INTERNATIONAL CIVIL AVIATION ORGANIZATION

REPORT OF THE FIFTH MEETING OF THE ASIA/PACIFIC AIR TRAFFIC FLOW MANAGEMENT STEERING GROUP

(ATFM/SG/5)

BANGKOK, THAILAND, 30 MARCH – 3 APRIL 2015

The views expressed in this Report should be taken as those of the Meeting and not the Organization

Approved by the Meeting

and published by the ICAO Asia and Pacific Office, Bangkok

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APPENDICES

INTRODUCTION

Meeting

1.1 The Fifth Meeting of Air Traffic Flow Management Steering Group (ATFM/SG/5) was held at the Kotaite Wing of the ICAO Asia and Pacific (APAC) Regional Office, Bangkok, Thailand, from 30 March to 3 April 2015.

Attendance

2.1 The meeting was attended by 49 participants from Australia, Bangladesh, China, Hong Kong China, India, Indonesia, Japan, Malaysia, New Zealand, Philippines, Singapore, Thailand, United States, Viet Nam, CANSO, EU/AATIP, IATA, and ICAO. A list of participants is at **Appendix A** to this report.

Officers & Secretariat

3.1 Mr. Sylvester Israel, General Manager (ATM), Airports Authority of India, and Mr. Peter Chadwick, Senior Operations Officer, Hong Kong China Civil Aviation Department, co-Chaired the meeting.

3.2 Mr. Shane Sumner, Regional Officer ATM, was Secretary for the meeting.

Opening of the Meeting

4.1 On behalf of Mr. Arun Mishra, Regional Director of ICAO Asia and Pacific Office, Mr. Sumner welcomed all the participants to the meeting.

4.2 Mr. Sylvester Israel and Mr Peter Chadwick welcomed participants to the meeting.

Documentation and Working Language

5.1 The working language of the meeting and all documentation was English. There were 25 working papers and 7 information papers considered by the meeting. A list of papers is included at **Appendix B** to this report.

Decisions, Draft Decisions and Draft Conclusions of ATFM/SG – Definition

6.1 A recorded its actions in the form of Draft Conclusions, Draft Decisions and Decisions within the following definitions:

a) **Decisions** of ATFM/SG that relate solely to matters dealing with the internal working arrangements of ATFM/SG.

b) **Draft Decisions** deal with the matters of concern only to APANPIRG and its contributory bodies; and

c) **Draft Conclusions** deal with matters that, according to APANPIRG terms of reference, require the attention of States, or action by the ICAO in accordance with established procedures;

List of Decisions, Draft Decisions and Draft Conclusions

7.1 List of Decisions

Decision ATFM/SG/5-1 – ATFM Information Requirements Small Working Group (ATFM/IR/SWG)

That, recognizing the need for the development of operational and technical requirements for the exchange of ATFM information in the cross-border, multi-nodal ATFM network, a small working group comprised of China, Hong Kong China, India, Japan, Singapore and Thailand, be established to draft:

1. An Operational Requirements document for the exchange of and interaction with ATFM information; and

2. A technical interface control document (ICD);

in accordance with the terms of reference at **Appendix C** to this report.

7.2 List of Draft Decisions

Draft Decision ATFM/SG/5-3: ATFM Seminars/Workshops

That, ICAO be urged to facilitate Asia/Pacific ATFM Seminars/Workshops for Asia/Pacific and trans-regional States, to:

1. familiarize stakeholders with the Asia/Pacific Regional Framework for Collaborative ATFM;

2. assist implementation of ATFM; and

3. act as a forum for further development of the Asia/Pacific Regional Framework for Collaborative ATFM, and the associated ATFM Information Requirements document and Interface Control Document (ICD)

7.2 List of Draft Conclusions

Draft Conclusion ATFM/SG/5-2: Asia/Pacific Regional Framework for Collaborative ATFM

That, the Asia/Pacific Regional Framework for Collaborative ATFM Version 0.4 attached as **Appendix D** to the report be endorsed, and made available on the ICAO Asia/Pacific Regional Office web site.

REPORT ON AGENDA ITEMS

Agenda Item 1: Adoption of Agenda (WP01)

1.1 The provisional agenda was adopted by the meeting.

Agenda Item 2: Review Outcomes of Related Meetings

Related Meeting Outcomes (WP/02)

2.1 The Secretariat provided information on meeting outcomes related to ATFM/SG from the following meetings:

- The Second Meeting of the APANPIRG Air Traffic Management Sub-Group (ATM/SG/2) was held in Hong Kong, China, from 4 to 8 August 2014.
- The Fourth Meeting of the Regional ATM Contingency Plan Task Force (RACP/TF/4) was held in Bangkok, Thailand, from 26 to 30 January 2015.
- The Fifth Meeting of the South Asia/Indian Ocean ATM Coordination Group (SAIOACG/5) was held in Bangkok, Thailand, from 3 to 5 March 2015.
- The Twenty-Second Meeting of the South-East Asia ATS Coordination Group (SEACG/22) was held in Bangkok, Thailand, from 9 to 12 March 2015.

2.2 ICAO had reported to ATM/SG/2 on the work of the eANP Working Group (eANP WG), and proposals to develop a new Asia/Pacific Regional Air Navigation Plan document.

2.3 Volume II of the new ANP should contain dynamic plan elements, the amend of which did not require approval by the Council. Included in Volume II was Table GEN II-1 *Major Traffic Flows.* The MTF were previously included in the GANP, but were removed before publication of the Fourth (current) edition. The MTF as updated by any State inputs would be presented to ATM/SG/3 in August 2015 for endorsement. **Figure 1** illustrates the MTF, which now includes representation of the cross-over of several flows.

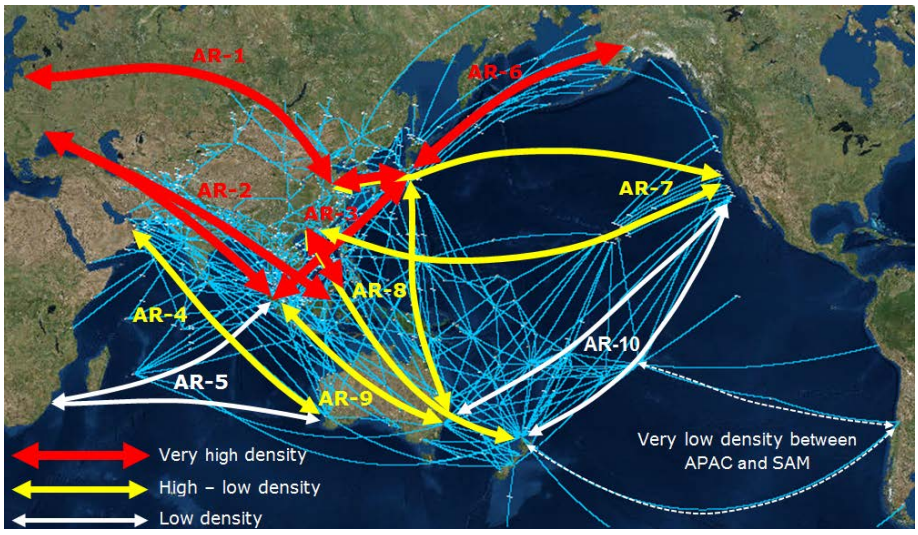


Figure 1: Major Traffic Flows

2.4 The RACP/TF/4 meeting had been briefed on outcomes from ATFM/SG/4, and discussed the application of ATFM measures for the management of traffic flows through airspace constrained by a contingency event. RACP/TF would monitor ATFM/SG outcomes, and discussed performance objectives for inclusion in the Regional ATM Contingency Plan that were aligned with those of the Regional Framework for Collaborative ATFM. Among its performance objectives the draft Contingency Plan included, *inter alia*;

- *Capability for networked tactical ATFM measures should be implemented to manage access to contingency airspace and regulate flows of traffic avoiding contingency events;*

2.5 SAIOACG/5 was informed of India's establishment of a Central Air Traffic Flow Management (C-ATFM) system. The baseline system would be in place by end of 2015, providing significant capabilities to perform strategic, pre-tactical and tactical ATFM and CDM. Phase 2, a nationwide ATFM system, would become operational by the end of 2016, and Phase 3 before 2018, with capabilities to expand as a sub-regional or regional ATFM system.

2.6 SEACG/22 reviewed the outcomes of the First Meeting of the South China Sea Major Traffic Flow Review Group (SCS-MTFRG), which had been established by SEACG/21 to review Major Traffic Flow (MTF) conflicts with specific ATS routes and the overall South China Sea airspace, air route and the suitability of the FLOS to optimise airspace capacity and enhance flight safety in the long term.

2.7 SAIOACG and SEACG had transferred tasks to ATFM/SG, discussed under WP/14 of this meeting. Among these was a task relating to the imposition of increased longitudinal separations from time to time for aircraft entering the Sanya FIR. China advised that this was due to several factors including both domestic and cross-border issues. The meeting agreed that this would best be resolved by side-meetings between the administrations concerned.

Seminar on Basic Capacity Enhancement Concepts and Developments of ATFM (WP/03)

2.8 ICAO presented the outcomes of the Seminar on Basic Capacity Enhancement Concepts and Developments of ATFM, held in Yangon, Myanmar, from 9 – 11 February 2015. The purpose of the seminar was to increase awareness of basic capacity enhancements and overall knowledge of ATFM and CDM principles, based on ICAO Doc. 9971 – *Manual on Collaborative ATFM*. It was attended by 30 participants from Myanmar, Hong Kong China, Macao China, India Philippines and Thailand. The seminar also included basic concepts of flexible use of airspace (FUA, based on ICAO Circular 330 *Civil/Military Cooperation in Air* Traffic Management), Performance-Based Navigation (PBN) and airspace design.

2.9 Outcomes of the seminar included *inter alia*:

- A hands-on CDM process exercise;
- Highlighting of the value of ICAO Circular 330;
- Airspace was a common resource for all users;
- The common benefits of ATFM and PBN in enabling the efficient use of airspace.

2.10 Myanmar had requested that ICAO conduct in-depth ATFM training for them. Noting the training requirements that would be included being prepared for inclusion in the Regional Framework for Collaborative ATFM, ICAO was asked to provide direct feedback on the use of the training requirements in any training that was delivered.

2.11 The significance of PBN to ATFM was noted, particularly in the increases in airspace capacity arising from implementation of PBN-based separation standards.

Update on the Progress of the North Asia Regional ATFM Harmonization Group (WP/04)

2.12 China, Japan and the Republic of Korea updated the meeting on the progress of the North-Asia Regional ATFM Harmonization Group (NARAHG), which aimed to enhance safety and efficiency to cope with the future growth of air traffic in North Asia.

2.13 Outcomes of the 2nd Meeting of NARAHG, held in Fukuoka, Japan from 17 – 19 March 2015, included:

1) NARAHG agreed on the principles of cooperation which would form the initial guiding principles and cooperative framework.

2) Arising from the Post Operations Analysis (Dalian ACC – Incheon ACC – Tokyo ACC):

   a) NARAHG agreed to provide details on reason(s) for ATFM measures and look at improving notification lead time

   b) NARAHG agreed to provide general data 4 times a year and a full data set, 2 times a year

   c) NARAHG agreed to add Shanghai ACC – Fukuoka ACC / Incheon ACC to the Post Operations Analysis

3) NARAHG agreed to work together to develop a consistent format for ATFM Daily Plan (ADP) and exchange available ADP upon finalization of data requirements

   a) The interim mode of exchange will be by normal email and progressively, to be uploaded onto the ICAO website (with secured access) when ready. The final mode of exchange will be discussed and agreed at a later stage.

4) NARAHG agreed that update and progress of agreed action items as listed in NARAHG meeting reports will be discussed and addressed during teleconference

5) Arising from the participation of Airspace Users:

   a) NARAHG noted the improved traffic situation and the concerns raised for this region. With the support showed by IATA and airline partners for the efforts initiated, NARAHG noted that there is an interest to exchange necessary data among ANSPs, Airports and Airspace Users as the next step forward. NARAHG agreed to invite the delegation of IATA including airline members of China, Japan and Republic of Korea to the next meeting in order to share the both perspective of traffic situation of this region.

2.14 It was noted that the hosting of information on the ICAO website was an interim

arrangement.

2.15 The meeting also discussed the provision of post-operational analysis data at the stated intervals. Best practice dictated that post-operations analysis should be conducted daily, while the scenarios and outcomes were still readily recalled and discussed. It was suggested that this should be considered in the next round of NARAHG discussions.

