enabler to high accuracy and stability of approach paths and ATFM-initiated trajectories.

5.18 **B0-NOPS Network Flow Management ATFM:** Inter-linked and networked ATFM nodes between ANSPs should be developed to serve various sub-regions. This module would not normally be considered for early implementation of basic ATFM in airspace or at airports where there is little or no current ATFM procedure or experience. It is included in the Interim Framework ASBU order-of-priority to indicate the desired ATFM end-state.

5.19 **Figure X** illustrates the concept of an ASBU implementation structure supporting ATFM.

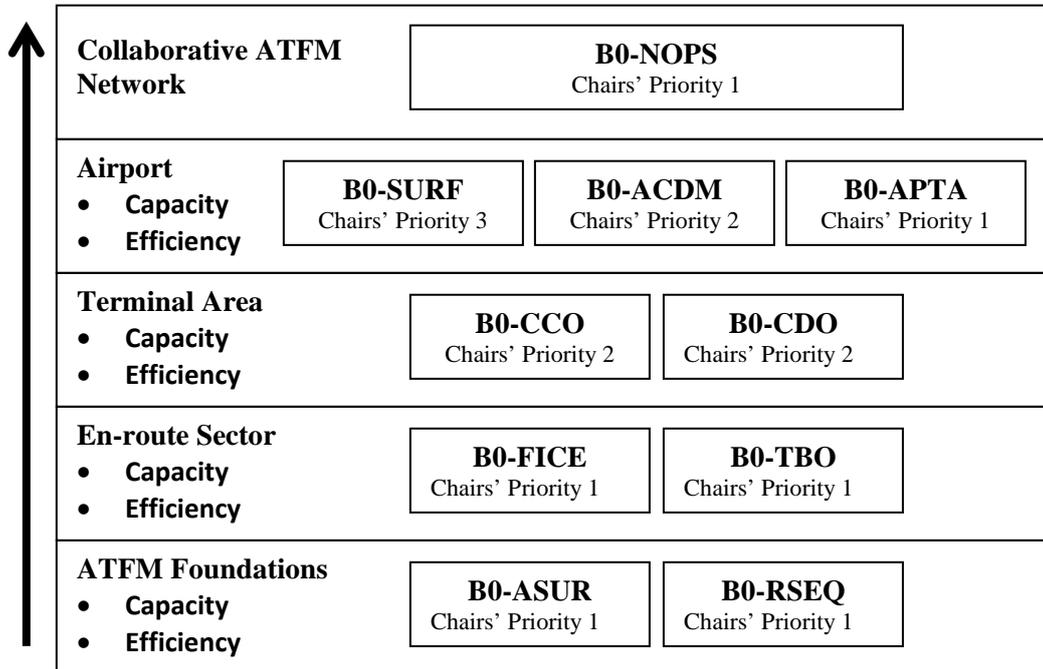


Figure X: ASBU Implementation Structure Supporting ATFM

ATFM Elements Derived from the Seamless ATM Plan Initiatives

These are copied and where necessary adapted from the list of *Global and Regional Elements* from the Seamless Plan. The group should consider whether they may be omitted from the interim framework, and further developed/adapted for later inclusion in the parent document

5.20 The Asia/Pacific Seamless ATM Plan identifies a number of Global and Regional elements having a bearing on CDM and ATFM. These have been adapted, where necessary and relevant, to reflect the ATFM context.

5.21 **Aerodrome Capacity Analysis.** Runway capacity should be maximized. There is a need to determine capacity and related constraints for runways, taxiways and gates, especially for Low Visibility Operations (LVO). Aircraft gate movement predictability affecting ATFM may be influenced by the efficiency of the embarkation and disembarkation of people and goods. In conducting aerodrome capacity analysis, it is important to include an assessment of the capacities of the airport passenger and cargo terminals and landside infrastructure to handle passengers, checked-in baggage, air freight and road traffic to ensure that the airfield, passenger/cargo terminals and landside capacities are balanced as much as possible.

5.22 Apron Management Services need to be integrated with ATC services using interoperable systems (including automated tools), shared data and harmonised procedures. Therefore clear procedures between a provider of aerodrome ATS services and the aerodrome operator are necessary in order to ensure that the planning, operation and review of aerodrome services are conducted collaboratively.

