International Civil Aviation Organization

The Fifth Meeting of ICAO Asia/Pacific Air Traffic Flow Management Steering Group (ATFM/SG/5)

Bangkok, Thailand, 30 March – 3 April 2015

Agenda Item 5: Development of Regional ATFM Framework

FRAMEWORK – BACKGROUND INFORMATION

(Presented by the Secretariat)

SUMMARY

This paper presents the Background Information section of the Draft Regional Framework for ATFM for review by the meeting.

1. INTRODUCTION

1.1 The Background Information section of the Draft Framework includes discussion and explanation of concepts and processes related to collaborative ATFM.

2. DISCUSSION

2.1 The Background Information section of the Draft Framework is appended at **Attachment A.** It includes discussion and explanation of the following topics:

i. ATFM Principles – presented separately under WP/20 (Secretariat)

ii. ATFM-Related Aviation System Block Upgrades (ASBU)

- Amended from previous Framework draft to provide more clear discussion of their relevance to ATFM;
- Lists the ASBUs from the Asia/Pacific Regional Priorities and Targets that have a bearing on ATFM;
- Discusses other ATFM-relevant Block 0 ASBU

iii. ATFM-Related Performance Objectives of the Seamless ATM Plan

iv. Collaborative Decision-Making – based on information provided by India (WP/12) in response to a task arising from ATFM/SG/4;

- May require further discussion of participation levels, and of diagrams provided (not yet included in the attachment);

v. ATFM Phases – mainly the description from ICAO Doc 9971, to provide context;

vi. Airspace and Airport Capacity Improvement;

vii. Capacity Planning, Assessment and Declaration;

- Some guidance on where information on capacity planning and assessment may be found, and on Regional experience in fast-time simulations reported to ATFM/SG/3;

- Requires the group to define how ATC sector capacity should be expressed as a regional standard;

viii. ATFM Daily Plan – template in **Attachment B** provided for discussion/amendment by the meeting.

ix. ATFM Terminology, Communications, Phrases and Information Distribution – presented separately under WP/21.

x. Meteorological Products for ATFM – Attachment C provides further examples of meteorological products, to be presented as an Appendix to the Framework.

xi. Asia/Pacific Region ATFM Implementation Study – discussing key outcomes and recommendations from Phase 1 of the IATA study. The findings of the study are also used in the Current Situation section of the framework.

xii. Asia/Pacific Region ATFM Operational Concept – brief discussion of the concept, with the concept itself to be provided in a separate appendix to the Framework.

xiii. Training and competencies for ATFM personnel – Introduces the training requirements document which will form an appendix to the framework – separately presented WP/08 (EU/AATIP, supported by Thailand)

2.2 Following on from discussions at ATFM/SG/2, 3 and 4, definitions of ATFM airspace and airport categories and performance capabilities included in this section of previous versions of the Framework have been removed. They are replaced with definitions more closely aligned with those of the Seamless ATM Plan, and have been moved to the Performance Improvement Plan section of the Framework (WP/24).

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this paper;

b) discuss and amend where necessary the information provided;

c) agree to the inclusion of this information in the Framework; and

d) discuss any relevant matters as appropriate.

…….

BACKGROUND INFORMATION

ATFM Principles

5.1 The major areas of Collaborative ATFM principles are mainly aligned with those of the Asia/Pacific Seamless ATM Plan; People (human performance), Facilities (physical equipment), and Technology and Information. The 35 principles as agreed by ATFM/SG and endorsed by APANPIRG are included at **Appendix X.**

ATFM-Related Aviation System Block Upgrades (ASBU)

5.2 The ICAO ASBU initiative, detailed in Doc. 9750 – Global Air Navigation Plan (GANP), describes a way to apply the concepts defined in Doc 9854 – Global Air Traffic Management Operational Concept (GATMOC), with the goal of implementing regional and global performance improvements. They are intended to provide a set of aviation system solutions or upgrades that 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.

5.3 The 25th Meeting of the Asia/Pacific Region Air Navigation Planning and Implementation Regional Group endorsed ten regional priorities (and performance indicators), including five ASBU modules directly related to regional collaborative ATFM.

B0-NOPS – Improved Flow Performance through Planning based on a Network-wide View.

APAC ATFM Notes: Inter-linked and networked cross-FIR ATFM capability both within and between ANSPs, and having harmonized interfaces with AMAN/DMAN and A-CDM systems using common reference points and information exchange, should be developed to serve various sub-regions. (Refer Doc 9971 Manual on Collaborative Air Traffic Flow Management)

B0-FICE – Increased Interoperability, Efficiency and Capacity through Ground-Ground Integration.

APAC ATFM Notes: 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.

B0-FRTO – Improved Operations through Enhanced En-route Trajectories.

APAC ATFM Notes: Flexible Use Airspace (FUA), User Preferred Routes (UPR), Dynamic Airborne Re-route Planning (DARP) and CDM. These will allow the use of airspace which would otherwise be segregated, along with flexible routing adjusted for specific traffic patterns for greater routing

possibilities, reducing flight time and fuel burn.

B0-ASUR – Initial Capability for Ground Surveillance

APAC ATFM Notes: E.g. 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-based separation standards. Earlier surveillance of aircraft also provides real-time updates of ATFM system information. ADS-B data may be readily shared between neighbouring ATSUs, enhancing safety, increasing capacity and efficiency and facilitating seamless ATM and collaborative ATFM operations.

B0-TBO – Improved Safety and Efficiency through the Initial Application of data Link En-route.

APAC ATFM Notes: 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, facilitating earlier inclusion in sequence planning and application of ATFM measures and the timely, reliable and accurate transmission of ATFM measure instructions to such aircraft.

<u>Other ATFM-Related ASBU Block-0 Modules</u>

B0-ACDM: (Priority 2) – Improved Airport Operations through Airport CDM

APAC ATFM Notes: Airport CDM improves the outcomes of collaborative ATFM by facilitating the timely positioning of aircraft in order to comply with ATFM measures such as Calculated Take-Off Time (CTOT), where harmonized with ATFM and AMAN/DMAN systems using common reference points and information exchange.

B0-AMET: (Priority 2) Meteorological Information Supporting Enhanced Operational Efficiency and Safety

APAC ATFM Notes: Global, regional and local meteorological information including aerodrome warnings, SIGMETs, and other operational meteorological (OPMET) information, including METAR/SPECI and TAF, supporting flexible airspace management, improved situational awareness, collaborative decision-making and dynamically optimized flight trajectory planning. Meteorological information other than the OPMET products currently defined in Annex 3 provide optimized decision-making information to support ATFM.

B0-CCO: (Priority 2) – Improved Flexibility and Efficiency Departure Profiles – Continuous Climb Operations.

APAC ATFM Notes: Continuous Climb Operations (CCO). These procedures

improve ATFM outcomes by segregating departing/climbing traffic from inbound/descending traffic, and facilitating higher runway departure rates by segregating the departure routes of aircraft having different speed and climb performance characteristics.

B0-CDO: (Priority 2) – Improved Flexibility and Efficiency Departure Profiles – Continuous Climb Operations.

APAC ATFM Notes: These arrival procedures allow aircraft to fly their optimum descent profile, taking into account airspace and traffic complexity, and permit the maximum use of aircraft capability to meet Calculated Times-Over (CTO) Arrival Fixes (AFIX) and Calculated Times of Arrival (CTA) during the descent and approach phases of flight.

B0-RSEQ: (Priority 2) Improved Traffic Flow through Sequencing (AMAN/DMAN).

APAC ATFM Notes: Arrival Manager (AMAN) and Departure Manager (DMAN) procedures and tools are designed to provide automation support for synchronisation of arrival sequencing, departure sequencing and surface information, and optimization of runway capacity. Collaborative, harmonized development of AMAN/DMAN, ATFM and Airport CDM systems should be undertaken, using common reference points and information exchange protocols.

B0-SURF: (Priority 3) Safety and Efficiency of Surface Operations (A-SMGCS Level 1-2)

APAC ATFM Notes: Advanced Surface Movements Guidance Control Systems (A-SMGCS), where warranted by weather conditions and capacity. While Implementation of A-SMGCS may not be a high priority in the Asia/Pacific except at high density aerodromes where the cost benefits are positive, it improves ATC capability to ensure the efficient positioning of aircraft to comply with ATFM measures and DMAN-generated departure sequencing, and improves the flow of aircraft to and from aprons and terminal gates under A-CDM.