Agenda Item 3: ATFM/CDM Global Update

3.1 There were no working papers presented under this agenda item.

ATFM Sub-Panel

3.2 The newly formed ATFM Sub-Panel, operating under the ICAO ATM Ops Panel, was briefly mentioned to the meeting. Participants were urged to ensure that their State was represented on the new body, which would be working on further guidance to be included in ICAO Doc 9971 – *Manual on Collaborative ATFM*.

Agenda Item 4: Review of Current CDM/ATFM Operation and Problem Areas

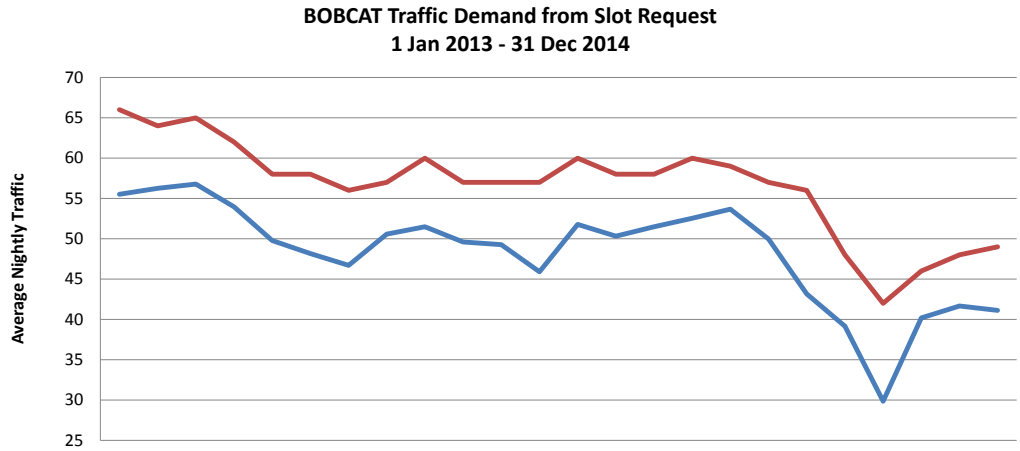
BOBCAT Operational Update (WP/05)

4.1 Thailand presented an analysis and overview of operational westbound flights through the Kabul FIR associated with the Bay of Bengal Cooperative Air Traffic Flow Management System (BOBCAT) from the commencement of its ATFM operation in July 2007 to December 2014, as well as Action Items assigned by previous Bay of Bengal ATS Coordination Group (BBACG) and SAIOACG meetings.

4.2 Sample monthly traffic data was collected by all participating States in the third week of each month, for analysis.

4.3 Based on IATA estimates, BOBCAT procedures had contributed to saving over 100 million kilograms of fuel, approximately equivalent to 405 million kilograms of carbon dioxide emissions, between July 2007 and December 2014.

4.4 **Figure 2** provides a summary of slot requests received between January 2013 and December 2014.



	Jan 13	Feb 13	Mar 13	Apr 13	May 13	Jun 13	Jul 13	Aug 13	Sep 13	Oct 13	Nov 13	Dec 13	Jan 14	Feb 14	Mar 14	Apr 14	May 14	Jun 14	Jul 14	Aug 14	Sep 14	Oct 14	Nov 14	Dec 14
Average	56	56	57	54	50	48	47	51	52	50	49	46	52	50	51	53	54	50	43	39	30	40	42	41
Peak	66	64	65	62	58	58	56	57	60	57	57	57	60	58	58	60	59	57	56	48	42	46	48	49

Figure 2: BOBCAT Traffic Demand (Slot Requests)

4.5 The number of airlines participating had remained at 58. The top 12 participating airlines are illustrated in **Figure 3**.

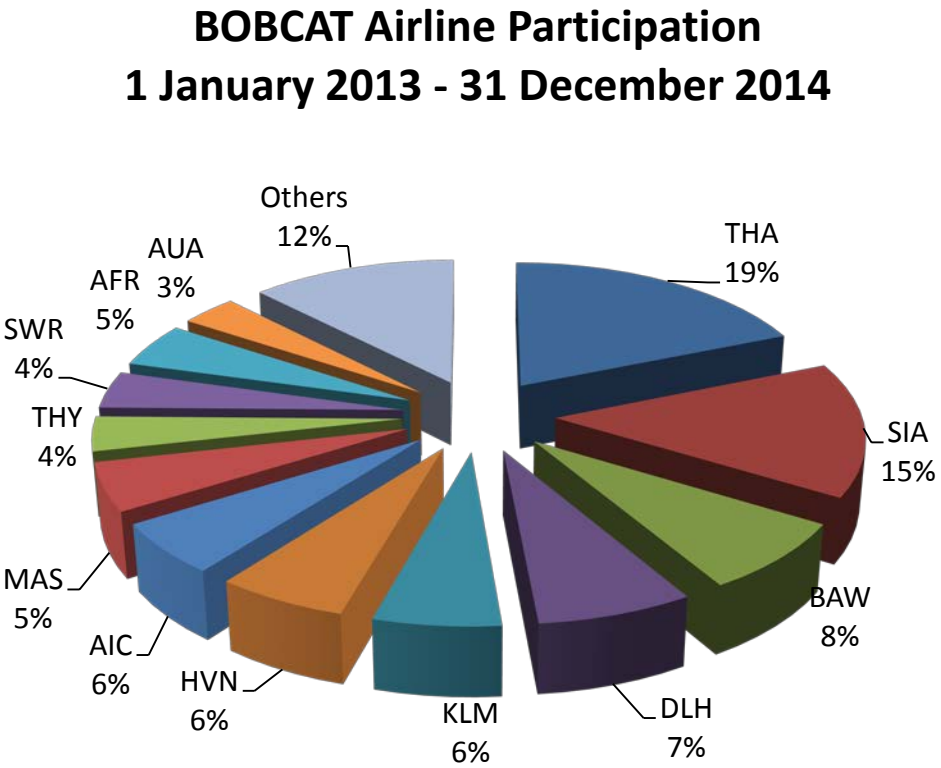


Figure 3: BOBCAT Airline Participation

4.6 **Figure 4** shows slot request per departure airport.

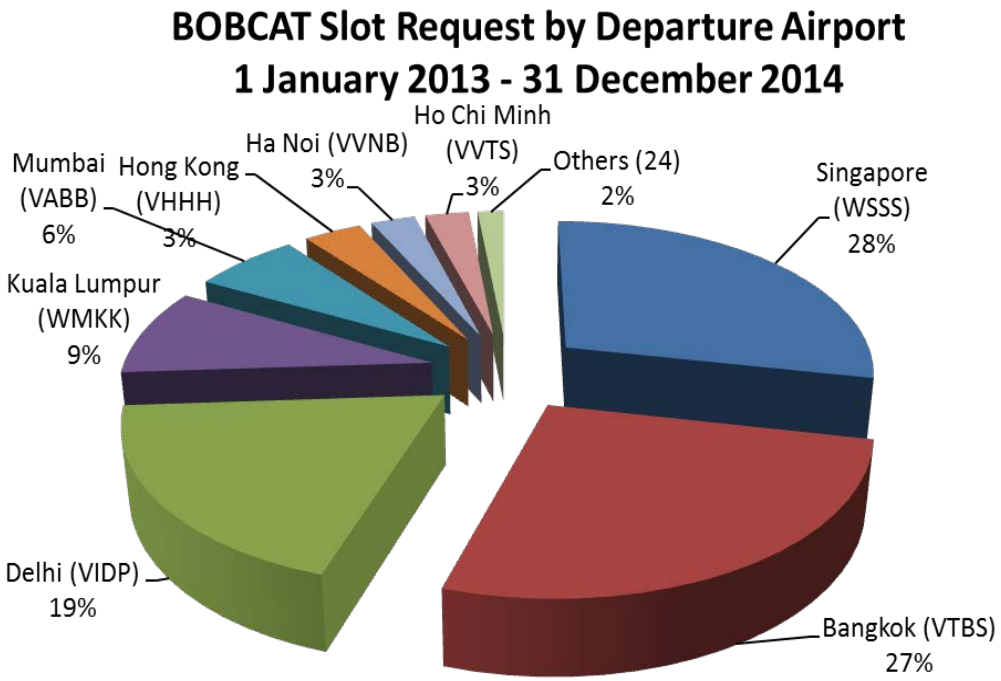


Figure 4: BOBCAT Slot Requests per Departure Airport

4.7 Under Action Item BBACG-20/1 States were invited to ensure that flight plans and movement messages for flights operating under BOBCAT were addressed to Bangkok ATFMU. The percentage of flights with DEP messages received at the ATFMU is summarized in **Figure 5**.

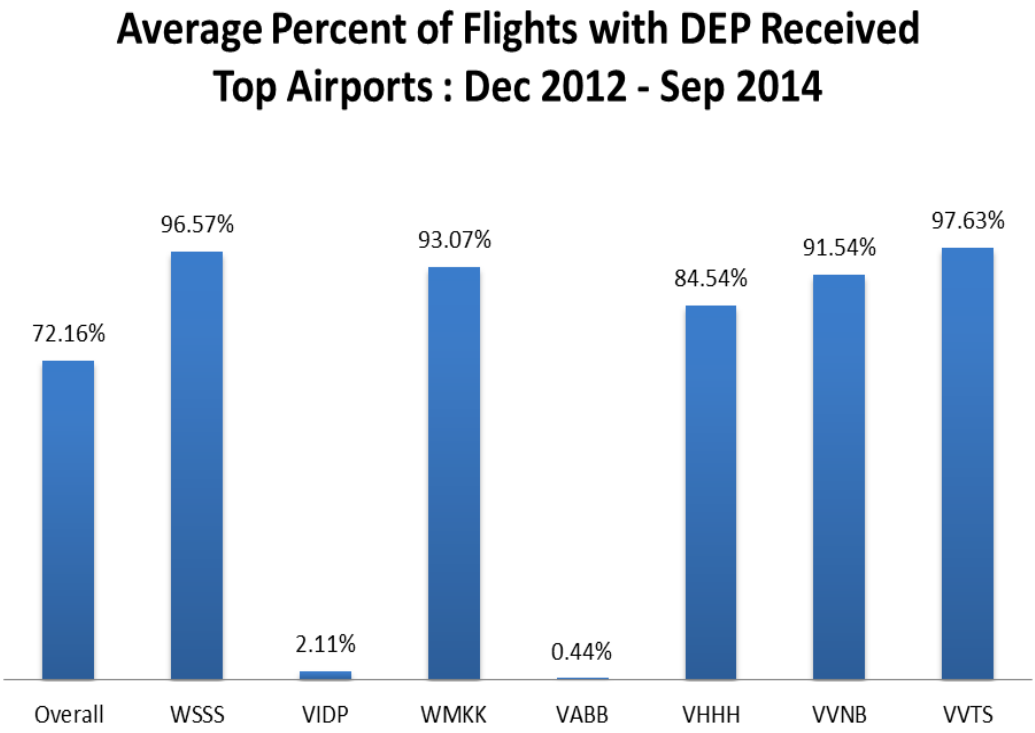


Figure 5: Percentage of Flights with DEP Messages Received at Bangkok ATFMU

4.8 **Figure 6** illustrates the percentage of flights achieving the same or better flight level through the Kabul FIR:

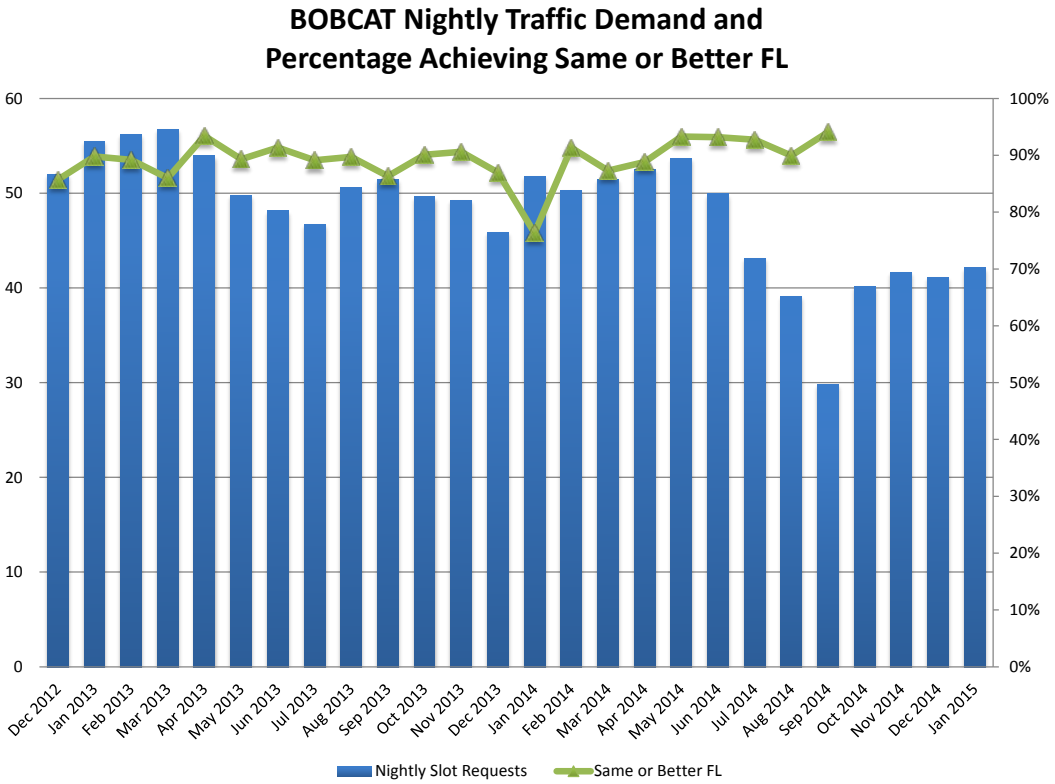


Figure 6: Nightly Traffic Demand from Slot Request, and Percentage Achieving Same or Better Flight Level.