5.23 **Flight Information Regions (FIRs).** FIR boundaries should not limit the delivery of ATFM messages and the coordination and application of ATFM measures.

5.24 **Airspace Priority.** At the 6th Worldwide Air Transport Conference (ATCONF, Montréal, 18-22 March 2013) support was expressed for work to be undertaken on the schemes of economic incentives, ‘best equipped or capable, best served’ and ‘most capable, best served’ concepts. The CONOPS states that in each case where any aircraft that does not meet specified requirements, it should receive a lower priority, except where prescribed (such as for State aircraft).

5.25 **ATC Separation.** In areas where the provision of direct ATS surveillance is possible, ATC separation should be based on these surveillance systems (i.e.: radar, multilateration and ADS-B). The Regional Surveillance Strategy reinforces this by encouraging the provision of communication, navigation, and data management capabilities necessary to make optimal use of surveillance systems. Moreover, States are expected to enhance ATM automation tools and safety nets through the use of aircraft-derived data such as flight identification, trajectories and intentions.

5.26 ATS surveillance-based separation may be provided with only one ATS surveillance system. Multiple ATS surveillance systems such as radar, ADS-B or MLAT should not be required, unless a single system does not demonstrate reliable performance in terms of availability, or overlapping coverage is required near an ATS sector boundary, or a safety case required enhanced redundancy or for any other economic reason.

5.27 **Civil Data-Sharing.** The provision of ATS surveillance data between civil ANSPs (suitably filtered as appropriate in terms of national security) is important for harmonised Transfer of Control (TOC) procedures between ATC units, unless surveillance coverage extends well into the adjacent unit’s airspace. ADS-B system data should not require filtering, as it is publically broadcast information, lending itself to improving safety through the sharing of ATS surveillance data across FIR boundaries, in accordance with the Regional Surveillance Strategy.

Human Performance

5.28 The Global ATM Operational Concept (Doc 9854) states:

Humans will play an essential and, where necessary, central role in the global ATM system. Humans are responsible for managing the system, monitoring its performance and intervening, when necessary, to ensure the desired system outcome. Due consideration to human factors must be given in all aspects of the system.

5.29 The role of the human is especially important in delivering high quality and consistent services supporting collaborative ATFM. Therefore it is crucial to ensure that ATFM training, competency and licensing (if any) requirements are developed using a competency-based framework, and that ATFM performance data is collected, analysed and acted upon.

5.30 An important human performance consideration for the delivery consistent, harmonized, safe and efficient Tactical ATFM measures is ATC training. Controllers need to be trained in the application of positive control techniques such as vectoring and speed control, and in the use of agreed, standardized phrases, to maintain separation between conflict pairs and to successfully apply ATFM measures. The appropriate use of ATC simulators to enhance their learning experience is an essential part of the necessary training.

Civil/Military Cooperation

5.31 Data sharing arrangements (including aircraft surveillance), are a key part of civil/military cooperation for tactical ATFM. Data sharing between the civil and military could facilitate CDM, a vital component of ATFM. The Regional Surveillance Strategy espouses civil/military cooperation and system interoperability.

The following civil/military elements were incorporated into the Seamless ATM framework, and should be included in ATFM implementation planning:

- a) **Strategic Liaison.** This element emphasises the creation of a permanent body and procedures such as participation at appropriate civil ATM meetings, to ensure long and medium-term planning for optimal civil and military operations;
- b) **Tactical Liaison.** The daily, safe and efficient tactical management of operations, including airspace scheduling through interaction and communications between civil and military units, which should include military representation within civil ATC Centres where necessary;
- c) **Military SUA.** The minimisation of airspace exclusively assigned for civil or military use in accordance with FUA principles, assessed by the percentage of military SUA within an FIR;
- d) **SUA Review.** The regular review of SUA, to ensure that the means and notice of activation provide adequate warning for other airspace users, and the airspace designations (SUA types) as well as the lateral and vertical limits are the minimum required to safely contain the activity therein. The review of airspace should be conducted by an airspace authority independent or a collaboration of civil and military airspace users;
- e) **International SUA.** The minimisation of SUA that affected international civil ATS routes. Restricted and prohibited areas must not be designated in international airspace or airspace of undefined sovereignty;
- f) **Integrated Civil/Military ATM Systems.** The integration of civil and military ATM systems where practicable, including joint procurement of systems where possible;
- g) **Shared Civil/Military Data:** The provision of ATS surveillance data from civil surveillance systems to military units to improve monitoring (thereby reducing the need for individual defence identification authorisation), trust and confidence. The provision of surveillance data from military surveillance systems where this would enhance ATS surveillance coverage and redundancy; suitably filtered as appropriate;