<u>ATFM-Related Performance Objectives of the Seamless ATM Plan</u>

5.4 The Asia/Pacific Seamless ATM Plan specifies performance objectives under *Preferred Aerodrome/Airspace and Route Specifications* (PARS) and *Preferred ATM Service Levels* (PASL), to be implemented in two phase:

- PARS/PASL Phase I – expected implementation by 12 November 2015; and
- PARS/PASL Phase II – expected implementation by 08 November 2018.

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

- PARS/PASL Phase I

7.1 All High density international aerodromes (100,000 scheduled movements per annum or more) should

a) provide apron management service to regulate entry of aircraft into and coordinate exit of aircraft from the apron.

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

7.2 All High Density Aerodromes operate an A-CDM system serving MTF and busiest city pairs, with priority implementation for the busiest Asia/Pacific Aerodromes.

7.3 CCO and CDO operations should be considered for implementation at all high density international aerodromes after analysis, based on a performance-based approach.

7.4 All international high density aerodromes should have RNAV 1 (ATS surveillance environment) or RNP 1 (ATS surveillance and non-ATS surveillance environments) SID/STAR.

7.25 All high density aerodromes should have AMAN/DMAN facilities.

7.26 All high density aerodromes should provide meteorological forecasts, aerodrome warnings and alerts that support efficient terminal operatios..

7.27 High density FIRs supporting the busiest Asia/Pacific traffic flows and high density aerodromes should implement ATFM incorporating CDM to enhance capacity, using bi-lateral and multi-lateral agreements.

- PARS/PASL Phase II

7.13 All high density aerodromes should have a declared airport terminal and runway capacity based on a capacity and efficiency analysis, to ensure the maximum possible efficiency of aircraft and passenger movement

7.43 ATM system design should be planned and implemented to support optimal aerodrome capacity expectations for the runway(s) concerned.

7.44 All terminal ATC sectors should have a nominal aircraft capacity figure based on a scientific capacity study and safety assessment to ensure safe and efficient aircraft operations.

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

7.50 To ensure the safety and efficiency of aircraft operations a nominal aircraft capacity figure based on a scientific capacity study and safety assessment should be available for all en-route ATC sectors.

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

Collaborative Decision Making

5.7 ICAO Doc 9971 defines Collaborative Decision Making:

A process focused on how to decide on a course of action articulated between two or more community members. Through this process, ATM community members share information related to that decision and agree on and apply the decision-making approach and principles. The overall objective of the process is to improve the performance of the ATM system as a whole while balancing the needs of individual ATM community members.

5.8 The planning and implementation of cross-boundary, networked ATFM requires new levels of collaborative decision-making among multi-national stakeholders. While current ATFM CDM processes and ATFM systems are oriented towards local or national demand and capacity balancing, the maturing of ATFM systems and expansion across national boundaries will lead to a CDM environment of multilateral decision-making with complementary individual goals.

5.9 Cross-border ATFM should have the following characteristics:

- an inclusive process – Participation by States and other Stakeholders is the key;
- a transparent process – Simple business rules to ensure compliance and build trust will be necessary;
- allows Sharing of information between all partners through a common platform to improved efficiency and operational decision making; and
- achieve common situational awareness for all partners, taking into account the data-sharing capability of stakeholders.

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

5.11 The challenges in establishing a regional ATFM framework include the establishment of transparent, easily understood and flexible procedures, compliance, participation and demonstration of proven benefits to educate and encourage change among stakeholders

5.12 CDM partners and stakeholders should include:

- States, establishing regulations and overseeing safety and compliance;
- ANSPs, implementing ATFM capability;
- International Organizations such as ACI, CANSO, IATA and IFATCA;
- International ATFM Organizations (to share tactical flight data through FUM) – Euro control, FAA;
- Airport operators; and
- CDM-participating airlines.

5.13 Recognizing that each State will develop ATFM capability according to its needs and requirements, and the overarching goal of seamless ATM across the Asia/Pacific Region, the following levels of State/ANSP CDM participation in sub-regional or regional ATFM networks should apply:

Level 1 – Full CDM Partner participation, through State ATFM centres, with the

capability for the exchange of relevant strategic and tactical ATFM data.

Level 2 – Active CDM Partner, through State ATFM centres, participating in ATFM measures implementation, with the capability for exchange of relevant strategic and tactical flight data.

Level 3 – Active CDM Participant, through State ATFM centres, with capability for exchange of relevant tactical flight data and ATFM capacity information;

Level 4 – CDM Participant, through State ATFM centres, with the capability for exchange of relevant tactical flight data.

Level 5 – Facilitator Participant, with no ATFM capability or requirement, but with the capability for exchange of relevant tactical flight data; and

Level 6 – Non-Participant, with no ATFM capability or requirement, and no capability for exchange of relevant tactical flight data.

5.14 Xxxxx

ATFM Phases

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

5.16 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.

5.17 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 collaborative decision-making (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 in the Asia/Pacific Region is under development, and its final form may be determined by the outcomes of sub-regional collaborative trial projects.

5.18 Tactical ATFM measures are taken on the day of operation, managing traffic flows and capacities in real time. Tactical ATFM practices, procedures and competencies supported where necessary by Arrival Manager (AMAN) and Departure Manager (DMAN) capability should be the first priority for ATFM implementation. These 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.

5.19 The timely application of measures in all three ATFM phases requires a fundamental understanding of airport and airspace capacity, and the continuous assessment of capacity and the factors that impact upon it.

5.20 Xxx

Airspace and Airport Capacity Improvement

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

procedures and stakeholder behaviours.

5.22 Airspace capacity improvements may be achieved by:

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

5.23 Airport capacity improvements may be achieved by:

- Improved airport design including additional runways, taxiways and appropriately positioned rapid-exit taxiways;
- Harmonized AMAN, DMAN and A-CDM systems;
- Analysis and improvement of runway occupancy times through enhancement of procedures and associated pilot practices;
- Implementation of precision approaches to all runways.

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

Capacity Planning, Assessment and Declaration

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

5.26 The primary areas of capacity assessment and declaration for ATFM are Airport Acceptance Rate (AAR), Airport Departure Rate (ADR), and airspace sector capacity. AAR and ADR

are usually expressed in terms of landings or departures per hour. Sector capacity may be expressed in terms of occupancy count and/or entry count.

5.27

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

- Chapter 4 – Capacity, Demand and ATFM Phases;
- Appendix C – Determining Airport Acceptance Rate - A simplified methodology for determining the acceptance rate at an airport, based on scientific processes developed by the USA.
- Appendix D – Determining Sector Capacity – An example of a simplified methodology for determining sector capacity at an ACC, based on the scientific process developed by the USA.
- Appendix E – Capacity Planning and Assessment Process – Information developed by EUROCONTROL related to the ATFM capacity and planning assessment process.

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

5.30 In late 2014 ten Asia/Pacific Region States participated in fast-time simulation workshop activities conducted by EUROCONTROL under a European Union/ASEAN air transport improvement project, using the EUROCONTROL Capacity Analyser (CAPAN) methodology, with simulations run on the Re-organized ATC Mathematical Simulator (RAMS).

5.31 Steps in a sector capacity assessment methodology include:

1. Collect the necessary airspace and traffic data;
2. Verify (with the support of local controllers) the traffic sample routes and the procedures used on a flow-by-flow basis;
3. Correct, refine and insert the information into the model (done by the simulation experts). This includes the ATC procedures used in the sector, standard controller tasks, simulation parameters and aircraft performance parameters;
4. Run an initial test-run of the model;
5. Verify flight profiles. The knowledge of local controllers is used to adapt aircraft performance to local conditions, to define and verify sector specific controller tasks together with simulation parameters including conflict detection and resolution mechanisms;
6. Consolidate a final model which is used to calculate results for all simulation scenarios, e.g. different sector configurations, different traffic samples, etc.;
7. Verify the simulation scenarios and the initial results, and if so required, do a fine-tuning of parameters.

5.32 A capacity assessment methodology should use a simulation engine that reproduces the

ATC environment, and should follow a reiterative process of validation involving licensed ATC staff currently active on the sector/s under assessment.

5.33 To ensure harmonization and common understanding of ATC sector capacity, the declaration of ATC sector capacity in the ATFM Daily Plan, and any tactical updates, should be expressed in terms of XXXX

ATFM Daily Plan

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

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

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

5.37 Feedback and review of the ADP received from ANSPs, AUs, and from the ATFM unit itself represent very important input for further improvement of the pre-tactical planning. This feedback helps the ATFM unit identify the reason(s) for ATFM measures and determine corrective actions to avoid reoccurrence. Systematic feedback from AUs should be gathered via specifically established links.