4.9 Accordingly to post-operational analysis between December 2012 and September 2014, major causes of aircraft unable to achieve preferred flight level were:

b) Tactical ATC issues: 36 percent;

c) Departures punctuality: 28 percent;

d) EET inaccuracy: 19 percent;

e) Unknown (more data required): 15 percent; and

f) Departure without slot allocation: 1 percent.

4.10 It was recognized that a major cause of flights not transiting the Kabul FIR at their slot allocation flight level related to departure punctuality. While overall system compliance was around 90 percent, improvement was needed at various airports. **Figure 7** shows average departure punctuality for top airports between December 2012 and September 2014.

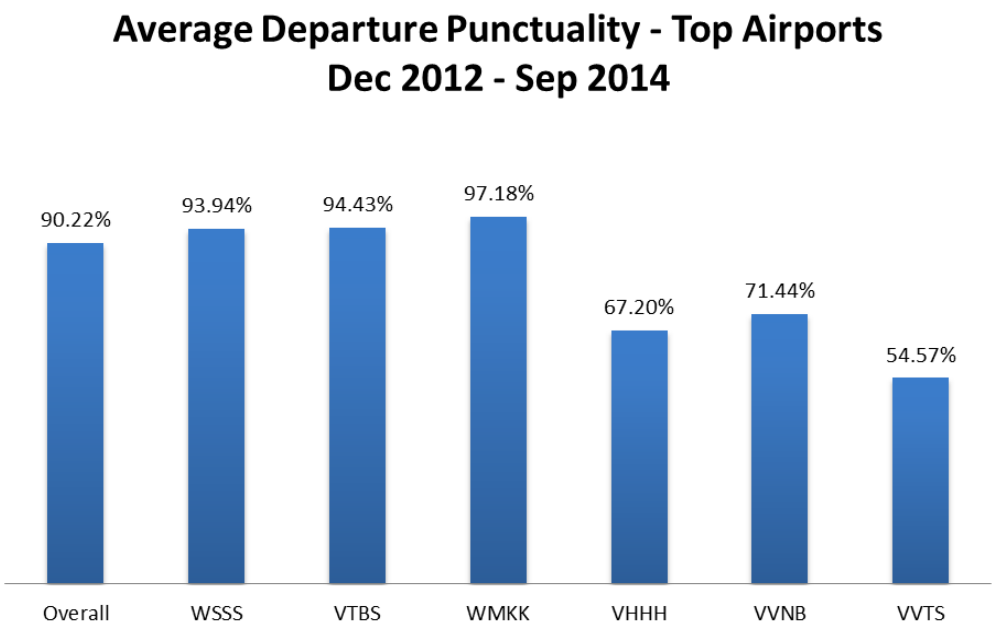


Figure 7: Average Departure Punctuality – TopAirports

4.11 The meeting was advised that reporting of BOBCAT departure punctuality was in accordance with Action Item BBACG-20/3, which was now transferred to ATFM/SG by SAIOACG/5.

4.12 It had been noted by the Kolkata FIR that some flights were operating without BOBCAT slot allocation. While some of these flights were operating to the Middle East and potentially planning routes not through Afghanistan's airspace, data would be further examined in the full post-operational analysis. Analysis also indicated that since November 2013 ANSPs had collaboratively managed to ensure that flights operating without a BOBCAT slot could be accommodated after those with a slot were accommodated.

4.13 Thailand would communicate with stakeholders on a BOBCAT software upgrade for sharing information in due course.

4.14 Data could be further examined to determine whether BOBCAT slot allocation beyond the 2000 – 2359 UTC time period was required to support SAIOACG action item 2/16 and a request from the Ad-Hoc Afghanistan Contingency Group (AHACG).

4.15 The meeting discussed issues of aircraft compliant with their slots not being allocated requested levels, and capacity increases that would arise from implementation of RNP 4 separation instead of RNP 10. It was suggested that changes in airspace management and any changes to BOBCAT software or configuration should be discussed among all stakeholders separately from ATFM/SG.

Updates on ATFM Implementation in Thailand (WP/06)

4.16 Thailand highlighted the growing air traffic demand in Bangkok FIR, and provided the progress of ATM infrastructure upgrades and ATFM implementation plans.

4.17 Thailand was upgrading the ATC automation system to ensure system-wide interoperability and enhanced automated aircraft handover and coordination between ATS units. The new system would also support ATS Inter-facility Data Coordination (AIDC) with neighbouring States as well as integration with the ATFM support system, reducing ATC workload impacts of manual

coordination and allowing for airspace capacity enhancement. Transition to the new system was expected to commence in 2016 – 2017.

4.18 To enable strategic and pre-tactical flow management the ATM Network Management Centre (ATM-NMC) would combine the expanded ATFM Unit, Airspace Management Cell (AMC), Information Management Unit and Flight Information Centre. The ATFMU would manage strategic and pre-tactical ATFM initiatives, including planning and dissemination of the ATFM Daily Plan, coordination and execution of ATFM measures, and operation of ATFM automation support systems.

4.19 Thailand was currently undergoing a project to enhance coordination in airspace use between civil and military units by establishing the AMC, helping to maximize pre-planned use of conditional routes.

4.20 To establish initial ATFM support automation Thailand had developed an Air Traffic Flow Advisory System to support ATFM implementation. The system could graphically display real-time and expected traffic demand using flight plan, airport slot allocation and schedule data. This development would continue to expand capability to include initial tactical ATFM using Calculated Take-Off Times (CTOT), supported by an integrated departure management program.

4.21 Gate hold procedures were currently being used at Bangkok/Suvarnabhumi to relieve congestion in TMA airspace. The procedure support tool would continue to be developed into effective departure management. The new ATC automation system would include integrated departure manager (DMAN) and arrival manager (AMAN).

4.22 Thailand was currently engaged in a phased review of sector capacity in the Bangkok ACC, first based on current airspace configuration and ATC automation system, then on current airspace and the new automation system, and finally on flexible sector configuration.

4.23 In response to a query, Thailand advised that tactical ATC units such as the Bangkok ACC would be equipped with a terminal displaying traffic demand prediction information derived by the ATFMU.

Preliminary Delay Assessment (IP/02)

4.24 Hong Kong China presented a methodology, by application of simple mathematical model, to preliminarily assess the delay caused by demand/capacity imbalance at an airport. The model was simple and generic in nature, and was not expected to provide an accurate delay estimation figure at a specific airport tactically or pre-tactically. However, it could act as a reference for States to preliminarily assess the necessity and urgency of establishing appropriate ATFM mechanism for their airports.

4.25 An example of the application was provided, using annual traffic growth estimated at 8%, a maximum runway arrival capacity of 40 landings per hour, current traffic demand of 28 flights per hour, and a typical model of 30 days per annum of 20% reduction in capacity for 2 hours, and 10days per year reduced by 30% for 3 hours (**Table 1**).

			Bad Days(30 days p.a.)				Poor Days(10 days p.a.)			
	Max Capacity	Dmd	Cap	Avg Delay	Max Delay	Holding Demand	Cap	Avg Delay	Max Delay	Holding Demand
Y0	40	28	32	0	0	0	28	0	0	0
Y1	40	30	32	0	0	0	28	7	14	7
Y2	40	33	32	1	2	1	28	15	30	14
Y3	40	35	32	6	12	7	28	23	47	22

Table 1: Projected Delays in Bad Weather – 8% p.a. Traffic Growth

4.26 The details of the mathematical deduction were provided in **ATFM/SG/5 IP/02 Attachment A**.

Agenda Item 5: Development of Regional ATFM Framework

IATA Project Phase 2 (WP/07)

5.1 Phase Two of the "IATA ATFM Project" had been supported by ***ATFM/SG Decision 4/3:*** *IATA Asia Pacific Regional Air Traffic Flow Management Project – Phase Two.*

5.2 IATA provided ATFM/SG/5 with an update of progress on the project and expected timeline for delivery of outcomes. The Cross Border Regional ATFM/CDM implementation plan would build on the high level strategy developed during Phase One and provide a more detailed plan for consideration by the ATFM/SG and States. It was expected that the Roadmap document would be completed in June 2015

5.3 ATFM/CDM workshops would be conducted by IATA, in partnership with ICAO. 4 two-day workshops were proposed (**Table 2**), focusing on cross-border Regional ATFM/CDM. A seminar would be conducted on Day 1 of each workshop.

DATE	LOCATION
September - October 2015	Indonesia
September 3rd and 4th 2015	India
November 26th and 27th 2015	Bangkok (ICAO)
November 30th and December 1st 2015	Bangkok (ICAO)

Table 2: Proposed ATFM Workshops

5.4 The Bangkok workshops' Day 2 topics would be generic in nature. The State-hosted workshops would include generic ATFM/CDM topics, and one or two topics specifically identified by and specific to the host State.

ATFM Training Requirements (WP/08)

5.5 A further draft of an ATFM Training Requirements Document, developed by the EU-AATIP project, supported by and in coordination with AEROTHAI, Thailand, was provided in **ATFM/SG/5 WP/08 Attachment A** for review by the meeting.

5.6 A previous draft of the attached document was presented to ATFM SG/4, where it was agreed that guidance from the document would be included in the Regional Framework.

5.7 The draft was presented in the format of an EU-AATIP deliverable, but the aim was to reach an APAC wide agreement that once the document had reached acceptable maturity, it was submitted to ICAO as draft material for inclusion in a future version of ICAO Doc 9971 Part II (Manual for Collaborative ATFM).

5.8 The paper proposed that the draft should be reviewed by APAC States. In particular, those States already providing an ATFM service needed to ensure the draft document was aligned with what they already practised. It was also proposed that the IATA/ICAO workshops were an opportunity to present a summary and outline of progress on the document. Further, the document should be submitted to ICAO via the newly created ATFM sub-panel of the ATM OPS Panel as draft material for inclusion in a future version of ICAO Doc 9971.

5.9 EU-AATIP noted several other papers presented to the meeting relating to ATFM training, and proposed that the contents of those papers would be incorporated into the training requirements document.

5.10 The meeting was reminded that the deliverable expected from this meeting was the final draft of the Regional Framework for Collaborative ATFM, which would include the training requirements document as an appendix. The meeting agreed that, following final drafting, the document should be provided by end of May 2015, for final review by the specialist team and Co-Chairs before being appended to the Draft Framework, for presentation to ATM/SG/3.

5.11 The meeting was informed that the document was not a curriculum. It was intended to be a toolbox of requirements, commensurate with its intended use as part of a regional framework document. Individual States could use the document to develop their own curriculum according to their own organizational and regulatory environment.

Progress of the ATFM Operational Trial (WP/09)

5.12 The meeting was updated on the collaborative efforts of Australia, China, Hong Kong China, Indonesia, Malaysia, Singapore, Thailand and Viet Nam to conduct an Air Traffic Flow Management (ATFM) Operational Trial using the concept of the Distributed Multi-Nodal ATFM Network. It was recognized that an effective cross-border ATFM solution would be necessary to address the air traffic flow needs of the region.