- h) **Common Civil/Military Training.** The familiarisation of civil and military ATM personnel in each other's systems and procedures where national security allows. Training and licensing of civil and military air traffic controllers to equivalent standards; and
- i) **Common Civil/Military Procedures.** The implementation of the same or equivalent standards, procedures and policies for the provision of ATS and the management of air traffic.

CURRENT SITUATION

Analysis

6.1 The Regional Framework for Collaborative ATFM will include a detailed analysis of the current regional baseline of ATFM capability, and recommendations for improvements. A Study, endorsed by ATFM/SG and conducted by IATA, will form the basis of the analysis.

PERFORMANCE IMPROVEMENT PLAN

ATFM Capability Elements

7.1 Many ATM units in the Region currently provide some form of ATFM service, whether they are aerodrome control towers providing services in low-density control zones, high density TMA or en-route radar sectors in an AACC environment, or something in between. The actual service may in many cases be simple, such as merely queuing arriving aircraft into a holding pattern at the primary approach navigation aid or ad-hoc traffic metering. In high density airspace the ATFM service may be provided through a well-developed and coordinated, automated CDM/ATFM system, or by manual Tactical ATFM processes, or by far less developed ad-hoc traffic management techniques applied by individual sector controllers. In other cases rudimentary ATFM outcomes may be achieved by applying a single large and longitudinal spacing no matter the level of demand, or use of non-surveillance separation standards within areas of contiguous surveillance coverage.

7.2 The minimum ATFM service capability applicable to particular types of airspace may be achieved by applying a tailored selection of *capability elements* from a suite of regionally agreed tools, procedures and practices to flexibly and efficiently manage demand. This requires the definition of a comprehensive list of ATFM capability elements. In the Interim Framework these are limited to ATFM capability related to early stages of Strategic and Tactical phases, and will be expanded and further developed for inclusion in the Regional Framework for Collaborative ATFM

7.3 ATFM Capability Elements of the Interim Framework are a suite of tools, practices and procedures defined to enable the safe, flexible and efficient management of demand within the Tactical and Strategic Phases of ATFM. ATFM Capability Elements defined for any airport or airspace are based on the guidance provided in Doc 9971, and include:

- Planning Tools;
- Prediction and Monitoring Tools;
- CDM Tools;
- ATFM Execution Tools; and
- ATFM Measures

7.4 The ATFM Capability Elements applicable to interim ATFM implementation are provided in **Appendix X**.

Interim ATFM Service Implementation (Interim Framework)

7.5 The final version of the Regional Framework for Collaborative ATFM will define airspace categories within which a minimum suite of ATFM Capability elements will be defined.

7.6 As stated in Section 1 of this document, States should implement ATFM services defined in the Interim Framework as soon as possible, where required by current or forecast traffic demand.

7.7 Interim ATFM service implementation should, as far as possible, be planned to permit future alignment with the Preferred Aerodrome/Airspace and Route Specifications (PARS) and Preferred ATM Service Levels (PASL) defined in the Seamless Plan.

7.8 As a minimum, interim capability for Tactical and Strategic ATFM should be implemented:

- at all high density aerodromes (100,000 scheduled movements per annum or more);
- in high density FIR supporting the busiest Asia/Pacific traffic flows (**Figure X**);
- in airspace servicing ATS routes between the busiest city pairs; and
- in TMA and en-route sectors where radar and/or ADS-B surveillance services are provided.