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

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

5.40 An important component of the CDM process is post-operations analysis, including consideration of feedback from airspace users, airports operators, ATS and other ATFM units. Daily post-operations analysis conferences should be held, supplemented where necessary by conferences called to assess the outcomes of programs of ATFM measures responding to non-normal situations.

ATFM Terminology

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

5.42 The Global development of ATFM has largely been undertaken in isolation by individual ANSPs, EUROCONTROL, ICAO Sub-Regions or other informal groups of States, or by ATFM

system vendors. This has resulted in differences in concept development and in the technical terms used for operational and technical coordination of ATFM information.

5.43 ATFM/SG developed a standardized ATFM terminology for the Asia/Pacific Region to promote harmonization and interoperability of CDM/ATFM systems and procedures.

5.44 The terms and definitions were drawn from those used by Australia, Canada, EUROCONTROL, Japan, South Africa and USA, and those in the *Flight Information Exchange Model* (FIXM) data dictionary.

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

ATFM System Communications

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

5.47 The Flight Information Exchange Model (FIXM) is part of a suite of data exchange formats, including Aeronautical Information Exchange Model (AIXM) and Meteorological Information Exchange Model (WXXM), intended to provide a global standard for information exchange. FIXM is a data interchange format for sharing information about flights throughout their lifecycle.

5.48 **Figure X** illustrates the data-level interoperability among domains achieved by FIXM.

Figure X: FIXM Interoperability among Domains

5.49 FIXM is referenced in Global Air Navigation Plan ASBU modules and roadmap:

- **ASBU B1-FICE –** Increased Interoperability, Efficiency and Capacity through Flight and Flow Information for a Collaborative Environment Step-1 (FF-ICE/1)[1] application before Departure;

[1] ICAO Doc 9965 – Manual on Flight and Flow – Information for a Collaborative Environment (FF-ICE) describes the FF-ICE concept.

- Introduces FF-ICE, Step 1 providing ground-ground exchanges using a common flight information reference model (FIXM) and extensible markup language (XML) standard formats before departure.

- **ASBU B1-DATM** – Service Improvement through Integration of all digital ATM Information Implements the ATM information reference model, integrating all ATM information, using common

  - Implements the ATM information reference model, integrating all ATM information, using common formats (UML/XML and WXXM) for meteorological information, FIXM for flight and flow information and Internet protocols.

- **Roadmap 2** – in the Blocks 1 and 2 time frame:

  - FIXM will be introduced as the global standard for exchanging flight data.

- **Roadmap 8** – in the Blocks 1 and 2 time frame:

  - FIXM will propose a global standard for exchanging flight information.

5.50 FIXM version 3.0 (or later), extended where necessary to accommodate additional regional requirements, is the agreed ATFM information exchange model for exchanging ATFM data between ATFM systems in the Asia/Pacific Region.

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

ATFM Information Distribution

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

- Networked, web-based interface at ATFMU, ATSU and Airspace User locations, each forming a node of a distributed multi-nodal ATFM platform;

- Web-based interface at ATFMU, ATSU and Airspace User locations, providing access directly to ATFM information provided by the ATFMU responsible for the initiation of ATFM measures for the destination airport or constrained airspace; or

- AFTN messages distributed to individual ATSUs;

- Email distribution (ATFM Daily Plan); or

- Voice Coordination

5.53 Considering the scope and performance objectives of this version of the Framework, and the stage of development of the multi-nodal ATFM concept, **Table X** outlines the minimum items of ATFM information that ATFM systems and processes should share.

The Multi Nodal Concept of Operations is detailed in paragraphs XX to XX.

Estimated	Calculated	Actual	Applicable
EOBT		AOBT	Terminal Gate
	CTOT	ATOT	Departure Runway
ETO	CTO	ATO	RFIX or AFIX
ELDT	CLDT	ALDT	Arrival Runway
Other			
ADP			

Table 1: Minimum ATFM Information for Distribution and Sharing

ATFM Communications by AFS

5.54 Recognizing that States' needs for ATFM may vary, where necessary ATSUs may participate in collaborative ATFM without having the need for dedicated ATFM systems or terminals. AFS may provide a suitable method for distribution of ADP and ATFM measure information to such ATSUs.

5.55 The *EUROCONTROL Specification for ATS Data Exchange Presentation* (ADEXP) provides a format for use in on-line, computer to computer message exchange and for message exchange over switched messaging networks. It is used in current generation ATM automation and supporting systems, and was used in the development of FIXM.

5.56 The ADEXP model provides machine-readable information that is also human-readable, rendering it useable for the distribution of ATFM information on computer-based displays and in text form via AFS.

5.57 ADEXP version 3.1 is the agreed format for ATFM message exchange in the Asia/Pacific Region in cases where an ATFM network interface has not been established, and ATFM information is distributed by AFS. More information is available on the EUROCONTROL website[2].

ATFM Phrases

ATFM phrases for use in ATFM coordination, and in air-ground communications, are also included in **Appendix X.**

Meteorological Products for ATFM

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

[2] https://www.eurocontrol.int/publications/ats-data-exchange-presentation-adexp-specification

products that bridge the gap between the traditional products.

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

5.60 The current Annex 3 provisions do not adequately provide meteorological products enabling an accurate determination of impact on capacity, and are largely produced in coded text format, which makes rapid interpretation difficult for ATM officers.

5.61 To enable rational and quantifiable capacity determination, ANSPs and Meteorological authorities should collaborate closely to define meteorological products enabling decisions based on specific impact to operations. ANSPs should identify and inform Met providers of the key thresholds for various weather criteria which have a quantifiable impact on airport and terminal airspace capacity, such as headwind, crosswind, visibility, ceiling, wind shear, and convective weather at the IAF or in the vicinity of critical arrival fixes, holding points and sequencing areas. An example of the simple type of matrix that could be produced, with intuitive colour coding for quick recognition by ATM staff, is shown in **Figure X**. In terms of the wider Terminal area, similar defined criteria, thresholds and colour coding can enable rapid interpretation of impact on operations.

Detailed Terminal Area Forecast for the next 9 hours

Issue time: 220734Z

Time (UTC)	0730	0800	0900	1000	1100	1200	1300	1400	1500	1600
Overall										
Wind TEMPO	290/05 --	290/05 --	290/05 --	290/05 040/10	040/10 --	040/10 --	040/10 --	040/10 --	040/10 --	040/10 --
07 Headwind (kt) TEMPO	-4 --	-4 --	-4 --	-4 9	9 --	9 --	9 --	9 --	9 --	9 --
25 Headwind (kt) TEMPO	4 --	4 --	4 --	4 -9	-9 --	-9 --	-9 --	-9 --	-9 --	-9 --
Crosswind (kt) TEMPO	N 3 --	N 3 --	N 3 --	N 3 N 5	N 5 --	N 5 --	N 5 --	N 5 --	N 5 --	N 5 --
Visibility TEMPO	3300 m --	3300 m --	3300 m --	4500 m 7000 m	7000 m --	7000 m --	7000 m --	7000 m --	7000 m --	7000 m --
Ceiling (ft) TEMPO	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --

Notes:

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

Level	Head wind	Cross wind	Visibility	Ceiling
1	=< 20 kt	< 30 kt	> 1000 m	> 400 ft
2	21 - 40 kt	30 - 35 kt	600 – 1000 m	200 – 400 ft
3	> 40 kt	> 35 kt	< 600 m	< 200 ft
-	< -5 kt	-	-	obscured sky

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

Figure 1: Example Colour-Coded Matrix of Met Information

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

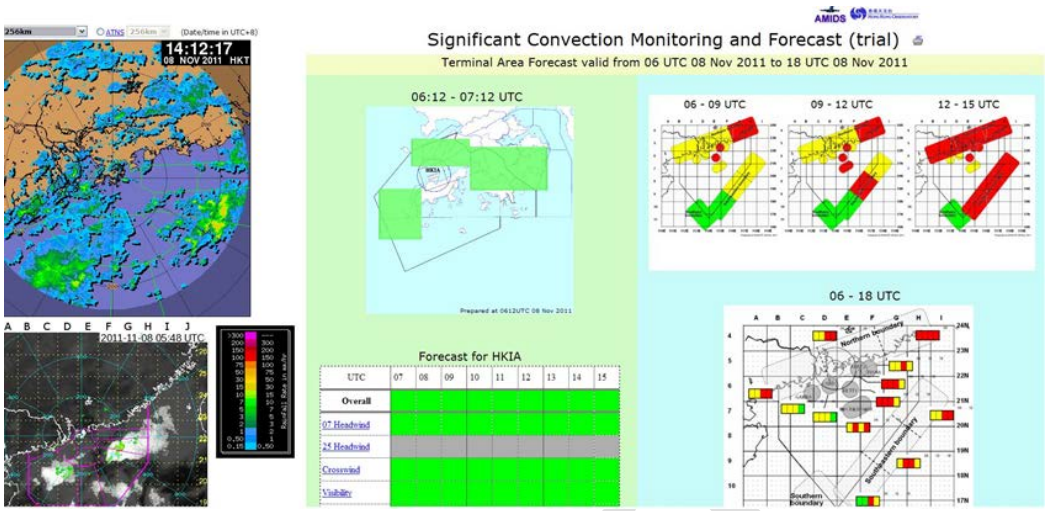

Figure X: IAF and Holding Stack Weather Prediction.