5.13 Following the concept development, several States had embarked on a collaborative ATFM Operational Trial based on the Distributed Multi-Nodal ATFM Network concept with support from international organizations. The Operational Trial was planned to commence in June 2015, using a phased approach to initially address demand capacity balancing at airports and subsequently in the airspace as appropriate.

5.14 **ATFM/SG/5 WP/09 Attachments A and B** outlined the participation requirement for ANSPs and Airspace Users, following a tiered participation level approach previously discussed at ATFM/SG/4, and **Attachment C** provided an operational trial scenario. **Attachment D** to the working paper outlined the evolution of stakeholder participation in the ATFM Operational Trial from independent ANSPs, airlines, airport operators into ATFM nodes which provide more coherent linkage among individual ANSPs, airlines and airport operators.

5.15 Two further meetings of trial participants had been held. It had been agreed that the process should, for the initial phase, be simple to understand and implement. To ensure conformance to industry standards, Calculated Take Off Time (CTOT) distribution to relevant stakeholders would take place no less than 2 hours before Estimated Off Blocks Time (EOBT). It was also agreed that the communication of CTOT and/or other ATFM-related information would use ATFM messages selectively adapted from EUROCONTROL's template (ADEXP Standard supplemented by EUROCONTROL ATFM User Manual) for cross-border suitability.

5.16 ATFM operational scenarios would be developed and tested, to provide comprehensive insight on capacity-impacting situations and how ATFM measures could be efficiently handled to achieve demand/capacity balance.

5.17 It had been recognized that the percentage of flights included in an ATFM measure directly impact equitability in delay absorption. Thus, to ensure confidence in the ATFM initiative, participating Airspace Users ("Member" airlines) would follow the participation requirements and would receive advanced CTOT notification for pre-flight planning, whereas non-participating airspace users ("Non-Member" airlines) would be subjected to conventional tactical flow measures such as minimum departure intervals (MDI) or MIT / MINIT on shorter notice, possibly with insufficient pre-planning time. This distinctively emphasized the advantage of active participation by airspace users.. Exemption from ATFM measures would be accorded to special flights such as Humanitarian, Emergency, Medical Evacuation and Head-of-State flights as referenced in ICAO Doc 9971.

5.18 A multi-phased, approach would be adopted. The ATFM Operational Trial had become more defined with provisional timing and scope of each phase and stage (**Table 3**).

Phase 1: *Distributed ATFM for Airport Arrival Constraints* (Jun 2015 – Jun 2016)		
Stage 1: *CTOT Communications* (Jun – Sep 2015) Ensure proper CTOT communication flow among ATFM Nodes and stakeholders	**Stage 2:** *CTOT Adherence* (Oct 2015 – Jan 2016) Initial ATFM operations under scripted scenarios with provisions of addressing ad-hoc demand-capacity imbalance	**Stage 3:** *Advanced CTOT Management* (Feb – Jun 2016) More complex ATFM operations including CTOT revisions, cancellation and improvements
Phase 2: *More Advanced Distributed ATFM* - Consider airspace constraints		

Table 3: ATFM Operational Trial Stages - Timing and Scope

5.19 Airservices Australia agreed to develop business rules to support the ATFM Operational Trial, assuming that an ATFM User Manual would be developed for each participating ANSP based on the common business rules.

5.20 Each participating ANSP was tasked to assess their capabilities and select their appropriate Participation Level for the trial. It was noted that within a single ANSP, there could be varying levels of participation at different aerodrome control units / ATC towers based on readiness and necessity.

5.21 Participants had agreed to consider the use of AIP Supplement and/or AIC for general information along with weekly NOTAMs to specify time period during which ATFM measures would will be applied.

5.22 The ATFM Operational Trial was aimed to set the stage for harmonized regional cross-border ATFM operations in Asia-Pacific and was a crucial step toward the implementation of Asia-Pacific Seamless ATM Plan.

5.23 In response to a query regarding the need for amendment to Regional Supplementary Procedures (Doc 7030) to support AIP amendment for *trial* purposes, the Secretariat advised that it was not required.

5.24 The meeting was reminded of the importance of ensuring that separate trials being conducted in the region cooperated and collaborated closely, to ensure that, if both were moving ahead independently, they made sure to coordinate on message formats, communications protocols, etc. Both the Multi-Nodal Group and NARAHG agreed that it was important for both to be in close communication and would be coordinating on the details.

5.25 China informed the meeting that they would like to take a more prominent role in the trial, particularly in the areas of information sharing and development of business rules.

Indonesia CDM Data Exchange (IP/03)

5.26 Indonesia presented the process of collaborative engagement between national CDM stakeholders for the submission of operational data, in order to gradually progress to real-time submission and sharing of information. The Data Center was located with and managed by the Ministry of Transport, and data could be exchanged between CDM stakeholders.

5.27 Data Center of the data placed and managed by Ministry of Transport and the data could be exchange between CDM Stakeholder. Data domains were specified for each operator, including ANSP, airport operator, slot time management unit, DGCA and aircraft operator.

Indonesia ATFM CDM Seminar and ATFM Ops Trial Meeting (IP/04)

5.28 The meeting was informed of the Seminar on Collaborative ATFM/CDM Implementation and the 3rd Multi-Nodal Ops Trial Meeting, held in Yogyakarta, Indonesia, from 27 to 29 January 2015. The seminar was attended by representatives of DGCA, AirNav Indonesia, military agencies, airport operators, airlines and aviation training, search and rescue and international organizations.

ATFM Training for ATM Officers in Japan (IP/05)

5.29 Japan presented information on ATFM training practices for ATM officers conducted at Air Traffic Management Center (ATMC) in Fukuoka, Japan. ATMC was the organization of Japan Civil Aviation Bureau (JCAB) providing ATFM services to aircraft in the Fukuoka FIR. The personnel providing ATFM services were called ATM officers. As of 1st February 2015 there were one hundred and forty-four (144) ATM officers in Japan. Background as an air traffic controller with en-route radar or terminal radar control qualifications was required for recruitment as an ATM Officer. The ATFM training curriculum did not therefore cover ab-initio ATC contextual knowledge or skills.

5.30 An overview of a typical training program was provided, as was an example of an on-the-job training (OJT) "check sheet" to ensure the systematic acquisition of skills (**ATFM/SG/5 IP/05 Attachment A**).

5.31 Between January 2010 and December 2014 46 trainees had successfully completed ATFM OJT, and 2 had failed. Average length of training required was 4 months and 3 weeks. Advanced training for ATM supervisor positions and facilitators of CDM web meetings was conducted where needed for qualified ATM officers. Refresher training was conducted at least once per year, as was the periodic test of ATM officer skills and knowledge.

CDM with Participating Airlines for Severe Weather Avoidance (IP/06, Presentation 1)

5.32 The meeting was provided with a description of Japan's program of on-line route coordination for severe weather avoidance between CDM participating airlines and the ATMC. 12 airlines were engaged in the program which executed pre-tactical ATFM, simplifying route coordination caused by severe weather through the use of Air Traffic Management Workstations (ATWs), which were a terminal of the ATFM system used by airlines. The coordination in ATMC was conducted on a Flow Management Workstation (FMW).

5.33 The program was also used to avoid volcanic ash cloud (VAC) activity.

Training of ATFM Personnel (IP/07)

5.34 India provided a brief on training for ATFM personnel as planned in the ATFM project implementation road map. **ATFM/SG/5 IP/07 Attachment A** described the ATFM training plan, its modules and their content.

5.35 India was implementing collaborative ATFM in 5 phases, the first involving the setting up of a Central Control and Command Centers (CCC) at Delhi and 6 Traffic Management Units (TMUs) at Delhi, Mumbai, Chennai, Bangalore, Hyderabad and Kolkata.

5.36 Training was being developed for CCC and TMU ATFM Operations Supervisors and Flow Managers, Flight Plan and Aeronautical Information Operators, and system device and system software maintenance.

5.37 Skills required included 5 – 15 years' ATC experience at multiple sectors and/or airports.

Curriculum/Syllabus for FMP (WP/10)

5.38 Indonesia presented a set of plans that contained an outline of learning including competence standards, basic competence, learning materials, indicators, assessment, allocation of time, and learning resources, developed by any educational institution. The curriculum/syllabus was developed to prepare the implementation of Air Traffic Flow Management both domestically and regionally

5.39 The information was presented in 5 competency levels. It was noted that Levels 0 (zero) and 1 were targeted not only at ATFMU trainees, but at all personnel in relevant aviation operations including airlines, military, meteorology, etc. Levels 2 to 5 were for the training of personnel involved in ATFMU operations.

5.40 The meeting discussed the nature of training information that should be included in the Framework. It was noted that a document detailing the training requirements, rather than the curriculum, was appropriate for this regional guidance document.

5.41 Indonesia was also preparing to develop training requirements for ATFM instructors, and requested further information on this from the meeting. Further discussion on this was conducted offline.

5.42 The meeting further discussed the need for ATC background for ATFM personnel. CANSO expressed its view that any role with a decision-making responsibility should have a very strong background in all ATC disciplines, as their actions could either save or cost a lot of fuel. There was general consensus with this view, but some ANSPs stated that non-ATC personnel were engaged in their ATFM units. In most cases decision making positions were held by individuals with ATC background.

5.43 It was noted that, historically, ATFMUs had to some extent been staffed by personnel that were no longer qualified for ATC work. This was inappropriate, as it was important that ATFMU personnel, particularly ATFM managers, were doing this work as a personal career choice. It was noted that, while ATC background was required for some critical roles, not all ATC were suitable for the role. The role of ATFM manager required additional skills in decision-making, communication and negotiation.

Data and Information Format for Integration and Exchange (WP/11)

5.44 Indonesia presented a proposed format and mechanism for data and information exchange in internal ATFM operations. Data and information was an important item for sharing, and for ATFM/CDM processes among CDM stakeholders.

5.45 Stakeholder data domains and utilization of data were provided. The proposed formats included XML, JSON, TEXT, EXCEL worksheet and CSV.

5.46 The meeting noted the information exchange architecture in Phase 1 of the multi-nodal ATFM trial. It was further noted that ATFM/SG had decided at ATFM/SG/3 that the Flight Information Exchange Model (FIXM[1]) version 3.0 or later was the agreed ATFM information exchange model for the Asia/Pacific Region, and that this was consistent with the Global Air Navigation Plan/ASBU, which included FIXM as the data exchange model leading to future applications in *Flight and Flow – Information for a Collaborative Environment* (FF-ICE[2]).

5.47 It was noted that States may need to integrate data in multiple formats, from a range of stakeholders such as airport operators, airlines, military or other authorities. The meeting further clarified FIXM was the agreed information exchange model for cross-border ATFM. Information exchange protocols and models used wholly within the local environment were a matter for the State.

Progress on Platform of Web-Based Distributed Multi-Nodal ATFM Information Messages (WP/15)

5.48 China presented information on the progress of a platform of web-based distributed Multi-nodal ATFM information exchanges. Participants would provide information their information, and simultaneously share information from other participants. The overall benefit would be promoted through active participation and collaboration. China appeals to all stakeholders to participate in researching the information interaction platform, to jointly accelerate the development of regional flow management.

[1] Information on FIXM was available at www.fixm.aero.

[2] ICAO Doc. 9965 – *Manual on Flight and Flow – Information for a Collaborative Environment*, provides further information.

5.49 ATFM information sharing was not limited to basic flight operation information, but also included a broad range of information that ensured all stakeholders could collaborate in an environment of common situation awareness.

5.50 In the example of the implementation of cross-region traffic management initiatives (TMIs) in the South China Sea area, some ANSPs claimed that ATFM units should issue the flow control information by NOTAM, while others would not. As a result, it became difficult to transmit information and implement flow control.

5.51 Since ATFM/SG/3, CAAC had researched technologies on a platform of web-based distributed multi-nodes ATFM information exchanges. The scope of information exchanges not only included flight operation information, but also other information including flow information.

5.52 Using the example of flight information, when Guangzhou and Haikou airports issued the CTOT at the same time, every ANSP, airports and airlines concerned would not need to check Guangzhou and Haikou airports' CTOT information. They could check relevant CTOT information through the information sharing platform. Other information that could be shared on the platform included capacity and demand, weather and other operational information, and comprehensive ATFM information, supporting collaborative sharing of common situational awareness.

5.53 Methods of information exchange could include an information collecting platform, a common data exchange with interface control (ICD), or the aeronautical fixed telecommunications network (AFTN). Alternate exchanges included email, fax and telephone.