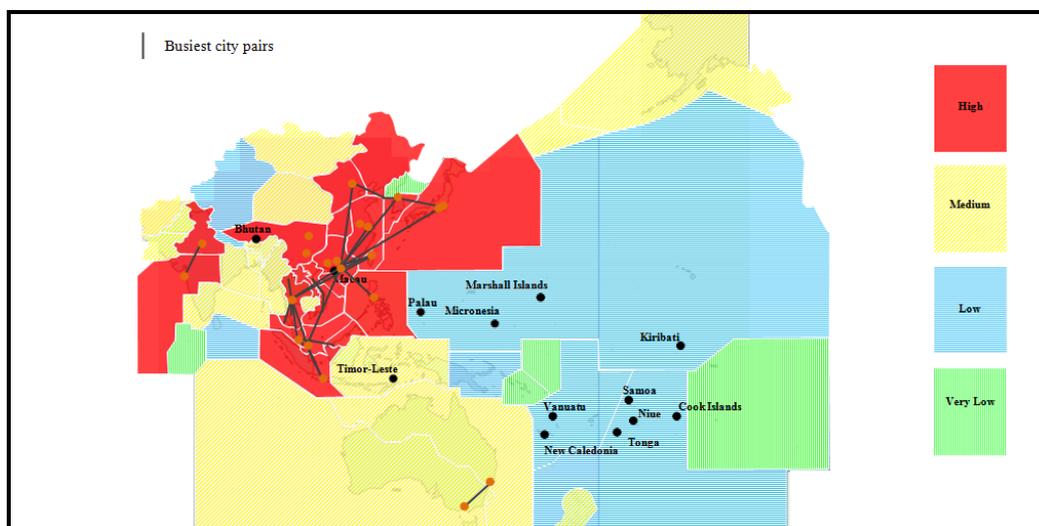


Figure X: High Density FIRs and Busiest City Pairs²

² Based on 2012 ICAO data, the 21 busiest Asia/Pacific aerodromes were:

- Australia (Sydney, Melbourne);
- China (Beijing, Shanghai Pudong and Hong Jiao, Guangzhou, Hong Kong, Xi'an, Shenzhen, Chengdu, Kunming);
- India (New Delhi, Mumbai);
- Indonesia (Jakarta);
- Japan (Haneda, Narita);
- Malaysia (Kuala Lumpur);
- Philippines (Manila);
- Republic of Korea (Incheon);
- Singapore (Changi); and
- Thailand (Suvarnabhumi).

7.9 xxxx

Airspace and Airport Capacity Measurement

7.10 Airspace and airport capacity measurement should as a minimum be conducted for all airports and airspace defined in paragraph 7.8 of this document.

7.11 ICAO Doc 9971 Manual on Collaborative ATFM provides guidance on airspace and airport capacity measurement. Excerpts from the document are provided at **Appendix X**. States may elect to develop their own capacity measurement tools and techniques.

7.12 Declared Airport Capacity should be expressed in terms of movements per hour, landings per hour and take-offs per hour, for all runway configurations used at the airports concerned.

7.13 Declared sector capacity should be expressed in terms of both entry count and occupancy count, adjusted to take into account other factors as necessary.

Airspace and Airport Capacity Improvement

7.14 Increased capacity is the primary and central method for management of increasing demand. Increasing existing capacity wherever possible should be given high priority.

7.15 Capacity improvements may be found in such areas as improved ATC separation standards, optimized ATS route design, reduced runway occupancy times. Recommendations for airspace and airport capacity improvements are provided at **Appendix X**.

Capacity improvement initiatives proposed by the group may alternatively be included here in the body of the document.

Planning for Interim Tactical ATFM

7.16 To be finalized after discussion at ATFM/SG/3 under separate WP

7.17 The implementation of Tactical ATFM services will be largely dependent on factors such as airspace and ATS route structure and surveillance and communications capability. The planning should include the gathering and analysis of aircraft performance data and development of procedures and processes.