5.63 When identifying criteria, ANSPs should consider thresholds that result in a change of runway operating mode, such as:

- a change of runway dependency;
- a change spacing between arriving aircraft;
- a change in nominal aircraft approach speeds;
- an exceedance of aircraft operating limitations for significant numbers of aircraft (eg maximum crosswind component);
- an inability to commence an approach via the IAF; or
- an inability to hold in the primary published holding areas, etc.

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

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

5.66 ANSPs should also closely collaborate with Met providers on these requirements to ensure the development of specific products rather than a simple truncation of an existing longer term forecast products that do not provide sufficiently detailed information or accuracy.

Asia/Pacific Region ATFM Implementation Study

5.41 At the first meeting after its reconvention, ATFM/SG/2 supported a project funded by IATA that studied current and planned ATFM initiatives to establish a regional baseline view of ATFM capability and interoperability, and to develop recommended implementation strategies for collaborative Regional and sub-Regional ATFM.

5.42 The study identified the benefits of regional ATFM implementation (**Table X**):

	2014	2019
Regional ATFM	USD250-300 million	USD600-800 million
Regional and Domestic ATFM	USD660-810 million	USD1.1-1.4 billion

Table 1: Regional Benefits of ATFM Implementation

5.43 Key outcomes of the study were:

- Most States had plans to implement or had implemented domestic ATFM;
- Very few States were planning cross-border ATFM;
- Significant effort would be required to establish a seamless, network based approach to regional ATFM.
- Budgetary and planning commitments must be made in 2015 to meet the 2018 timelines for ASBU and the Asia/Pacific Seamless ATM Plan.
- The ATFM Steering Group and ICAO have a critical leadership role to ensure coordination and development of the key initiatives that will lead to regional ATFM implementation.

5.44 Recommendations arising from the study were:

1. Adoption of the *Multi-Nodal Concept of Operations* as the APAC concept of operations/implementation strategy for cross border ATFM;

   Note: the Multi-Nodal Concept of Operations is detailed in paragraphs XX.

2. Support for the multi-nodal operational trial program commencing June 2015;
3. Formal State commitment to regional cross border ATFM including budgetary and planning commitment for regional implementation;
4. Regional commitment to 2018 timeline for implementation;
5. State planning, procurement and resource commitment for expanded participation during Phase Two of the multi-nodal operational trial program.

5.67 ATFM/SG subsequently agreed to support Phase 2 of the IATA Regional ATFM Project, to develop a proposal for a regional cross-border ATFM implementation plan.

Asia/Pacific Region ATFM Operational Concept

5.68 The concept of the Distributed Multi-Nodal ATFM Network, conceived through the collaborative research project by Singapore, together with industry partners and operational inputs from Malaysia, Hong Kong, China and Thailand and other relevant stakeholders, was adopted by ATFM/SG as the foundation for a Regional Concept of Operations and implementation strategy, with an implementation target date of 8 November 2018 in alignment with the Seamless ATM Plan.

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

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

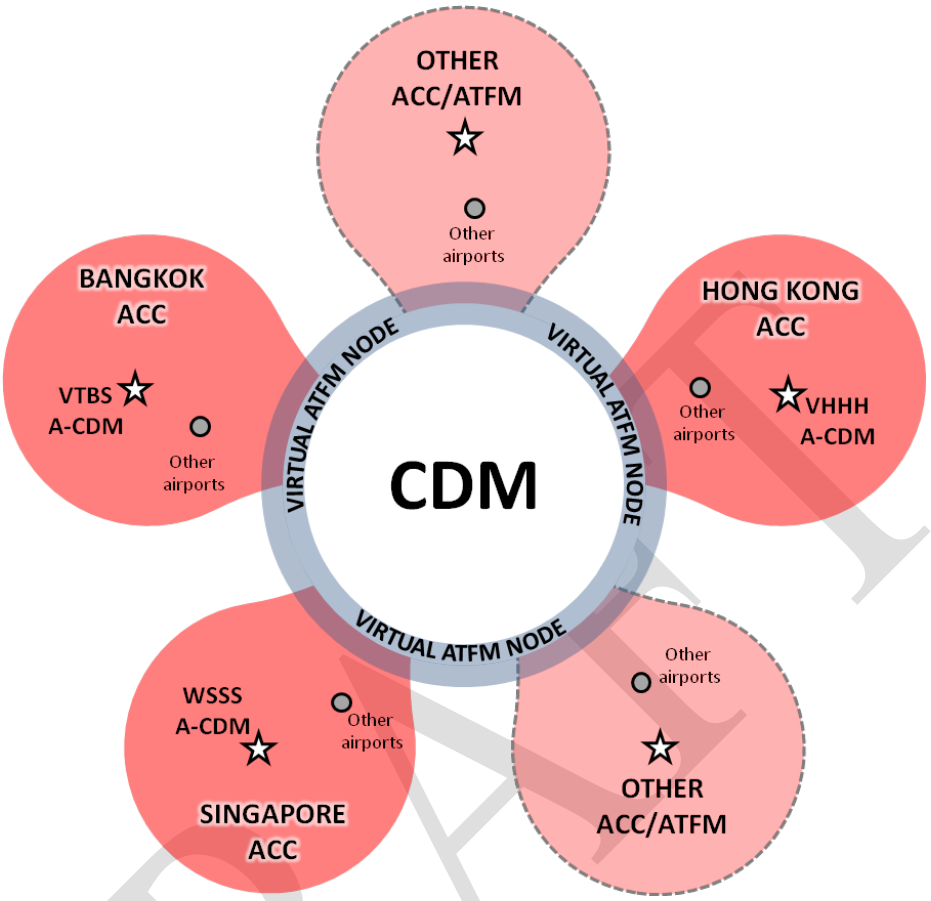

Figure X: A Distributed Multi-Nodal ATFM Network

5.70 The Distributed Multi-Nodal ATFM Operational Concept is provided at **Appendix X**. The concept, untried elsewhere, will be further developed as experience is gained in operational trials.

Training and Competencies for ATFM Personnel

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

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

5.73 **Appendix X** provides generic guidance on ATFM training requirements, which States may consider for inclusion in any existing or planned ATFM training programs.

APPENDIX X – ATFM DAILY PLAN TEMPLATE

ATFM Daily Plan	[name of ATFM Unit]	[UTC DATE] [APPLICABLE TIME]

CAPACITY and CONSTRAINTS			
Location (AD or SECT)	**APPLICABLE PERIOD**	**CAPACITY (AAR OR SECT ENTRY PER HR)**	**CONSTRAINT/REMARK**

ATFM MEASURES			
Location (AD or SECT)	**APPLICABLE PERIOD**	**MEASURE**	**REMARKS**

POSSIBLE/DEVELOPING ISSUES		
Location (AD or SECT)	**APPLICABLE PERIOD**	**MEASURE REMARKS**

EXAMPLE ATFM DAILY PLAN

ATFM Daily Plan	RJAA

CAPACITY and CONSTRAINTS			
Location (AD or SECT)	**APPLICABLE PERIOD**	**CAPACITY (AAR OR SECT ENTRY PER HR)**	**CONSTRAINT/REMARK**
RJCC	2100 – 2300	04 – 06	LVP
RJTT	0200 – 0300	10	RWY34L/16R CLSD 0200 – 0245 CONST
RJTT	0300 – 0500	14	FLTCK RWY22 ILS
SECT 1	0130 – UFN	25	Developing CB

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

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

BACKGROUND INFORMATION

ATFM Principles

5.1 The major areas of Collaborative ATFM principles are mainly aligned with those of the Asia/Pacific Seamless ATM Plan; People (human performance), Facilities (physical equipment), and Technology and Information. The 35 principles as agreed by ATFM/SG and endorsed by APANPIRG are included at **Appendix X.**

ATFM-Related Aviation System Block Upgrades (ASBU)

5.2 The ICAO ASBU initiative, detailed in Doc. 9750 – Global Air Navigation Plan (GANP), describes a way to apply the concepts defined in Doc 9854 – Global Air Traffic Management Operational Concept (GATMOC), with the goal of implementing regional and global performance improvements. They are intended to provide a set of aviation system solutions or upgrades that 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.