5.54 China had conducted preliminary studies of ATFM information sharing and exchange. To avoid wasted resources in duplicated research, and to promote regional information transfer as soon as possible, China was willing to share experience, and participate in the research of a cross-border CDM/ATFM information network and working mechanism to jointly accelerate the development of regional ATFM.

Research on Data Exchange in the Process of Data Sharing (WP/16)

5.55 China presented information on data exchange research. The Civil Aviation Administration of China (CAAC) had adopted a technical scheme, recognizing the data and information related to ATFM was necessary for efficient interaction between the ANSP and airspace users. The technical scheme met the requirement for information outlined in DOC 9971, including syntactic interoperability, data definition, update requirements and information quality.

5.56 Since ATFM/SG/3 China had established a message exchange protocol, used between ANDP, airlines and airports in the airport CDM (A-CDM) process. The protocol, suitable for message exchange between ANSPs, was limited to a dedicated internal network. The CDM platform contained a message bus to which all participants including ANSPs, airlines and airports were connected. (**Figure 8**). The table of contents and introduction of China's CDM platform information exchange protocol document were provided in **ATFM/SG/5 WP/16 Attachment A**.

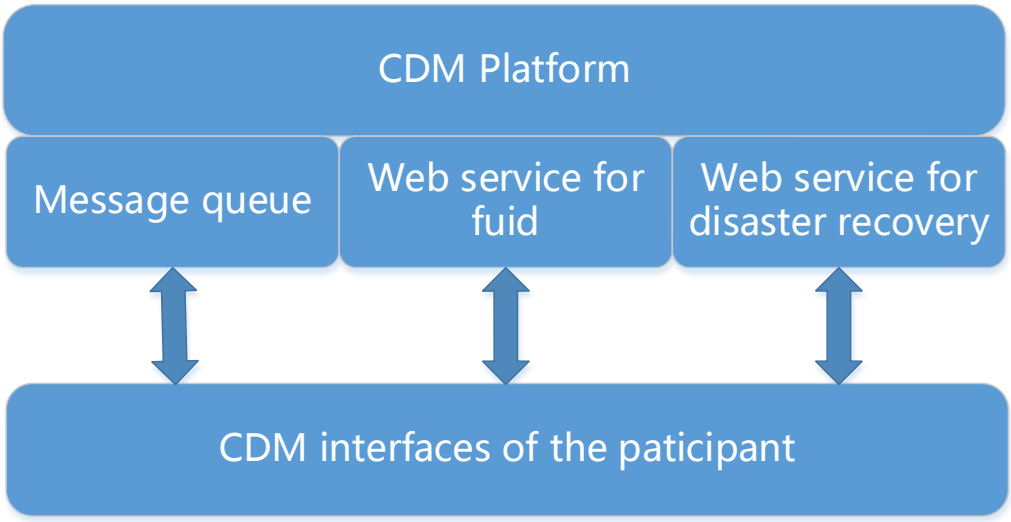


Figure 8: China Information Sharing Platform.

5.57 The meeting discussed both WP/15 and WP/16, noting that the Regional ATFM Concept aimed to develop a distributed multi-nodal ATFM network, with each node operating independently while remaining connected to the distributed network and communicating information with other nodes.

5.58 China advised the meeting of their experience in a distributed network, with current CDM operations between 7 regional ATFMUs and 1 ATFM Centre.

Proposal for Establishment of ATFM Information Interaction Platform Technical Group (WP/17)

5.59 China presented a paper discussing the establishment of an APAC cross-border CDM/ATFM information platform technical expert group.

5.60 Research of information interaction technology under the framework of the distributed multi-nodal ATFM in the Asia-Pacific region was needed, with broad participation including ANSPs, airspace users, and airports, to make the information interaction technology widely universal to meet each participant's needs, and to promote t cross-border ATFM. A technical expert group could determine the scope of information interaction needed.

5.61 Information could be exchanged on an open network platform, data exchange interface, standard protocol, AFTN, E-mail, fax and telephone. A technical expert group could research ATFM information exchange according to the situation of the region. A data interface control document could be researched that realized efficient and convenient data exchange between participants. An ATFM information interaction network technical expert group of the Asia/Pacific region would be encouraged to participate in technical discussion together, in technical group meetings by telephone video conferencing, e-mail and telephone. Related research results would be submitted to ATFM/SG and related ATFM meetings.

5.62 The meeting discussed the need for both a common interface control document (ICD) for technical ATFM communications solutions including the communications media identified in the Framework, and an operational requirements document for ATFM information. The meeting agreed to the following Decision:

Decision ATFM/SG/5-1 – ATFM Information Requirements Small Working Group (ATFM/IR/SWG)

That, recognizing the need for the development of operational and technical requirements for the exchange of ATFM information in the cross-border, multi-nodal ATFM network, a small working group comprised of China, Hong Kong China, India, Indonesia, Japan, Singapore, Thailand and ICAO, be established to draft:

1. An Operational Requirements document for the exchange of and interaction with ATFM information; and

2. A technical interface control document (ICD);

in accordance with the terms of reference at **Appendix C** to this report.

Trial Operation Rules for Collaborative Flight Delivery Management (WP/18)

5.63 The meeting was provided with information on the trial operational rules for collaborative flight delivery management; a form of CDM/ATFM implemented in China. The rules included the duty to provide information, and principles of slot management.

5.64 Since 2013 China had used "collaborative flight delivery management" as the main CDM/ATFM approach, with the goal of reducing flight delays and passengers' in-cabin waiting time. China had developed a set of operational rule which were applied to the process. The operational rules were collectively discussed and approved by all CDM/ATFM participants.

5.65 The paper provided a detailed description of the operational rules, including responsibilities of participants, principles of slot allocation, dissemination and compliance, and the responsibilities of airspace users in the areas of slot confirmation, slot swap and providing flight delay or cancellation information.

5.66 China proposed that the information and experience of China could be added to the ATFM Framework.

5.67 The meeting was reminded that version 1 of the Framework was, as had been discussed at ATFM/SG 2, 3 and 4, expected to be completed by this meeting and then reviewed by ATM/SG and subsequently referred to APANPIRG for endorsement in September 2015. The inclusion of a large amount of new procedural material at this late stage was unlikely to be achieved. It was also pointed out that the document being finalized was a framework, and as such should not include information that would more appropriately appear in a procedure manual or similarly more detailed document. However, it was also noted that China's experience would provide a valuable contribution to the future work of ATFM/SG, and of the cross-border ATFM initiatives of which China was a participant.

Framework – Preliminary Sections (WP/19)

5.68 The draft preliminary sections of Framework were provided in **ATFM/SG/5 WP/19 Attachment A** for review by the meeting. The structure of the Draft Asia/Pacific Regional Framework for Collaborative ATFM was aligned with that of the Asia/Pacific Seamless ATM Plan. The preliminary sections (Sections 1 – 4) of the Draft Framework included:

- Scope;

- Development and Objectives;

- Executive Summary; and
- Abbreviations and Acronyms

5.69 Abbreviations and acronyms for ATFM-specific terminology developed for the Framework were listed in an appendix to Section 5, *Background Information* and were examined separately under WP/21. The preliminary sections were included in the draft Framework document after update by the meeting.

Framework – Principles (WP/20)

5.70 The Principles of ATFM formed the first part of the *Background Information* section (Section 5) of the Framework document, and provide the basis for the further development of the Framework. The Principles were listed in a separate appendix to the Framework document, and structured under sub-headings aligned with those of the Seamless ATM Plan. The draft Principles, reviewed by the meeting, were provided in **ATFM/SG/5 WP/20 Attachment A**, and subsequently included in the draft Framework document agreed by the meeting.

Terminology and Communications (WP/21)

5.71 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.

5.72 General information on ATFM terminologies, system communications and information distribution were provided for review by the meeting in **ATFM/SG/5 WP/21 Attachment A**, and included in Section 5 of the Framework (WP/22). The terminologies and communications exchanges, terminology map and ATFM phrases for use by ATC, developed by ATFM/SG, were provided in **ATFM/SG/5 WP/21 Attachment B.** The agreed terminologies, communications and phrases are included in an appendix to the draft Framework document agreed by the meeting.

CDM Guidance for Regional ATFM Framework (WP/12)

5.73 Responding to a task assigned by ATFM/SG/3, India provided draft guidance for Collaborative Decision making (CDM) processes needed for a regional ATFM framework. The CDM Guidance captured the essential characteristics of an evolutionary CDM environment as appropriate to the emerging concept of cross border ATFM. The CDM guidance was aligned to the concepts of CDM as described in Doc 9971 Part I.

5.74 The CDM guidance material provided in this WP and agreed by the meeting was included in Section 5 of the Framework, discussed under WP/22.

Framework – Background Information (WP/22)

5.75 The Background Information section (Section 5) of the Draft Framework was provided in **ATFM/SG/5 WP/22 Attachment A** for review by the meeting. The section included information on the following topics:

i. ATFM Principles, presented separately under WP/20 ;

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

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

iv. CDM guidance, presented separately under WP/12;

v. ATFM Phases;

vi. Airspace and Airport Capacity Improvement;

vii. Capacity Planning, Assessment and Declaration;

viii. ATFM Daily Plan template, presented as an appendix to the Framework document;

ix. ATFM Terminology, Communications, Phrases and Information Distribution – presented separately under WP/21 and appended separately to the Framework document;

x. Meteorological Products for ATFM;

xi. Asia/Pacific Region ATFM Implementation Study, presented separately under WP/23;

xii. Asia/Pacific Region ATFM Operational Concept; and

xiii. Training and competencies for ATFM personnel, separately presented under WP/08.

5.76 Following update by the meeting Section 5 was included in the agreed draft Framework document.

Framework – Current Situation (WP/23)

5.77 The Current Situation section (Section 6) of the Draft Framework (**ATFM/SG/5 WP/23 Attachment A**) provided a summary of the findings of the IATA ATFM Study reported to ATFM/SG/4. The information included discussion of the benefits of ATFM in the Asia/Pacific Region, and an analysis of current collaborative ATFM capability. Following review and update by the meeting this information was included in the agreed draft Framework document.

Framework – Performance Improvement Plan (WP/24)

5.78 Section 7 of the Framework, the Performance Improvement Plan (**ATFM/SG/5 WP/24 Attachment A**), included regional collaborative ATFM performance objectives arranged in *Regional ATFM Capability* phases aligned, where practicable, with Phases I and II of the Seamless ATM Plan's Preferred Aerodrome/Airspace and Route Specifications (PARS) and Preferred ATM Service Levels (PASL):

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

5.79 Recognizing the short lead time between the finalization of the Framework and PARS/PASL Phase I, Regional ATFM Capability Phase I was proposed to be divided into sub-phases A and B, with expected implementation 12 November 2015 and 10 November 2016 respectively.

5.80 In reviewing the performance objectives the meeting discussed rationale and timing of Phases 1A and 1B. While this had been agreed at ATFM/SG/4, further consideration indicated that it did not provide a sufficiently reasonable amount of time to implement the Phase 1B objectives. The meeting subsequently decided that the following Regional ATFM Capability implementation dates should apply:

- Phase IA – expected implementation by 12 November 2015;
- Phase IB – expected implementation by 25 May 2017; and
- Phase II – expected implementation by 08 November 2018.

5.81 Phase 1B would also provide an opportunity to comprehensively review regional progress towards implementation in the November 2018 timeframe. Therefore, this review has been included in the ATFM/SG task list.

5.82 Following review by the meeting the Performance Improvement Plan was included in the agreed draft Framework document.

Framework – R&D and Milestones, Timelines and Actions (WP/25)

5.83 The meeting considered the final two sections of the Draft Framework; Research and Future Development Possibilities, and Milestones, Timelines, Priorities and Actions (Sections 8 and 9, **ATFM/SG/5 WP/25 Attachment A**).

5.84 The Research and Future Development Possibilities section included items for future development, where it was considered that elements of the Regional concept may not be achievable within the near to medium term timeframe of the Framework (2015 – 2018), and additional items identified by the meeting.

5.85 The Milestones, Timelines, Priorities and Actions section of the Framework included relevant items detailed elsewhere in the Framework, and their alignment with the Seamless ATM Plan. The meeting also discussed ongoing actions of the Steering Group that would be dependent on the continuance of the group and any amendment to its terms of reference (TOR), which were presented for review by the group under WP/14. Following review by the meeting these sections were included in the agreed draft Framework.