7.18 A checklist of items to be considered in Tactical ATFM planning is provided at **Appendix X**.

ATFM Messages and Coordination (Interim Framework)

7.19 To be finalized after discussion at ATFM/SG/3 under separate WP

ATFM Competencies – ATC and ATFM

7.20 Operational ATC license holders may be required to acquire, demonstrate and exercise competencies in a number of ATC practices and skills to support the application of ATFM measures. These may include the application of a number various techniques, while maintaining separation at all times, to ensure optimal ATFM outcomes. Typically, Tactical ATFM techniques are used to execute ATFM measures such as Miles-in-Trail (MIT), Minutes-in-Trail (MINIT), Calculated Times Over (CTO) or Calculated Times of Arrival (CTA) at defines points in cases where aircraft may not be able to meet them by independent trajectory adjustments, .Techniques may include: speed control during the

cruise, descent and approach phases of flight, or radar vectoring or holding.

7.21 A checklist of ATC ATFM-related competencies is provided at **Appendix X.**

Airport Collaborative Decision Making (A-CDM)

7.22 Effective implementation of Airport CDM is a vital component of an overall collaborative ATFM system, and from the perspective of the ANSP facilitates airspace user compliance with ATFM measures.

7.23 Airport CDM is not specifically included as a deliverable in the Interim Framework due to the complexity of its interface with ATM systems and its dependency on networked communications capability. Airport CDM considerations will be included in the Regional Framework for Collaborative ATFM.

ATS Route Design Considerations for ATFM

7.24 Effective implementation and optimization of ATFM is dependent on efficient ATS route and procedure design. Particularly, Standard Instrument Departure (SID), Standard Arrival Route (STAR) and instrument approach procedures should be designed to ensure the segregation of departing and arriving traffic and the facilitation of Continuous Descent Operations (CCO) and Continuous Climb Operations (CCO), improving airspace capacity and efficiency.

7.25 Guidance on ATS route design is provided at **Appendix X.**

Strategic ATFM

7.26 Strategic ATFM implementation requires close coordination and cooperation between aircraft operators, air navigation service providers and airport operators for the management of the slot allocation process. The IATA *Worldwide Slot Guidelines – WSG* provide widely accepted guidance in cases where local Strategic ATFM capability is not available.

7.27 The WSG are publicly available at <http://www.iata.org/policy/slots/Documents/wsg-5.pdf>.

Implementation Steps for Interim ATFM

Possibly to be included as an appendix, after discussion and further development by ATFM/SG/3 under a separate WP.

7.28 Interim ATFM implementation steps should be undertaken in the following sequence:

- a) ATFM data gathering and analysis;
- b) Capacity assessment and adjustment;
 - i. assess minimum required spacing between consecutive landing aircraft in different runway and approach type configurations to determine airport acceptance rates;
 - ii. determine enroute and TMA sector capacities;

-
- iii. identify and implement opportunities for capacity improvement.
- c) Determine suite of ATFM Capability Elements required;
 - d) Plan initial Tactical ATFM capability, including:
 - i. Stakeholder engagement;
 - ii. develop manual techniques for determination of landing sequence and required ATFM measures;
 - iii. ATFM coordination;
 - Tactical Coordination Procedures and Facilities
 - ATFMU to ATFMU;
 - ATFMU to ATC;
 - ATC to ATFMU
 - ATC to ATC
 - Stakeholder conference call scheduling and triggering events for non-scheduled coordination.

Note: An ATFMU need not be established as a stand-alone facility or capability. The Tactical ATFM functions of an ATFMU may be carried out by appropriately skilled ATC personnel at an operational ATC position.

 - iv. Develop ATFM competency criteria for ATC and ATFMU staff;
 - v. Plan, develop and deliver training; and
 - vi. Implement Tactical ATFM Capability Elements (ATFM Measures);
 - e) Strategic ATFM;
 - i. Arrival Slot Allocation Process;
 - f) Tactical ATFM Optimisation, including implementation of Interim ATFM-Related ASBU Elements
 - g) ATFM performance review and improvement.

ATFM Compliance

7.29 [UNDER CONSTRUCTION]x

7.30 x.