5.3 The 25th Meeting of the Asia/Pacific Region Air Navigation Planning and Implementation Regional Group endorsed ten regional priorities (and performance indicators), including five ASBU modules directly related to regional collaborative ATFM.

B0-NOPS – Improved Flow Performance through Planning based on a Network-wide View.

APAC ATFM Notes: Inter-linked and networked cross-FIR ATFM capability both within and between ANSPs, and having harmonized interfaces with AMAN/DMAN and A-CDM systems using common reference points and information exchange, should be developed to serve various sub-regions. (Refer Doc 9971 Manual on Collaborative Air Traffic Flow Management)

B0-FICE – Increased Interoperability, Efficiency and Capacity through Ground-Ground Integration.

APAC ATFM Notes: 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.

B0-FRTO – Improved Operations through Enhanced En-route Trajectories.

APAC ATFM Notes: Flexible Use Airspace (FUA), User Preferred Routes (UPR), Dynamic Airborne Re-route Planning (DARP) and CDM. These will allow the use of airspace which would otherwise be segregated, along with flexible routing adjusted for specific traffic patterns for greater routing

possibilities, reducing flight time and fuel burn.

B0-ASUR – Initial Capability for Ground Surveillance

APAC ATFM Notes: E.g. 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-based separation standards. Earlier surveillance of aircraft also provides real-time updates of ATFM system information. ADS-B data may be readily shared between neighbouring ATSUs, enhancing safety, increasing capacity and efficiency and facilitating seamless ATM and collaborative ATFM operations.

B0-TBO – Improved Safety and Efficiency through the Initial Application of data Link En-route.

APAC ATFM Notes: 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, facilitating earlier inclusion in sequence planning and application of ATFM measures and the timely, reliable and accurate transmission of ATFM measure instructions to such aircraft.

<u>Other ATFM-Related ASBU Block-0 Modules</u>

B0-ACDM: (Priority 2) – Improved Airport Operations through Airport CDM

APAC ATFM Notes: Airport CDM improves the outcomes of collaborative ATFM by facilitating the timely positioning of aircraft in order to comply with ATFM measures such as Calculated Take-Off Time (CTOT), where harmonized with ATFM and AMAN/DMAN systems using common reference points and information exchange.

B0-AMET: (Priority 2) Meteorological Information Supporting Enhanced Operational Efficiency and Safety

APAC ATFM Notes: Global, regional and local meteorological information including aerodrome warnings, SIGMETs, and other operational meteorological (OPMET) information, including METAR/SPECI and TAF, supporting flexible airspace management, improved situational awareness, collaborative decision-making and dynamically optimized flight trajectory planning. Meteorological information other than the OPMET products currently defined in Annex 3 provide optimized decision-making information to support ATFM.

B0-CCO: (Priority 2) – Improved Flexibility and Efficiency Departure Profiles – Continuous Climb Operations.

APAC ATFM Notes: Continuous Climb Operations (CCO). These procedures

improve ATFM outcomes by segregating departing/climbing traffic from inbound/descending traffic, and facilitating higher runway departure rates by segregating the departure routes of aircraft having different speed and climb performance characteristics.

B0-CDO: (Priority 2) – Improved Flexibility and Efficiency Departure Profiles – Continuous Climb Operations.

APAC ATFM Notes: These arrival procedures allow aircraft to fly their optimum descent profile, taking into account airspace and traffic complexity, and permit the maximum use of aircraft capability to meet Calculated Times-Over (CTO) Arrival Fixes (AFIX) and Calculated Times of Arrival (CTA) during the descent and approach phases of flight.

B0-RSEQ: (Priority 2) Improved Traffic Flow through Sequencing (AMAN/DMAN).

APAC ATFM Notes: Arrival Manager (AMAN) and Departure Manager (DMAN) procedures and tools are designed to provide automation support for synchronisation of arrival sequencing, departure sequencing and surface information, and optimization of runway capacity. Collaborative, harmonized development of AMAN/DMAN, ATFM and Airport CDM systems should be undertaken, using common reference points and information exchange protocols.

B0-SURF: (Priority 3) Safety and Efficiency of Surface Operations (A-SMGCS Level 1-2)

APAC ATFM Notes: Advanced Surface Movements Guidance Control Systems (A-SMGCS), where warranted by weather conditions and capacity. While Implementation of A-SMGCS may not be a high priority in the Asia/Pacific except at high density aerodromes where the cost benefits are positive, it improves ATC capability to ensure the efficient positioning of aircraft to comply with ATFM measures and DMAN-generated departure sequencing, and improves the flow of aircraft to and from aprons and terminal gates under A-CDM.

<u>ATFM-Related Performance Objectives of the Seamless ATM Plan</u>

5.4 The Asia/Pacific Seamless ATM Plan specifies performance objectives under *Preferred Aerodrome/Airspace and Route Specifications* (PARS) and *Preferred ATM Service Levels* (PASL), to be implemented in two phase:

- PARS/PASL Phase I – expected implementation by 12 November 2015; and
- PARS/PASL Phase II – expected implementation by 08 November 2018.

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

- PARS/PASL Phase I

7.1 All High density international aerodromes (100,000 scheduled movements per annum or more) should

a) provide apron management service to regulate entry of aircraft into and coordinate exit of aircraft from the apron.

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

7.2 All High Density Aerodromes operate an A-CDM system serving MTF and busiest city pairs, with priority implementation for the busiest Asia/Pacific Aerodromes.

7.3 CCO and CDO operations should be considered for implementation at all high density international aerodromes after analysis, based on a performance-based approach.

7.4 All international high density aerodromes should have RNAV 1 (ATS surveillance environment) or RNP 1 (ATS surveillance and non-ATS surveillance environments) SID/STAR.

7.25 All high density aerodromes should have AMAN/DMAN facilities.

7.26 All high density aerodromes should provide meteorological forecasts, aerodrome warnings and alerts that support efficient terminal operatios..

7.27 High density FIRs supporting the busiest Asia/Pacific traffic flows and high density aerodromes should implement ATFM incorporating CDM to enhance capacity, using bi-lateral and multi-lateral agreements.

- PARS/PASL Phase II

7.13 All high density aerodromes should have a declared airport terminal and runway capacity based on a capacity and efficiency analysis, to ensure the maximum possible efficiency of aircraft and passenger movement

7.43 ATM system design should be planned and implemented to support optimal aerodrome capacity expectations for the runway(s) concerned.

7.44 All terminal ATC sectors should have a nominal aircraft capacity figure based on a scientific capacity study and safety assessment to ensure safe and efficient aircraft operations.

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

7.50 To ensure the safety and efficiency of aircraft operations a nominal aircraft capacity figure based on a scientific capacity study and safety assessment should be available for all en-route ATC sectors.

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

Collaborative Decision Making

5.7 ICAO Doc 9971 defines Collaborative Decision Making:

A process focused on how to decide on a course of action articulated between two or more community members. Through this process, ATM community members share information related to that decision and agree on and apply the decision-making approach and principles. The overall objective of the process is to improve the performance of the ATM system as a whole while balancing the needs of individual ATM community members.

5.8 The planning and implementation of cross-boundary, networked ATFM requires new levels of collaborative decision-making among multi-national stakeholders. While current ATFM CDM processes and ATFM systems are oriented towards local or national demand and capacity balancing, the maturing of ATFM systems and expansion across national boundaries will lead to a CDM environment of multilateral decision-making with complementary individual goals.

5.9 Cross-border ATFM should have the following characteristics:

- an inclusive process – Participation by States and other Stakeholders is the key;
- a transparent process – Simple business rules to ensure compliance and build trust will be necessary;
- allows Sharing of information between all partners through a common platform to improved efficiency and operational decision making; and
- achieve common situational awareness for all partners, taking into account the data-sharing capability of stakeholders.

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

5.11 The challenges in establishing a regional ATFM framework include the establishment of transparent, easily understood and flexible procedures, compliance, participation and demonstration of proven benefits to educate and encourage change among stakeholders

5.12 CDM partners and stakeholders should include:

- States, establishing regulations and overseeing safety and compliance;
- ANSPs, implementing ATFM capability;
- International Organizations such as ACI, CANSO, IATA and IFATCA;
- International ATFM Organizations (to share tactical flight data through FUM) – Euro control, FAA;
- Airport operators; and
- CDM-participating airlines.