Endorsement of the Regional Framework for Collaborative ATFM Version 1.0

5.86 Having considered and reviewed each of the sections of the Draft Regional Framework for Collaborative ATFM, the meeting agreed to the following Draft Conclusion for consideration by ATM/SG and subsequent APANPIRG endorsement, subject to the circulation of a State Letter containing the Draft Framework for information, and final comment from ATFM/SG participants by 15 May 2015:

Draft Conclusion ATFM/SG/5-2: Asia/Pacific Regional Framework for Collaborative ATFM

That, the Asia/Pacific Regional Framework for Collaborative ATFM Version 0.4 attached as **Appendix D** to the report be endorsed, and made available on the ICAO Asia/Pacific Regional Office web site.

5.87 Given the need to familiarize stakeholders with the Framework, and recognizing the ICAO RSO focus on ATFM implementation, the meeting agreed to the following Draft Decision for ATM/SG and APANPIRG endorsement:

Draft Decision ATFM/SG/5-3: ATFM Seminars/Workshops

That, ICAO be urged to facilitate Asia/Pacific ATFM Seminars/Workshops for Asia/Pacific and trans-regional States, to:

1. familiarize stakeholders with the Asia/Pacific Regional Framework for Collaborative ATFM;

2. assist implementation of ATFM; and

3. act as a forum for further development of the Asia/Pacific Regional Framework for Collaborative ATFM, and the associated ATFM Information Requirements document and Interface Control Document (ICD).

Agenda Item 6: Any Other Business

Manual on Flexible Use of Airspace (WP/13)

6.1 India presented to the meeting the Manual on Flexible Use of Airspace (FUA), which had been adopted by the National High Level Airspace Policy Body (NHLAPB) of India. The preparation and adoption of the manual was a milestone event, and provided the evidence of India's commitment to the implementation of FUA and the significant progress of civil-military cooperation in India.

6.2 The Draft Manual on FUA in India was prepared by the FUA Secretariat, taking into account the knowledge contained in various ICAO documents and manuals, especially ICAO Cir. 330, Caribbean - South America (CAR/SAM) Regional Guidance Material, and EUROCONTROL and FAA documents.

6.3 The Manual on FUA Version 1.0 was adopted at the Fourth Meeting of the NHLAPB on 20 August 2014. The completion of the activity marked a milestone in the implementation of FUA, demonstrating the mutual trust between civil and military authorities at all levels.

6.4 The manual on FUA was provided in **ATFM/SG WP/13 Attachment A**, and was available at the following web pages:

www.aai.aero/public_notices/FUA_Manual_V1_230315.pdf; and

www.aaians.org.

Agenda Item 7: Review of the Task List

Review the Task List (WP/14)

7.1 The meeting reviewed the ATFM/SG Terms of Reference (TOR), which were provided in **ATFM/SG/5 WP/14 Attachment A**.

7.2 The meeting agreed to the updated task list included as **Appendix E** to this report.

7.3 In discussing the TOR and the Task List, the meeting also discussed the continuation of the Steering Group. The TOR, as updated and agreed by APANPIRG/25, included in paragraphs 2, 3 and 4 a number of tasks requiring the continuation of the group. It was also acknowledged that the Regional Framework for Collaborative ATFM itself would require regular update as experience was gained in the operational trialling and implementation of the distributed multi-nodal ATFM network concept. It was noted that, in reviewing the Task List, 4 tasks had been closed and 13 completed, 6 remained open, 4 open tasks were transferred to ATFM/SG by other groups, and 12 new tasks were identified.

7.4 Echoing the outcomes of the ATFM/SG/4 meeting held in December 2014, the meeting expressed the strong view that the ATFM/SG, in its present form and with the benefit of the consistency of participation it has enjoyed since its reconvention, must continue beyond merely producing the first version of the Framework document, with meetings held at intervals appropriate to its tasks and the ATFM development needs of the Region.

7.5 It was agreed that the ATFM/SG Co-Chairs, and IATA, would submit working papers on the continuation of ATFM/SG to ATM/SG/3.

Agenda Item 8: Date and Venue of the Next Meeting

7.6 The next meeting would be held at a date and venue to be confirmed.

Closing of the Meeting

7.7 The Co-Chairs thanked the meeting participants for their contributions.

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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

LIST OF WORKING PAPERS (WPs) and INFORMATION PAPERS (IPs)

(Presented by the Secretariat)

WORKING PAPERS

NUMBER	AGENDA	WORKING PAPERS	PRESENTED BY
WP/1	1	Provisional Agenda	Secretariat
WP/2	2	Related Meeting Outcomes	Secretariat
WP/3	2	Seminar on Capacity Enhancement Concepts and ATFM Developments	ICAO
WP/4	2	Progress of NARAHG Activities	ICAO
WP/5	4	BOBCAT Operational Updates	Thailand
WP/6	4	Update on ATFM Implementation in Thailand	Thailand
WP/7	5	IATA Project Phase 2	IATA
WP/8	5	ATFM Training Requirements	EU/AATIP Thailand
WP/9	5	Progress of the ATFM Operational Trial	Australia, China, Hong Kong China, Indonesia, Malaysia, Singapore, Thailand, Viet Nam, CANSO, IATA and IFATCA
WP10	5	Curriculum/Syllabus for FMP	Indonesia
WP/11	5	Data and Information Format for Integration and Exchange	Indonesia
WP/12	5	CDM Guidance for Regional ATFM Framework	India
WP/13	6	Manual on Flexible Use of Airspace	India
WP/14	7	Review the Task List	Secretariat
WP/15	5	Web-based Distributed Multi-nodal ATFM Information Exchange Platform	China
WP/16	5	Research on Data Exchange in the Process of Data Sharing	China
WP/17	5	Proposal for Establishment of ATFM Information Interaction Platform Technical Group	China
WP/18	5	Trial Operation Rules for Collaborative Flight Delivery Management	China

NUMBER	AGENDA	WORKING PAPERS	PRESENTED BY
WP/19	5	Framework Preliminary Sections	Secretariat
WP/20	5	Framework Principles	Secretariat
WP/21	5	Terminology and Communications	Secretariat
WP/22	5	Framework Background Information	Secretariat
WP/23	5	Framework Current Situation	Secretariat
WP/24	5	Framework Performance Improvement Plan	Secretariat
WP/25	5	Framework Sections R&D and Milestones, Timelines and Actions	Secretariat

INFORMATION PAPERS

NUMBER	AGENDA	INFORMATION PAPERS	PRESENTED BY
IP/1	-	List of Papers	Secretariat
IP/2	4	Preliminary Delay Assessment	Hong Kong, China
IP/3	5	Indonesia CDM Data Exchange	Indonesia
IP/4	5	Indonesia ATFM CDM Seminar and ATFM Ops Trial Meeting	Indonesia
IP/5	5	ATFM Training for ATM Officers in Japan	Japan
IP/6	5	CDM with Participating Airlines for Severe Weather Avoidance	Japan
IP/7	5	Training of ATFM Personnel	India

Terms of Reference

ATFM Information Requirements Small Working Group (ATFM/IR/SWG)

Recognizing that:

The Draft Regional Framework for Collaborative ATFM will be presented to APANPIRG/26 for endorsement; and

The ongoing development of the Regional ATFM Concept and the understanding of operational requirements for information distribution are dependent on experience to be gained in trial programs and operational deployments:

1. The ATFM/IR/SWG, reporting to ATFM/SG, will develop a draft operational requirements document detailing:

    a) Items of ATFM information, such as ADP, ATFM measures and compliance information to be distributed and dynamically updated to each of the following stakeholder domains:

        i. ATFMU;

        ii. ATSU (ACC/APP/TWR);

        iii. Airspace User; and

        iv. Airport Operator

    b) Access levels and authorizations for stakeholders;

    c) Items of ATFM Information that authorized users may add or amend, including but not limited to:

        v. ADP;

        vi. ATFM measures;

        vii. Collaborative ATFM interaction;

        viii. Cancellation, suspension and de-suspension of ATFM measures;

        ix. Compliance monitoring information such as ATOT and ATO;

    d) Network and/or node administrator arrangements;

    e) Required reliability and availability of the distributed multi-nodal network and its interfaces.

    f) Notification parameters guidance for ATFM measure implementation.

2. ATFM/IR/SWG will, in cooperation with the ACS ICG, develop an interface control document (ICD) for cross-border ATFM described in the Regional Framework for Collaborative ATFM and the Regional ATFM Concept.

INTERNATIONAL CIVIL AVIATION ORGANIZATION

D R A F T

ASIA/PACIFIC REGION

FRAMEWORK

FOR

COLLABORATIVE AIR TRAFFIC FLOW MANAGEMENT

DRAFT Version 0.4 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
ICAO Asia and Pacific Office, Bangkok

CONTENTS

SCOPE OF THE FRAMEWORK

Regional Air Traffic Flow Management

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

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

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

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

Conclusion 24/15: Asia/Pacific ATFM Steering Group

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

1.5 This document, the *Asia/Pacific Region Framework for Collaborative ATFM* (the Framework) is intended to provide a common Regional framework that addresses ATFM implementation and ATFM operational issues in the Asia/Pacific region. Further discussed in later sections, a core concept of the Framework is the *distributed multi-nodal ATFM network*, envisaged as interconnected States and/or sub-Regional groups operating in an ATFM network without the need for any central, physical facility providing the network management function. The concept, untried elsewhere, originated in the *Regional ATFM Concept of Operations*, developed as a collaborative effort between Singapore and industry partners, later expanded to involve Hong Kong China, Malaysia and Thailand. The Framework will, in its future versions, be expanded and adjusted where necessary as the concept matures and experience is gained from operational implementation of cross-border, network-based ATFM and its supporting technology.

1.6 Doc 9971 states that *in its initial application, ATFM need not involve complicated processes, procedures or tools. The goal is to collaborate with system stakeholders and to communicate operational information to airspace users, air navigation service providers, and to other stakeholders in a timely manner*. Version 1.0 of the Framework includes near to medium term performance objectives to prepare and guide States in the implementation of collaborative, cross-border ATFM, providing for regionally harmonized ATFM concepts, communications and practices.

Framework Structure

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

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

1.9 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 this Framework, define goals and the means of meeting State planning objectives.

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

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

1.12 The performance objectives of the Framework are expected to be implemented in phases aligned, where practicable, with those of the Seamless ATM Plan. Having considered the short time frame between the endorsement of the Framework by APANPIRG and the Phase I expectations of the Seamless Plan, Regional ATFM Capability is expected to be implemented in the following phases:

- Phase IA, expected implementation by 12 November 2015;
  - *(aligned with Seamless ATM Plan Phase I)*
- Phase IB, expected implementation by 25 May 2017; and
- Phase II, expected implementation by 08 November 2018.
  - *(aligned with Seamless ATM Plan Phase II.)*

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

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

Document Review

1.15 The Framework is intended, as a minimum, to be first reviewed coincident with the first planned review of the Seamless ATM Plan in 2016 and thereafter each three years, also coincident with the regular review of the Seamless ATM Plan. Earlier or more frequent review and amendment will be conducted as recommended by ATFM/SG and agreed by APANPIRG, through its Air Traffic Management (ATM) Sub-Group (ATM/SG).

DEVELOPMENT AND OBJECTIVES OF THE FRAMEWORK

Framework Development

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

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

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

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

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

2.5 Further development of the Framework beyond this version will be guided by the concepts discussed in its Research and Future Development section, and by the experience gained in operational implementation and the maturing distributed multi-nodal ATFM network concept.

ATFM Framework Objective

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

2.7 The Framework provides information, guidance and performance objectives including:

- ATFM principles;
- ATFM-related Aviation System Block Upgrades (ASBU), and relevant performance objectives from the Asia/Pacific Seamless ATM Plan;
- ATFM-related performance objectives of the Asia/Pacific Seamless ATM Plan;
- Collaborative decision-making (CDM);
- ATFM phases;
- Airspace and airport capacity improvement, planning, assessment and declaration;
- ATFM daily plan;
- ATFM terminology, communications and information distribution;
- Meteorological products for ATFM;
- Distributed multi-nodal ATFM network concept;
- Training and competencies for ATFM personnel;
- Analysis of current ATFM capability in the Region
- A performance improvement plan; and
- considerations for research and future development.