RESEARCH AND FUTURE DEVELOPMENT

8.1 [MAY NOT BE REQUIRED FOR THE INTERIM FRAMEWORK. (apart from a brief outline of development of the Regional Framework)]

MILESTONES, TIMELINES, PRIORITIES AND ACTIONS

9.1 [UNDER CONSTRUCTION]

APPENDIX X: ATFM Framework Principles

To be further developed by ATFM/SG/3 under separate WP

People: Aviation Regulations, Standards and Procedures

1. Increased capacity is the primary and central method for management of increasing demand.
2. Regional model of inter-connected sub-regional ATFM networks based on system-wide CDM, serving the busiest terminal airspace and major sub-Regional traffic flows.
3. Harmonized regional or sub-regional ATFM rules and guidelines based on the ICAO Manual on Collaborative Air Traffic Flow Management (Doc 9971).
4. Regionally harmonized methodology for the collection, analysis and ongoing monitoring of demand and capacity data.
5. Development of manual processes and skills to promote practical knowledge and understanding of ATFM before implementing technology based solutions, and as a contingency response capability.
6. Consistency between the ICAO Regional Air Navigation Plan, Asia/Pacific Seamless ATM Plan and Regional ATFM Framework.
7. An emphasis on delivery of ATFM services based on CNS capability, resulting in flexible, dynamic systems providing equity of access and delivering optimal ATFM network outcomes.
8. The use of high-fidelity simulators to train controllers and ATFMU personnel involved in in ATFM procedures and techniques.

ATM Coordination

9. The prioritization of integrated AIDC systems for timely ATM and ATFM system updates of trajectory data, including preferred implementation of advanced AIDC messaging and configuration of systems for early delivery of AIDC messages.

Facilities: Aerodromes

10. Encouragement for aerodrome operators to actively participate in ATM coordination in respect of Airport CDM development and operational planning, including aerodrome complexity and capacity.

ATS Units

11. Collaboration by ANSPs for evaluation and planning of ATFM facilities.
12. Optimization of ATFM facilities through automated, networked, central flow management centres and units or equivalent virtual platforms.

Technology and Information: ATFM Systems

13. Continuous supervision, operation, adjustment, monitoring and executive control of ATFM systems and their output by ~~qualified~~ trained and competent ATC or ATFM personnel.

14. Encouragement of the use of dual-redundant automated ATFM processing and communications systems, supported by agreed contingency procedures and facilities including ATN/AMHS and public telephone systems.
15. Collaborative development of CDM, ATFM, A/MAN and D/MAN support tools.
16. Encourage real-time sharing of dynamic air traffic data relating to flights operating or intending to operate in civil-controlled airspace, between military ATM systems and civil ATM/ATFM systems.

ATM Modernisation Projects

17. Inter-regional and sub-regional cooperation ('clustering') for the research, development and implementation of ATFM projects
18. A focus on harmonized technologies for earliest deployment and best cost benefits.
19. Xx

APPENDIX X: Collaborative ATFM Capability Elements

To be further developed by ATFM/SG/3 under separate WP

Planning Tools

- Airspace design and ATS Route Planning including segregated SIDs (CCO) and STARs (CDO)
- Capacity Analysis and workload modelling
- ~~Network Operational Plans~~

ATFM Unit, Centre or Virtual ATFM Centre Structure

- Strategic management unit;
- ~~Pre Tactical Management Unit;~~
- Tactical Management Unit;
- Capacity Unit;
- ~~Operability Monitoring Unit;~~
- Coordination and Decision Unit; and
- Flow Management Positions (ACC, TMA positions linked to ATFM Unit or Centre)

Prediction and Monitoring Tools

- Demand and workload prediction
- weather prediction
- monitoring tools

CDM Tools

- ~~information exchange~~
- ~~collaboration~~
- ~~electronic user helpdesk~~
- ~~crisis management~~

Tactical ATFM Capability

- Agreed acceptance rates
- Agreed flow gates at uniform distances from the aerodrome

- Prioritization of landing aircraft;
- Industry notification of additional fuel for traffic delays;
- Prioritization of compliant flights and de-prioritization of non-complaint flights

ATFM Execution Tools

- Slot Allocation
- Route and Fix Balancing
- ~~Collaborative Trajectory Options~~

ATFM Measures

- Miles in Trail
- Minutes in trail
- fix balancing
- rerouting
(could be both strategic and tactical)
- mandatory rerouting
- Level capping
- alternative or advisory routing
- minimum departure intervals
- slot swapping
- ~~Collaborative trajectory options~~
- ground delay programme
- ground stop
- airborne holding

Analysis Tools

- data analysis and reporting

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