5.13 Recognizing that each State will develop ATFM capability according to its needs and requirements, and the overarching goal of seamless ATM across the Asia/Pacific Region, the following levels of State/ANSP CDM participation in sub-regional or regional ATFM networks should apply:

Level 1 – Full CDM Partner participation, through State ATFM centres, with the

capability for the exchange of relevant strategic and tactical ATFM data.

Level 2 – Active CDM Partner, through State ATFM centres, participating in ATFM measures implementation, with the capability for exchange of relevant strategic and tactical flight data.

Level 3 – Active CDM Participant, through State ATFM centres, with capability for exchange of relevant tactical flight data and ATFM capacity information;

Level 4 – CDM Participant, through State ATFM centres, with the capability for exchange of relevant tactical flight data.

Level 5 – Facilitator Participant, with no ATFM capability or requirement, but with the capability for exchange of relevant tactical flight data; and

Level 6 – Non-Participant, with no ATFM capability or requirement, and no capability for exchange of relevant tactical flight data.

5.14 Xxxxx

ATFM Phases

5.15 ICAO Doc 9971 describes three phases of ATFM execution; *strategic*, *pre-tactical* and *tactical*, illustrated in **Figure X**.

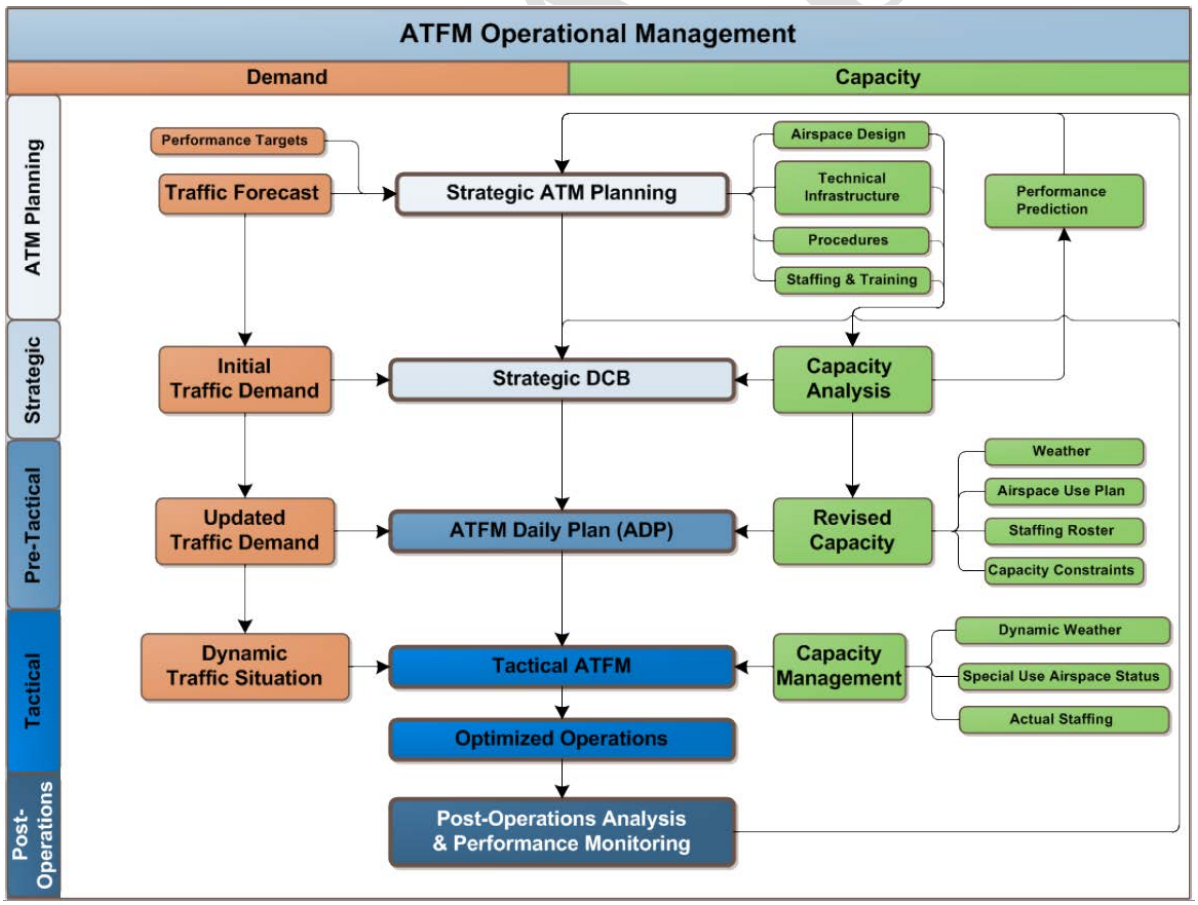

Figure X: ATFM Operational Management and Phases

5.16 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.

5.17 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 collaborative decision-making (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 in the Asia/Pacific Region is under development, and its final form may be determined by the outcomes of sub-regional collaborative trial projects.

5.18 **Tactical ATFM** measures are taken on the day of operation, managing traffic flows and capacities in real time. Tactical ATFM practices, procedures and competencies supported where necessary by Arrival Manager (AMAN) and Departure Manager (DMAN) capability should be the first priority for ATFM implementation. These 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.

5.19 The timely application of measures in all three ATFM phases requires a fundamental understanding of airport and airspace capacity, and the continuous assessment of capacity and the factors that impact upon it.

5.20 Xxx

Airspace and Airport Capacity Improvement

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

5.22 Airspace capacity improvements may be achieved by:

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

- Implementation of RNP-based separations (RNP 4 or better) in non-surveillance airspace;

5.23 Airport capacity improvements may be achieved by:

- Improved airport design including additional runways, taxiways and appropriately positioned rapid-exit taxiways;
- Harmonized AMAN, DMAN and A-CDM systems;
- Analysis and improvement of runway occupancy times through enhancement of procedures and associated pilot practices;
- Implementation of precision approaches to all runways.

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

Capacity Planning, Assessment and Declaration

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

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

5.27

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

- Chapter 4 – Capacity, Demand and ATFM Phases;
- Appendix C – Determining Airport Acceptance Rate - A simplified methodology for determining the acceptance rate at an airport, based on scientific processes developed by the USA.
- Appendix D – Determining Sector Capacity – An example of a simplified methodology for determining sector capacity at an ACC, based on the scientific process developed by the USA.
- Appendix E – Capacity Planning and Assessment Process – Information developed by EUROCONTROL related to the ATFM capacity and planning assessment process.

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

5.30 In late 2014 ten Asia/Pacific Region States participated in fast-time simulation workshop activities conducted by EUROCONTROL under a European Union/ASEAN air transport improvement project, using the EUROCONTROL Capacity Analyser (CAPAN) methodology, with simulations run on the Re-organized ATC Mathematical Simulator (RAMS).

5.31 Steps in a sector capacity assessment methodology include:

1. Collect the necessary airspace and traffic data;
2. Verify (with the support of local controllers) the traffic sample routes and the procedures used on a flow-by-flow basis;
3. Correct, refine and insert the information into the model (done by the simulation experts). This includes the ATC procedures used in the sector, standard controller tasks, simulation parameters and aircraft performance parameters;
4. Run an initial test-run of the model;
5. Verify flight profiles. The knowledge of local controllers is used to adapt aircraft performance to local conditions, to define and verify sector specific controller tasks together with simulation parameters including conflict detection and resolution mechanisms;
6. Consolidate a final model which is used to calculate results for all simulation scenarios, e.g. different sector configurations, different traffic samples, etc.;
7. Verify the simulation scenarios and the initial results, and if so required, do a fine-tuning of parameters.

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

5.33 To ensure harmonization and common understanding of ATC sector capacity, the declaration of ATC sector capacity in the ATFM Daily Plan, and any tactical updates, should be expressed in terms of XXXX

ATFM Daily Plan

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

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

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

5.37 Feedback and review of the ADP received from ANSPs, AUs, and from the ATFM unit itself represent very important input for further improvement of the pre-tactical planning. This feedback helps the ATFM unit identify the reason(s) for ATFM measures and determine corrective actions to avoid reoccurrence. Systematic feedback from AUs should be gathered via specifically established links.