EXECUTIVE SUMMARY

The Need for a Regional Framework for Collaborative ATFM

3.1 The Asia-Pacific (APAC) region is the world's largest market for air transport. In 2012 it accounted for 33% of the global air transport market[1]. This was expected to grow to 37% by 2017. Three of the top ten airports (passenger movements) and four of the top ten (air cargo tonnage) in 2013 were in the Asia/Pacific Region[2].

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

3.3 The need for a regional, network-based response to the challenges of increasing demand was recognized by APANPIRG/24 (June 2013) in its adoption of **Conclusion 24/15: Asia/Pacific ATFM Steering Group**, re-convening the ATFM/SG to develop a common Regional ATFM framework addressing ATFM implementation and ATFM operational issues in the Asia/Pacific Region. It was further recognized in the inclusion of the ASBU module **B0-NOPS** – *Improved Flow Performance through Planning based on a Network-Wide View* among the ten priorities and targets for the Asia/Pacific Region[3].

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

Distributed Multi-Nodal ATFM Network Concept

3.5 Of central importance to Framework is the concept of cross-border ATFM utilizing a distributed multi-nodal ATFM network. Previously untried, the concept as detailed in this document will develop further with experience gained, particularly in the ongoing multi-partite trial program, with operational trials planned to commence in June 2015. This program, with the active participation of 8 Asia/Pacific Region administrations and 2 international organizations, is expected to contribute significantly to the knowledge and experience necessary for the ongoing work of ATFM/SG and the further development of the regional ATFM framework.

Interoperability is the Key

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

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[1] IATA Asia/Pacific Region ATFM Study 2014

[2] Airports Council International (ACI) 2013 World Airport Traffic Report

[3] Conclusion APANPIRG 25/2 – APAC Regional Air Navigation Priorities and Targets

3.7 A key consideration in the development of Version 1.0 of the Regional Framework for Collaborative ATFM was the interoperability of systems, procedures and practices to ensure not only regionally harmonized ATFM, but also the effective, complementary operation of other systems forming part of the gate-to-gate chain of air traffic management. It is vital that all systems and processes use common information, terminology and communications protocols to ensure common understanding and optimal outcomes. In particular, the interoperability of ATFM, Airport Collaborative Decision-Making (A-CDM), Arrival Manager (AMAN) and Departure Manager (DMAN) systems, and airspace user and ATM automation system interfaces, is critical to the success of a regional ATFM program and the optimized use of available capacity. ATFM/SG addressed these issues in the development of harmonized ATFM terminology and the specification of automated system communications protocols, and through its linkage to the ICAO Asia/Pacific Region Aerodromes Operations and Planning Working Group (AOP/WG).

ABBREVIATIONS and ACRONYMS

Abbreviations and Acronyms

Note: Abbreviations and acronyms for ATFM-specific terminology developed for the Asia/Pacific Regional Framework for Collaborative ATFM are listed separately in an appendix to Section 5, Background Information - Terminology and Communications.

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
AFS	Aeronautical Fixed Service
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

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 A.**

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.

ATFM-Related Performance Objectives of the Seamless ATM Plan

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 operations.

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

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

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

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

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

ATFM Phases

5.18 ICAO Doc 9971 describes three phases of ATFM execution; *strategic*, *pre-tactical* and *tactical*, illustrated in **Figure 1**.

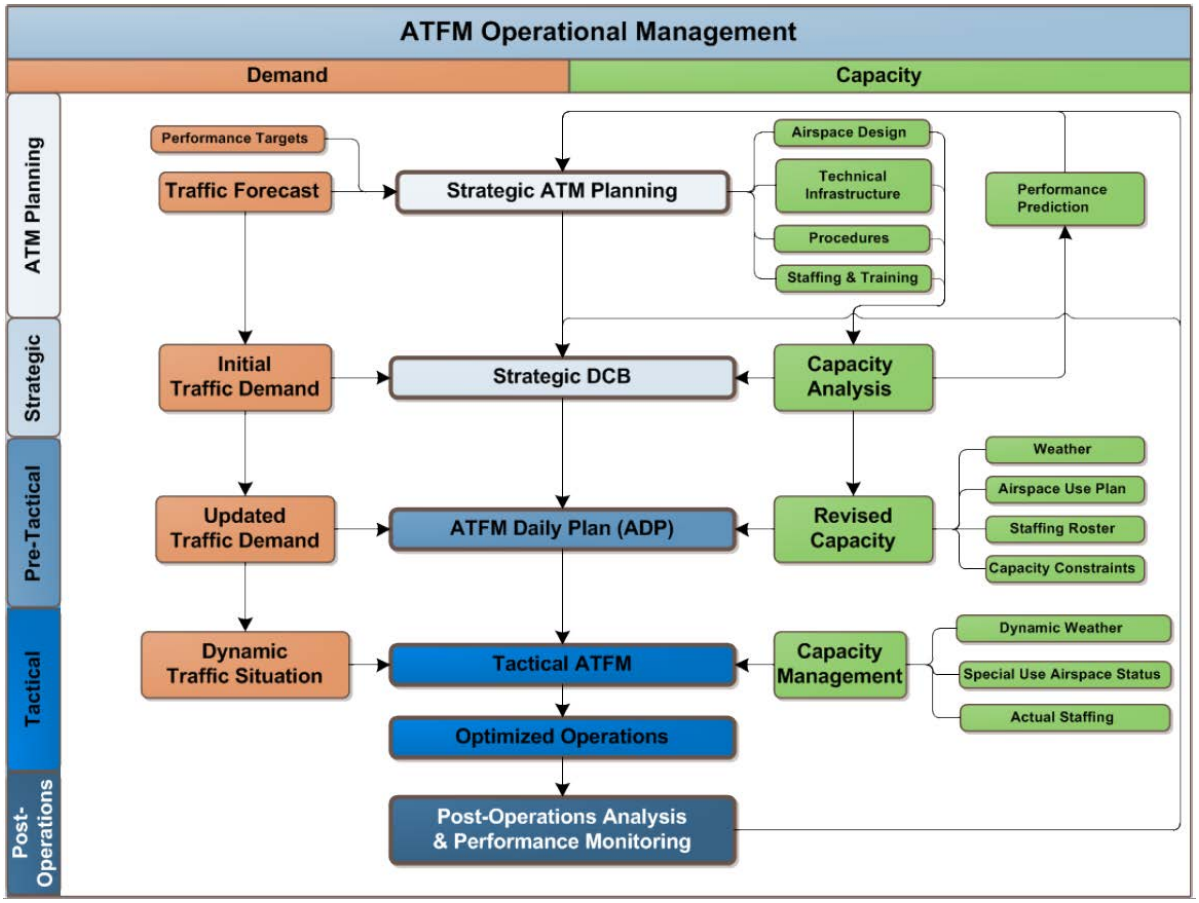

Figure 1: ATFM Operational Management and Phases

5.19 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.

5.20 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.

5.21 **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. Experience has demonstrated that inclusion of at least 70% of flights is necessary for ATFM programs to deliver benefits.

5.22 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.

Airspace and Airport Capacity Improvement

5.23 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.

5.24 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;

5.25 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.

5.26 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

5.27 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.

5.28 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.

5.29 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.

5.30 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.

5.31 Steps in a sector capacity assessment methodology utilizing fast-time simulations 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 fast-time simulation capacity assessment methodology should use a simulation engine that reproduces the ATC environment, and should follow a reiterative process of validation involving licensed ATC staff currently active on the sector/s under assessment.

ATFM Daily Plan

5.33 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.

5.34 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.

5.35 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.

5.36 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.

5.37 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.

5.38 An ADP should include the following items of information:

- Aerodrome or Airspace Sector identification;
- AAR;
- Description of constraints;
- Time frame
- Proposed ATFM measures; and
- Remarks/other relevant information.

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

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 D**.

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 2** illustrates the data-level interoperability among domains achieved by FIXM.

Figure 2: 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)[4] 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.

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

- **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 (ATFM measures);
- 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 network concept, **Table 1** outlines the minimum items of ATFM information that ATFM systems and processes should share.

The multi nodal ATFM network concept is described in paragraphs 5.72 to 5.73.

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. The Aeronautical Fixed Service (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[5].

ATFM Phrase

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

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

Meteorological Products for ATFM

5.59 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.

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

5.61 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.

5.62 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 3**. 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 3: Example Colour-Coded Matrix of Met Information

5.63 An example of IAF and holding stack prediction based on weather intensity and coverage area is shown in **Figure 4**, using similarly defined criteria and thresholds to facilitate rapid interpretation of the impact on operations.

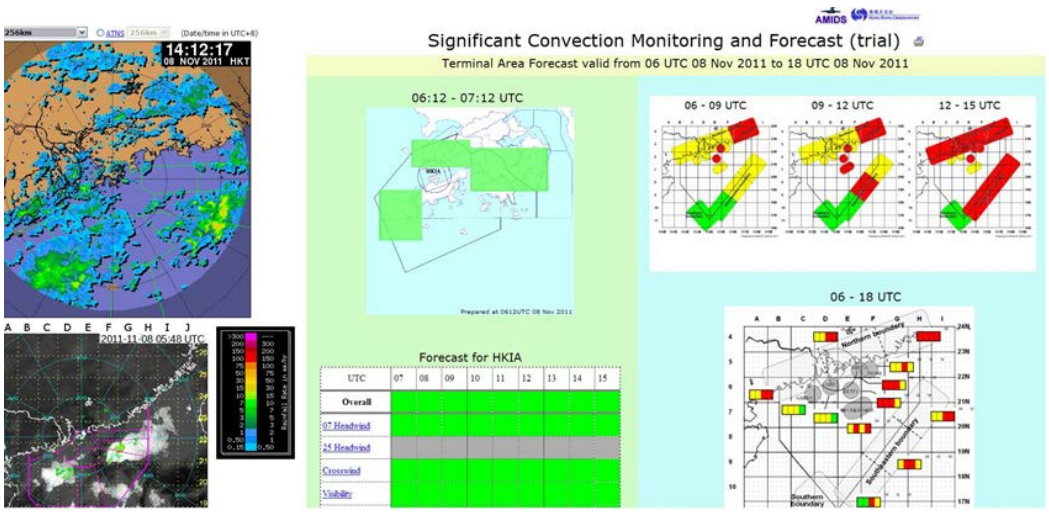

Figure 4: IAF and Holding Stack Weather Prediction.

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

5.65 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.

5.66 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.

5.67 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

5.68 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.

5.69 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.

5.70 Recommendations arising from the study were:

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

5.71 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

5.72 The concept of the distributed multi-nodal ATFM network, conceived through the collaborative development of the Regional ATFM Concept of Operations (a research project by Singapore, together with industry partners and operational inputs from Malaysia, Hong Kong China, Thailand and other stakeholders), was adopted by ATFM/SG as the foundation for a Regional ATFM concept and implementation strategy, with an implementation target date of 8 November 2018 in alignment with the Seamless ATM Plan.

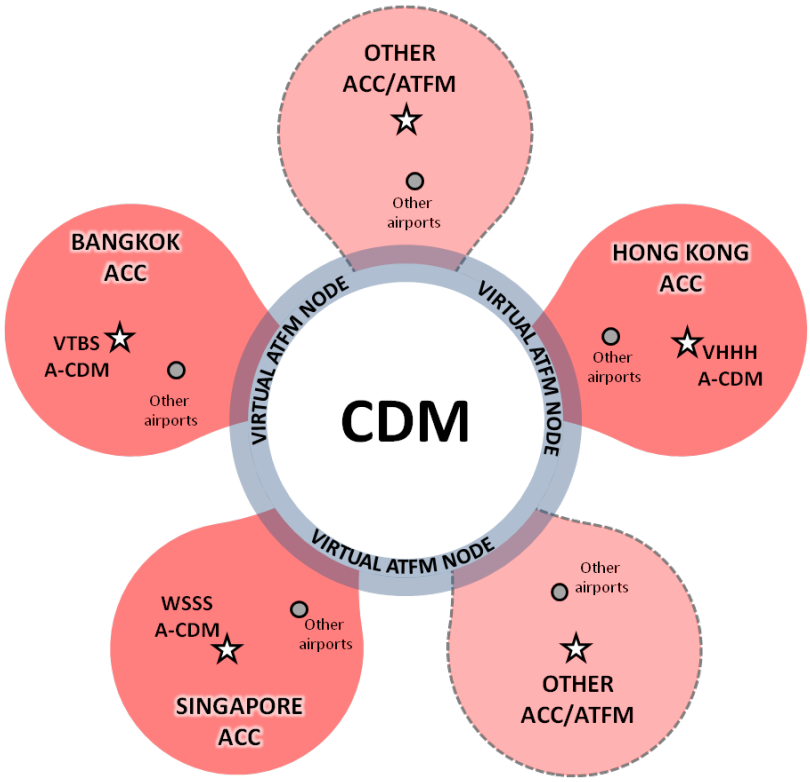

Figure 5: A Distributed Multi-Nodal ATFM Network

5.73 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 5**:

5.74 The Regional ATFM Concept of Operations document is available at **[TBA]**.

Training and Competencies for ATFM Personnel

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

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

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

CURRENT SITUATION

The IATA ATFM Study

6.1 This analysis of the current state of ATFM implementation and capability in the Asia/Pacific Region is extracted from the IATA *Asia-Pacific (APAC) Regional Air Traffic Flow Management – Phase 1 Final Report* (21 November 2014). The study was commissioned to establish a baseline view of ATFM capability and interoperability, and to develop recommendations for a cohesive and flexible approach for achieving integrated and coordinated ATFM capabilities within the Asia/Pacific Region.

