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

DRAFT REGIONAL FRAMEWORK FOR COLLABORATIVE ATFM

(Presented by the Secretariat)

SUMMARY

This paper presents the current early draft version of the Regional Framework for Collaborative ATFM, to update the meeting on the progress and process of its development

1. INTRODUCTION

1.1 The primary task of the ATFM Steering Group is the development of the Regional Framework for Collaborative ATFM. Development of the document requires work to be conducted offline, for review and enhancement at ATFM/SG meetings, and is dependent on the development and finalization of the Regional Interim Framework for ATFM.

2. DISCUSSION

2.1 The draft contents of both the Regional Framework for Collaborative ATFM and the Interim Framework were circulated for review and comment in a combined document, the *Draft Interim Framework for Collaborative ATFM version 0.1.1*. The documents have now been separated.

2.2 The latest draft version of the separate *Regional Framework for Collaborative ATFM* is appended at **Attachment A**. It includes comments received up to 4 March 2014, Secretariat responses to those comments, and records subsequent amendments.

2.3 The Steering Group's effort should initially be focused on finalization of the Interim Framework, as that document will eventually be subsumed into the broader Regional Framework, and is required to be finalized in a short time-frame. The Interim Framework will be examined under separate ATFM/SG/3 working papers.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this paper;

b) discuss and comment on the structure of the draft content of the Regional Framework for Collaborative ATFM;

c) provide additional feedback to the Secretariat offline;

d) discuss any relevant matters as appropriate.

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INTERNATIONAL CIVIL AVIATION ORGANIZATION

D R A F T

ASIA/PACIFIC REGION

FRAMEWORK

FOR

COLLABORATIVE AIR TRAFFIC FLOW MANAGEMENT

DRAFT Version 0.1.2, 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

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 which, together with its contributory documents including the Collaborative Framework and other guidance material, define goals and the means of meeting State planning objectives.

1.4 Now incorporated within the Asia/Pacific Seamless ATM Plan are the Asia/Pacific ATFM Concept of Operations and Air Navigation Concept of Operations. The 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 ATM 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. Only a limited range of Pre-Tactical ATFM measures is therefore 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.

ATFM Service Categories

1.10 The Interim Framework categorizes ATFM Service Categories within any particular airspace sector or terminal area on the basis of assumed traffic density and airspace complexity associated with major international airports, and in some cases on the ATFM Service Categories of adjacent airspace sectors. A minimum suite of ATFM Capability Elements is defined for each Service Category.

1.11 The ATFM Service Categories that are under consideration for definition in the Regional Framework for Collaborative ATFM are:

- Tier A: Terminal Areas (radar or ADS-B surveillance) servicing major international and high density domestic airports;
- Tier B: En-route ATC sectors (radar or ADS-B surveillance) overlying, or servicing major ATS routes between, Tier A terminal areas;
- Tier C: En-route ATC sectors (non-surveillance) adjoining Tier B sectors or servicing ATS routes between Tier A terminal areas.
- Tier D: Terminal Areas (radar or ADS-B surveillance) servicing regional domestic or low-density international airports;
- Tier E: En-route ATC (radar or ADS-B surveillance) sectors adjoining Tier B sectors, or overlying or servicing ATS routes between Tier D terminal areas;
- Tier F: Regional TMA or TWR/TMA (non-surveillance); and
- Tier G: All other airspace sectors (non-surveillance).

Note: The Service Category assigned to any particular airspace may be amended where traffic density, complexity or other factors dictate that a higher level of Service Category is appropriate.

1.12 The Interim Framework is primarily targeted to implement ATFM in Tiers A, B and C airspace. This does not, however, preclude the optional application of the principles and guidance provided in this document to other ATFM Service Categories of airspace as appropriate to individual States' circumstances.

ATFM Capability Elements

1.13 ATFM Capability Elements of the Interim Framework are a suite of tools, practices and procedures defined to enable the flexible and efficient management of demand within the Tactical and Strategic Phases of ATFM. ATFM Capability Elements 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

Implementation Timelines

1.14 Implementation timelines for ATFM services defined in the Interim Framework are formulated to facilitate alignment with the timelines expected in the parent Regional Framework for Collaborative ATFM, when finalized. These timelines will themselves be aligned, where appropriate, with the Seamless ATM Plan's 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 ATM 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. ~~The Interim Framework will to be subsumed into the parent Collaborative Framework, and therefore requires review only APANPIRG as guided by ATFM/SG.~~ The Interim Framework is expected to be subsumed by the broader Regional Framework for Collaborative ATFM by the end of 2015. Regular scheduled review if the Interim Framework is therefore not required. The document may be reviewed whenever deemed necessary by APANPIRG, its ATM Sub-Group or the ATFM/SG.