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

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

5.40 An important component of the CDM process is post-operations analysis, including consideration of feedback from airspace users, airports operators, ATS and other ATFM units. Daily post-operations analysis conferences should be held, supplemented where necessary by conferences called to assess the outcomes of programs of ATFM measures responding to non-normal situations.

ATFM Terminology

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

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

5.43 ATFM/SG developed a standardized ATFM terminology for the Asia/Pacific Region to promote harmonization and interoperability of CDM/ATFM systems and procedures.

5.44 The terms and definitions were drawn from those used by Australia, Canada, EUROCONTROL, Japan, South Africa and USA, and those in the *Flight Information Exchange Model* (FIXM) data dictionary.

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

ATFM System Communications

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

5.47 The Flight Information Exchange Model (FIXM) is part of a suite of data exchange formats, including Aeronautical Information Exchange Model (AIXM) and Meteorological Information Exchange Model (WXXM), intended to provide a global standard for information exchange. FIXM is a data interchange format for sharing information about flights throughout their lifecycle.

5.48 **Figure X** illustrates the data-level interoperability among domains achieved by FIXM.

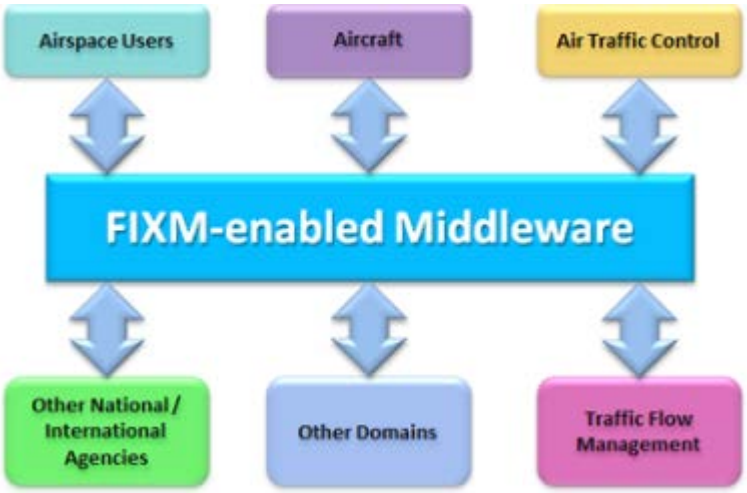

Figure X: FIXM Interoperability among Domains

5.49 FIXM is referenced in Global Air Navigation Plan ASBU modules and roadmap:

- **ASBU B1-FICE –** Increased Interoperability, Efficiency and Capacity through Flight and Flow Information for a Collaborative Environment Step-1 (FF-ICE/1)[1] application before Departure;
  - Introduces FF-ICE, Step 1 providing ground-ground exchanges using a common flight information reference model (FIXM) and extensible markup language (XML) standard formats before departure.
- **ASBU B1-DATM** – Service Improvement through Integration of all digital ATM Information Implements the ATM information reference model, integrating all ATM information, using common
  - Implements the ATM information reference model, integrating all ATM information, using common formats (UML/XML and WXXM) for meteorological information, FIXM for flight and flow information and Internet protocols.
- **Roadmap 2** – in the Blocks 1 and 2 time frame:
  - FIXM will be introduced as the global standard for exchanging flight data.
- **Roadmap 8** – in the Blocks 1 and 2 time frame:
  - FIXM will propose a global standard for exchanging flight information.

[1] ICAO Doc 9965 – Manual on Flight and Flow – Information for a Collaborative Environment (FF-ICE) describes the FF-ICE concept.

5.50 FIXM version 3.0 (or later), extended where necessary to accommodate additional regional requirements, is the agreed ATFM information exchange model for exchanging ATFM data between ATFM systems in the Asia/Pacific Region.

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

ATFM Information Distribution

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

- Networked, web-based interface at ATFMU, ATSU and Airspace User locations, each forming a node of a distributed multi-nodal ATFM platform;
- Web-based interface at ATFMU, ATSU and Airspace User locations, providing access directly to ATFM information provided by the ATFMU responsible for the initiation of ATFM measures for the destination airport or constrained airspace; or
- AFTN messages distributed to individual ATSUs;
- Email distribution (ATFM Daily Plan); or
- Voice Coordination

5.53 Considering the scope and performance objectives of this version of the Framework, and the stage of development of the multi-nodal ATFM concept, **Table X** outlines the minimum items of ATFM information that ATFM systems and processes should share.

The Multi Nodal Concept of Operations is detailed in paragraphs XX to XX.

Estimated	Calculated	Actual	Applicable
EOBT		AOBT	Terminal Gate
	CTOT	ATOT	Departure Runway
ETO	CTO	ATO	RFIX or AFIX
ELDT	CLDT	ALDT	Arrival Runway
Other			
ADP			

Table 1: Minimum ATFM Information for Distribution and Sharing

ATFM Communications by AFS

5.54 Recognizing that States' needs for ATFM may vary, where necessary ATSUs may participate in collaborative ATFM without having the need for dedicated ATFM systems or terminals. AFS may provide a suitable method for distribution of ADP and ATFM measure information to such ATSUs.

5.55 The *EUROCONTROL Specification for ATS Data Exchange Presentation* (ADEXP) provides a format for use in on-line, computer to computer message exchange and for message exchange over switched messaging networks. It is used in current generation ATM automation and supporting systems, and was used in the development of FIXM.

5.56 The ADEXP model provides machine-readable information that is also human-readable, rendering it useable for the distribution of ATFM information on computer-based displays and in text form via AFS.

5.57 ADEXP version 3.1 is the agreed format for ATFM message exchange in the Asia/Pacific Region in cases where an ATFM network interface has not been established, and ATFM information is distributed by AFS. More information is available on the EUROCONTROL website[2].

ATFM Phrases

ATFM phrases for use in ATFM coordination, and in air-ground communications, are also included in **Appendix X.**

Meteorological Products for ATFM

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

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

5.60 The current Annex 3 provisions do not adequately provide meteorological products enabling an accurate determination of impact on capacity, and are largely produced in coded text format, which makes rapid interpretation difficult for ATM officers.

5.61 To enable rational and quantifiable capacity determination, ANSPs and Meteorological authorities should collaborate closely to define meteorological products enabling decisions based on specific impact to operations. ANSPs should identify and inform Met providers of the key thresholds for various weather criteria which have a quantifiable impact on airport and terminal airspace capacity, such as headwind, crosswind, visibility, ceiling, wind shear, and convective weather at the IAF or in the vicinity of critical arrival fixes, holding points and sequencing areas. An example of the simple type of matrix that could be produced, with intuitive colour coding for quick recognition by ATM staff, is shown in **Figure X**. In terms of the wider Terminal area, similar defined criteria, thresholds and colour coding can enable rapid interpretation of impact on operations.

[2] https://www.eurocontrol.int/publications/ats-data-exchange-presentation-adexp-specification

Detailed Terminal Area Forecast for the next 9 hours

Issue time: 220734Z

Time (UTC)	0730	0800	0900	1000	1100	1200	1300	1400	1500	1600
Overall										
Wind TEMPO	290/05 --	290/05 --	290/05 --	290/05 040/10	040/10 --	040/10 --	040/10 --	040/10 --	040/10 --	040/10 --
07 Headwind (kt) TEMPO	-4 --	-4 --	-4 --	-4 9	9 --	9 --	9 --	9 --	9 --	9 --
25 Headwind (kt) TEMPO	4 --	4 --	4 --	4 -9	-9 --	-9 --	-9 --	-9 --	-9 --	-9 --
Crosswind (kt) TEMPO	N 3 --	N 3 --	N 3 --	N 3 N 5	N 5 --	N 5 --	N 5 --	N 5 --	N 5 --	N 5 --
Visibility TEMPO	3300 m --	3300 m --	3300 m --	4500 m 7000 m	7000 m --	7000 m --	7000 m --	7000 m --	7000 m --	7000 m --
Ceiling (ft) TEMPO	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --

Notes:

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

Level	Head wind	Cross wind	Visibility	Ceiling
1	=< 20 kt	< 30 kt	> 1000 m	> 400 ft
2	21 - 40 kt	30 - 35 kt	600 – 1000 m	200 – 400 ft
3	> 40 kt	> 35 kt	< 600 m	< 200 ft
-	< -5 kt	-	-	obscured sky