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 Asia/Pacific Region Seamless ATM 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 in:

a. ATFM data gathering and analysis;

b. capacity assessment and adjustment;

c. Initial Tactical ATFM implementation, including:

i. determining minimum spacing between consecutive landing aircraft in different runway and approach type configurations;

ii. determining airport acceptance rates;

iii. determining the landing sequence;

iv. ATFM coordination;

v. ATFM techniques and tools (ATFM Measures) to achieve the sequence; and

vi. training.

d. Stakeholder engagement;

e. Strategic ATFM;

f. ~~Tactical ATFM Optimisation~~, ATFM Airspace Optimization, including

i. airspace and ATS route re-design;

ii. procedure enhancement; and

iii. implementation strategies.

g. Identification of relevant Aviation System Block Upgrade modules;

h. ATFM performance review and improvement.

2.2 xxx

Interim Framework Development

2.3 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.

2.4 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.

2.5 It was envisaged that interim ATFM framework would include fundamental, introductory Tactical and Strategic ATFM guidance such as:

- Demand and Capacity Analysis:
- Tactical ATFM Implementation:
  - procedure development;
  - Training Development
  - Initial ATFM implementation
  - Review of outcomes
- ~~Tactical ATFM Optimisation~~ ATFM Airspace Optimization:
  - airspace and ATS route re-design;
  - procedure re-design
  - training development
  - optimized tactical ATFM implementation
- Strategic ATFM
  - Arrival slot program.

2.6 The Interim Framework was drafted by a specialist team formed within 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).

2.7 The Asia/Pacific Region 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 in or appended to the Regional Framework for Collaborative ATFM.

EXECUTIVE SUMMARY

[UNDER CONSTRUCTION. Being drafted by Secretariat, in consultation with Regional Office and ATFM/SG Co-Chairs, then circulated for comment by the team]

Heading

3.1 x.

Heading

ABBREVIATIONS AND ACRONYMS

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 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 an 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 intended to exploit current aircraft equipage and capability, and to establish 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 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

5.7 xxxxxx

Interim ATFM - Order of Priority for ASBU Upgrades

5.8 ATFM/SG considered the ASBU Modules identified and prioritized in the Seamless ATM Plan, and the outcomes of the meeting of the Chairpersons of APANPIRG Sub-Groups meeting held in Hong Kong, China, 16 to 17 January 2014, which 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 recommended order of implementation of those upgrades that will best facilitate an achievable step-by-step Interim ATFM implementation. Table X presents the recommended order of priority for implementation.

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.

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

Table X: Interim ATFM-Related Order of Implementation for ASBU Elements

5.9 The above table includes those which are outside the scope of the Interim Framework, but will support the Regional Framework for Collaborative ATFM. ASBU Priorities 7 to 10 are not expected to be implemented under the Interim Framework.

5.10 **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.

5.11 **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.

5.12 **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.

5.13 **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.

5.14 **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.

5.15 **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.

5.16 **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).

5.17 **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.

5.18 **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.

ATFM Elements Derived from the Seamless ATM Plan Initiatives

5.19 The Asia/Pacific Seamless ATM Plan identifies a number of Global and Regional elements having a bearing on CDM and ATFM

5.20 **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.

5.21 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.

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

5.23 **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).

5.24 **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.

5.25 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.

5.26 **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

5.27 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.

5.28 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.

5.29 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

5.30 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 [UNDER CONSTRUCTION. Note that in the Interim Framework this will only be a fairly brief summary of current ATFM in the Region. The IATA study will provide the bulk of the detail for this section of the broader Framework for Collaborative ATFM.]

6.2 x.

PERFORMANCE IMPROVEMENT PLAN

ATFM Capability Elements

7.1 Most if not all ATC 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 (**Appendix X**). The ATFM Capability Elements defined in the Interim Framework are limited to those related to early stages of Strategic and Tactical phases, and will be further developed in the Regional Framework for Collaborative ATFM

7.3 x.