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

Figure 1: Example Colour-Coded Matrix of Met Information

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

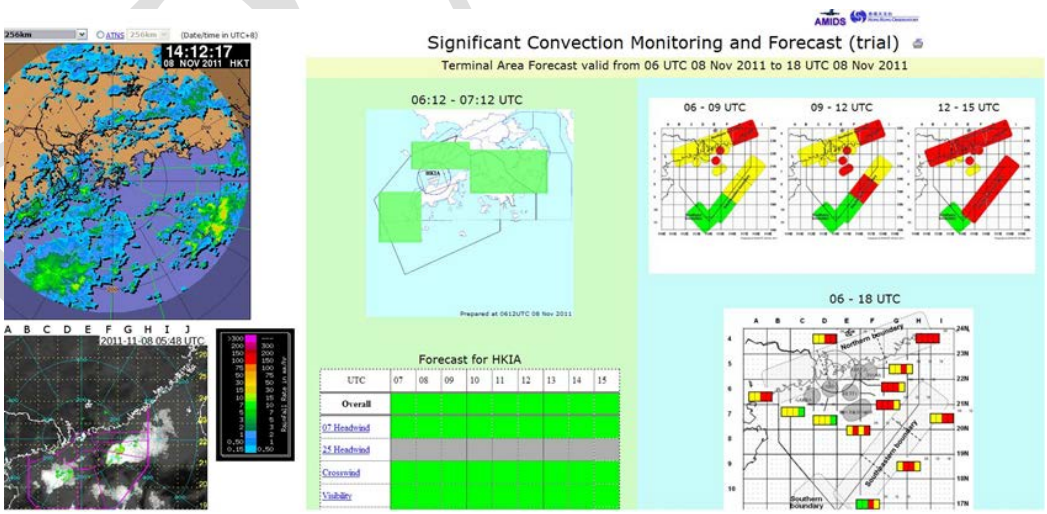

Figure X: IAF and Holding Stack Weather Prediction.

5.63 When identifying criteria, ANSPs should consider thresholds that result in a change of runway operating mode, such as:

- a change of runway dependency;
- a change spacing between arriving aircraft;
- a change in nominal aircraft approach speeds;

- an exceedance of aircraft operating limitations for significant numbers of aircraft (eg maximum crosswind component);
- an inability to commence an approach via the IAF; or
- an inability to hold in the primary published holding areas, etc.

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

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

5.66 ANSPs should also closely collaborate with Met providers on these requirements to ensure the development of specific products rather than a simple truncation of an existing longer term forecast products that do not provide sufficiently detailed information or accuracy.

Asia/Pacific Region ATFM Implementation Study

5.41 At the first meeting after its reconvention, ATFM/SG/2 supported a project funded by IATA that studied current and planned ATFM initiatives to establish a regional baseline view of ATFM capability and interoperability, and to develop recommended implementation strategies for collaborative Regional and sub-Regional ATFM.

5.42 The study identified the benefits of regional ATFM implementation (**Table X**):

	2014	2019
Regional ATFM	USD250-300 million	USD600-800 million
Regional and Domestic ATFM	USD660-810 million	USD1.1-1.4 billion

Table 1: Regional Benefits of ATFM Implementation

5.43 Key outcomes of the study were:

- Most States had plans to implement or had implemented domestic ATFM;
- Very few States were planning cross-border ATFM;
- Significant effort would be required to establish a seamless, network based approach to regional ATFM.
- Budgetary and planning commitments must be made in 2015 to meet the 2018 timelines for ASBU and the Asia/Pacific Seamless ATM Plan.
- The ATFM Steering Group and ICAO have a critical leadership role to ensure coordination and development of the key initiatives that will lead to regional ATFM implementation.

5.44 Recommendations arising from the study were:

1. Adoption of the *Multi-Nodal Concept of Operations* as the APAC concept of operations/implementation strategy for cross border ATFM;

   Note: the Multi-Nodal Concept of Operations is detailed in paragraphs XX.

2. Support for the multi-nodal operational trial program commencing June 2015;

3. Formal State commitment to regional cross border ATFM including budgetary and planning commitment for regional implementation;

4. Regional commitment to 2018 timeline for implementation;

5. State planning, procurement and resource commitment for expanded participation during Phase Two of the multi-nodal operational trial program.

5.67 ATFM/SG subsequently agreed to support Phase 2 of the IATA Regional ATFM Project, to develop a proposal for a regional cross-border ATFM implementation plan.

Asia/Pacific Region ATFM Operational Concept

5.68 The concept of the Distributed Multi-Nodal ATFM Network, conceived through the collaborative research project by Singapore, together with industry partners and operational inputs from Malaysia, Hong Kong, China and Thailand and other relevant stakeholders, was adopted by ATFM/SG as the foundation for a Regional Concept of Operations and implementation strategy, with an implementation target date of 8 November 2018 in alignment with the Seamless ATM Plan.

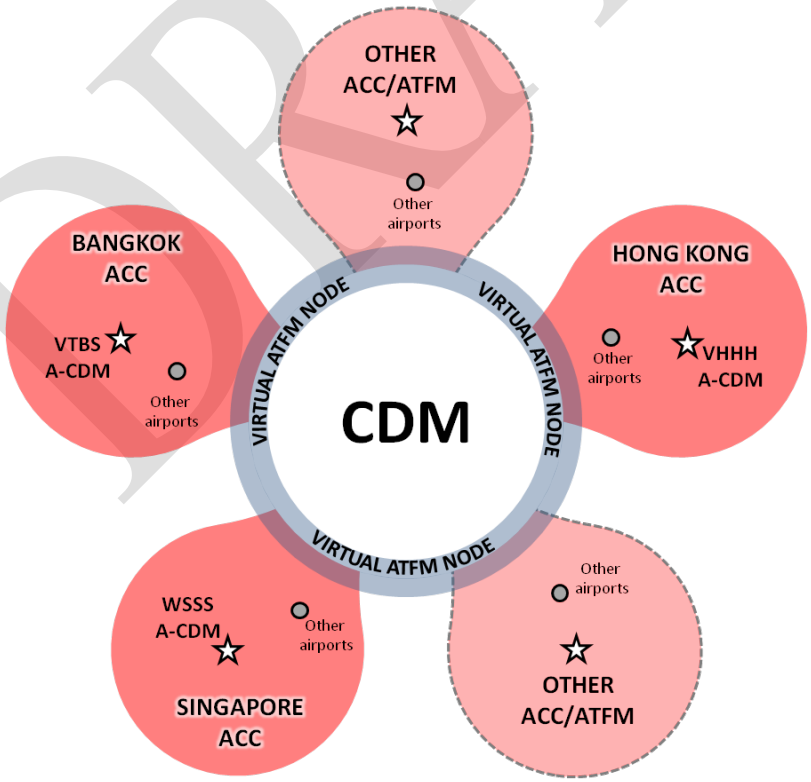

Figure X: A Distributed Multi-Nodal ATFM Network

5.69 The concept recognizes that a centralized ATFM Unit (ATFMU) approach is not yet practicable for the Asia/Pacific region. At the centre of the concept is the distributed multi-nodal ATFM network, illustrated in **Figure X**:

5.70 The Distributed Multi-Nodal ATFM Operational Concept is provided at **Appendix X**. The concept, untried elsewhere, will be further developed as experience is gained in operational trials.

Training and Competencies for ATFM Personnel

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

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

5.73 **Appendix X** provides generic guidance on ATFM training requirements, which States may consider for inclusion in any existing or planned ATFM training programs.

APPENDIX X – ATFM DAILY PLAN TEMPLATE

ATFM Daily Plan	[name of ATFM Unit]	[UTC DATE] [APPLICABLE TIME]

CAPACITY and CONSTRAINTS			
Location (AD or SECT)	**APPLICABLE PERIOD**	**CAPACITY (AAR OR SECT ENTRY PER HR)**	**CONSTRAINT/REMARK**

ATFM MEASURES			
Location (AD or SECT)	**APPLICABLE PERIOD**	**MEASURE**	**REMARKS**

POSSIBLE/DEVELOPING ISSUES		
Location (AD or SECT)	**APPLICABLE PERIOD**	**MEASURE REMARKS**

EXAMPLE ATFM DAILY PLAN

ATFM Daily Plan	RJAA

CAPACITY and CONSTRAINTS			
Location (AD or SECT)	**APPLICABLE PERIOD**	**CAPACITY (AAR OR SECT ENTRY PER HR)**	**CONSTRAINT/REMARK**
RJCC	2100 – 2300	04 – 06	LVP
RJTT	0200 – 0300	10	RWY34L/16R CLSD 0200 – 0245 CONST
RJTT	0300 – 0500	14	FLTCK RWY22 ILS
SECT 1	0130 – UFN	25	Developing CB

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

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