ATFM Service Capability Categories

7.4 ATFM Service Categories define types of airspace within which specified levels of ATFM service capability apply.

7.5 The Interim Framework applies a simplified range of ATFM Service Categories:

- Tier A: Terminal Areas (radar or ADS-B surveillance) servicing major international airports;
- Tier B: En-route ATC sectors (radar or ADS-B surveillance) overlying or servicing major ATS routes between Tier A terminal areas;
- Tier C: En-route ATC sectors (non-surveillance) adjoining Tier B sectors or servicing ATS routes between Tier A terminal areas.

7.6 The Service Categories define airspace within which a specified minimum of ATFM Capability Elements should be implemented under the Interim Framework. Coordination agreements should be established with ATS units providing service in airspace either not defined in these Service Categories or without any ATFM Capability to ensure the reliable and timely delivery of ATFM messages to airspace users.

7.7 The ATFM Capability Elements applicable to each ATFM Service Category are defined in **Appendix X**. Administrations may also elect to apply appropriate ATFM measures in airspace not defined in the Capability Categories, as determined by traffic density and airspace complexity, where complexity measurement may include such factors as traffic mix (IFR and VFR traffic, jet v non-jet, military activity, general aviation activity), airspace constraints, environmental factors or meteorological factors.

7.8 In order to determine the airspace sectors that will be categorized as Tier B or Tier C, it is necessary to identify Asia/Pacific Region Tier A airspace, i.e. terminal areas with radar or ADS-B surveillance servicing major international airports. The agreed list of major international airports to which this applies is provided at Appendix X.

7.9 x

7.10 x

Airspace and Airport Capacity Measurement

7.11 [UNDER CONSTRUCTION]

7.12 x

Strategic ATFM Guidance

7.13 [UNDER CONSTRUCTION]

Airport CDM

7.14 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.

7.15 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.

ATFM Communications Capability

7.16 [UNDER CONSTRUCTION]

ATFM Messages

7.17 [UNDER CONSTRUCTION]

ATFM Competencies - ATC

7.18 [UNDER CONSTRUCTION. (these are being compiled from material provided by ATFM/SG/2 participants.)]

ATFM Competencies – ATFM Staff

7.19 [UNDER CONSTRUCTION]x

ATFM Compliance

7.20 [UNDER CONSTRUCTION]x

Implementation Steps for Interim ATFM

7.21 Interim ATFM implementation steps should be undertaken in the following seqence:

a) ATFM data gathering and analysis;

b) Capacity assessment and adjustment;

i. assess minimum 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 opportunities for capacity improvement.

c) Determine ATFM Service Categories of all ATC sectors;

d) Determine suite of ATFM Capability Elements required;

e) Plan initial Tactical ATFM capability, including:

i. Stakeholder engagement;

~~ii. determining minimum spacing between consecutive landing aircraft in different runway and approach type configurations;~~

~~iii. determining airport acceptance rates;~~

iv. manual techniques for determination of landing sequence and required ATFM measures;

v. 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.

vi. Develop ATFM and related ATC competency criteria

vii. Plan, develop and deliver training; and

viii. Implement Tactical ATFM Capability Elements (ATFM Measures);

f) Strategic ATFM;

i. Arrival Slot Allocation Process;

g) Tactical ATFM Optimisation, including implementation of Interim ATFM-Related ASBU Elements in the following recommended order:

- **B0-ASUR** Initial Capability For Ground Surveillance;
- **B0-RSEQ** Improve Traffic Flow Through Runway Sequencing (AMAN/DMAN);
- **B0-TBO** Improved Safety And Efficiency Through The Initial Application Of Data Link En-Route;
- **B0-FICE** Increased Interoperability, Efficiency And Capacity Through Ground-Ground Integration (AIDC);
- **B0-CDO** Improved Flexibility And Efficiency In Descent Profiles (Continuous Descent Operations - CDO)
- **B0-CCO** Improved Flexibility And Efficiency Departure Profiles - Continuous Climb Operations (CCO);
- **B0-APTA** Optimization Of Approach Procedures Including Vertical Guidance

h) ATFM performance review and improvement.

7.22 x.

RESEARCH AND FUTURE DEVELOPMENT

x

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]

9.2 x

APPENDIX X: ATFM Framework Principles

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.

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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

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
- ~~Holding patterns permitting CDO~~
- 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

APPENDIX X: Major International and High Density Domestic Airports (Tier A Terminal Areas)

- standard phrases for delaying action (ICAO Doc 4444);

Administration	Airport	Remark

APPENDIX X: ATC Procedures and Practices

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APPENDIX X: ATFM SERVICE CATEGORY AND CAPABILITY ELEMENTS MATRIX