The Benefits of Networked, Cross-Border ATFM

6.2 An interoperable network approach for the region will result in system-wide Demand Capacity Balancing. This approach enhances the safety and optimizes the efficiency of airports and available airspace.

6.3 As the Asia-Pacific region, the world's largest market for air transport, continues to grow, it becomes essential to optimize the use of available capacity through ATFM. In 2013, the Asia/Southwest Pacific Region was the fastest growing region by passengers in the world (**Table 2**). The region's passenger growth was 8.5%. Individual countries with notable passenger growth include: China (11.8%), Indonesia (20.4%), and Thailand (16.4%).

6.4	**Passenger Volume**	**Annual %**
Indonesia	92,534,902	20.4
Thailand	62,831,288	16.4
China	404,174,939	11.8
Singapore	42,438,276	7.6
Malaysia	51,821,210	7.5
Japan	148,450,196	4.9
India	97,677,318	4.4
Hong Kong	44,399,060	3.9
Korea, Republic of	62,166,163	1.2
Australia	81,983,309	0.6
Asia/Southwest Pacific	1,075,572,893	8.5

Table 2: Top Asia/Pacific Passenger Countries 2013

6.5 Throughout the Asia Pacific region, individual States' ATM and ATFM equipment, services, procedures, airspace design, communications, and resources have a wide disparity in capabilities. These limitations often result in a less efficient operational environment. Prevalent throughout the study region are excessive miles-in-trail restrictions (MITs), fuel burn, carbon dioxide (CO_2) emissions, aircraft departure holding on the ground, airborne holding, and delays.

6.6 Weather and other system constraints increase schedule buffer, delayed flights, cancellations, and missed connections. Flight delays add costs to airlines, passengers, airport operators, and States. Aviation inefficiencies have trickle-down impacts on other sectors due to lost time and productivity. As traffic demand increases, delays will also increase if resource capacity is not increased.

6.7 An interoperable ATFM network of States will have potential benefits to airlines, passengers, airport operators, and States.

6.8 The IATA ATFM Study listed the substantial benefits of implementation of an interoperable cross-border ATFM network. Key benefits were in the domains of safety, and operating efficiency.

Safety Benefits

6.9 Standard ATM practices of separating and sequencing traffic by vectors, speed control, and airborne holding are carried out during un-metered peaks of traffic. These practices are proven safe and effective. However, during these peak periods, the workload on ATC and pilots can increase significantly, thereby reducing the margin for error. Through ATFM, a constant manageable flow of traffic is achieved, resulting in a more manageable workload and hence, a safer operation. A network approach to ATFM reduces sector/system saturation, increases efficiency and enhances safety.

6.10 Often with implementation of ATFM, States enhance their ability for severe weather detection. This earlier detection of weather is shared with airline operators and ANSPs, increasing situational awareness. In addition this is taken into account when determining capacity of resources, resulting in the correct ATFM measure being implemented, which can have a direct impact on safety.

6.11 Communication networks will improve between States with ATFM implementation so as to accommodate CDM. A resultant benefit will be reduced coordination errors, leading to enhanced safety.

Economic Benefits

6.12 Air traffic demand in Asia Pacific is expected to grow significantly in the next five to ten years. While the growth is predicted to increase by approximately 5.5% - 6% annually, such an increase in demand will eventually lead to unsustainable levels of congestion and delay within the region's airport and airspace operating environments, until capacity enhancements are operationally available. **Table 3** shows the expected fuel savings benefit expected from ATFM in 2014 and 2019, based on this projected traffic growth.

	2014	**2019**
Regional ATFM	US$250 – $300M	US$600M – $800M
Domestic & Regional ATFM	US$660 – 810M	US$1.1B - $1.4B

Table 3: Asia Pacific Annual Fuel Savings Benefit Projection

6.13 The benefit opportunity of a network-based Asia Pacific Regional ATFM implementation strategy is particularly significant in the following airport operating environments, where international arrival traffic accounts for 35-100% of the total demand, indicating that domestic ATFM deployments are not practical for demand/capacity balancing at these airports:

- China - Shanghai Pudong International
- Indonesia - Ngurah Rai International
- Hong Kong - Hong Kong International
- Japan - Narita International
- South Korea - Incheon International
- Malaysia - Kuala Lumpur International
- Philippines - Ninoy Aquino International
- Singapore - Changi International
- Taiwan - Taiwan Taoyuan International
- Thailand - Suvarnabhumi Bangkok International
- Vietnam - Tan Son Nhat International and Nội Bài International

6.14 Within the remainder of the major Asia Pacific airport operating environments, international arrival traffic currently accounts for 20-30% of the total demand. Achieving the benefit of fuel savings in these environments would be supported by domestic ATFM deployments and enhanced through the Regional ATFM implementation strategy.

Summary of Asia/Pacific Region Collaborative ATFM Capability

6.15 A comprehensive survey was conducted in mid-2014 of current ATFM initiatives within the Region. **Figure 6** summarizes the results:

		ATFM Structure			ATFM Demand and Capacity Balancing							Interoperability						
		Regulatory & Operational Requirements	Organizational Structure	Infrastructure	Airport Capacity Declaration	Airspace Capacity Declaration	CDM Processes - Situational Awareness	CDM Processes - Procedures and Tool	Demand and Capacity Balancing - Strategic	Demand and Capacity Balancing -Pre-tactical	Demand and Capacity Balancing -Tactical	ATFM LOAs with Adjoining ANSP	Message Exchange with Adjoining FIR	Exchange AAR/ADR with Adjoining FIR	TMI Documented in External LOA	External TMI Communication	ATFM Initiatives Planned Internally	ATFM Initiatives Planned with Adjoining FIR
States	Australia	1	1	1	1	1	1	1	1	1	1	1	1	4	1	1	1	4
	Bangladesh	1	4	4	4	4	4	4	4	4	1	4	1	4	4	4	4	4
	China	1	2	2	1	4	1	1	1	1	1	4	4	4	4	1	1	4
	Hong Kong	1	2	2	1	4	2	2	1	1	1	1	1	1	1	1	1	1
	India	1	3	3	1	1	4	4	1	4	1	4	1	4	4	4	1	4
	Indonesia	4	3	3	1	4	4	4	1	4	1	4	4	4	4	4	1	4
	Japan	1	1	1	1	4	1	1	1	1	1	1	1	4	1	1	1	4
	Malaysia	1	3	3	1	4	3	4	1	4	1	1	1	4	4	1	4	4
	Maldives	4	4	4	1	4	4	4	4	4	1	4	1	4	4	4	1	4
	New Zealand	1	2	2	1	4	1	1	1	4	1	4	1	4	4	4	1	4
	Pakistan	1	3	3	1	1	4	4	1	4	1	4	1	4	4	1	4	4
	Philippines	1	2	2	1	4	2	2	1	1	1	4	4	4	4	1	1	4
	Singapore	1	3	3	1	4	3	4	1	4	1	1	1	1	4	1	1	1
	South Korea	1	3	3	1	1	4	4	1	4	1	1	1	4	4	1	1	4
	Taiwan	1	3	2	1	4	4	4	1	1	1	4	1	4	1	4	4	4
	Thailand	1	2	2	1	1	3	3	1	1	1	4	1	1	4	1	1	1
	Vietnam	4	4	3	1	4	3	4	4	4	1	4	4	4	4	4	1	1

More Advanced 1 Yes
2
3
Less Advanced 4 No

Figure 6: 2014 Asia/Pacific ATFM Survey – Summary of Results

6.16 It was observed that:

1. All respondent States recognized the requirement for ATFM;

2. Few States had well-established ATFM organizational structures;

3. There was a diverse range of ATFM capability infrastructure; only three States had mature ATFM systems, while others had little or no infrastructure;

4. CDM between States was minimal. While there was a common desire for better CDM, there was no standard for the region;

5. Airport capacities were declared for most major airports in the region, but only five States are declaring capacities for airspace.

6. Very few States were performing Demand Capacity Balancing (DCB) in the strategic phase of ATFM beyond allocating Airport Slots via the IATA World Scheduling Guidelines (WSG).

7. Only a limited number of States with mature ATFM systems were able to carry out DCB in the pre-tactical phase.

8. States without mature ATFM systems that were encountering DCB issues did not have any facility to monitor demand against capacity.

9. All of the States were performing DCB in the tactical phase, but only five States had the ability to issue ATFM Measures using allocated slot times to smooth traffic into airports.

10. There was no substantive interoperability between the States. There was very little formal ATFM procedure agreement between States.

11. The most prominent Regional development for cross-border ATFM implementation was the Singapore-initiated Regional ATFM Concept of Operations. Four States participated in the development of the concept with relevant stakeholder participation. The resultant operational trial of the distributed multi-nodal regional ATFM concept was being planned, with Australia, China, Hong Kong China, Indonesia, Malaysia, Thailand and Viet Nam participating.

Survey Scope

6.17 The survey was distributed to 22 States, of which 17 responded (**Table 4**).

6.18 Most of the responses were comprehensively completed. The States that have more mature ATFM capabilities were able to respond in a higher level of detail. Generally, the responses directly answered the survey with the possibility of limited misunderstanding. Any misunderstanding does not appear to have impacted the results of the study.

	State	Survey Sent	Response Received
1	Australia	Yes	Yes
2	Bangladesh	Yes	Yes
3	China	Yes	Yes
4	Hong Kong, China	Yes	Yes
5	India	Yes	Yes
6	Indonesia	Yes	Yes
7	Japan	Yes	Yes
8	Republic of Korea	Yes	Yes
9	Malaysia	Yes	Yes
10	Maldives	Yes	Yes
11	New Zealand	Yes	Yes
12	Philippines	Yes	Yes
13	Singapore	Yes	Yes
14	Taiwan	Yes	Yes
15	Thailand	Yes	Yes
16	Vietnam	Yes	Yes
17	Pakistan	Yes	Yes
18	Lao PDR	Yes	No
19	Nepal	Yes	No
20	Cambodia	Yes	No
21	Sri Lanka	Yes	No
22	Unites States Of America	Yes	No(Not relevant)
23	Papua New Guinea	No	No
24	Myanmar	No	No

	State	Survey Sent	Response Received
25	Fiji FIR	No	No
	Organizations		
1	IATA	Yes	Yes
2	EU (AATIP)	Yes	Yes
3	ICAO	Yes	Yes
5	CANSO	Yes	Yes

Table 4: State Responses to Survey

6.19 All States were requested to supply supporting documentation; Australia, Singapore, Philippines, and India did so.

Regulatory Requirements

6.20 Thirteen States had regulatory requirements for ATFM in their FIR. Vietnam, Indonesia, and Malaysia, while having no regulatory requirement, had plans to implement ATFM.

Annex 11 to the Convention on Civil Aviation States: Air traffic flow management (ATFM) shall be implemented for airspace where air traffic demand at times exceeds, or is expected to exceed, the declared capacity of the air traffic control services concerned.

ATFM Infrastructure

6.21 ATFM infrastructure was assessed against each ANSP's human resources commitment and personnel, dedicated positions and equipment available to perform ATFM, and the existence of internal and external stakeholder ATFM Letters of Agreement (LOAs). **Figure 7** illustrates the assessed ATFM infrastructure of the 17 respondents. Two States had mature ATFM structures and six States had developing ATFM structures. Six States had an Air Traffic Flow Management Unit (ATFMU). Seven States had some ATFM functionality, which was carried out from existing supervisory and/or Air Traffic Control (ATC) positions. Two States had no infrastructure. All respondents had plans to implement ATFM.

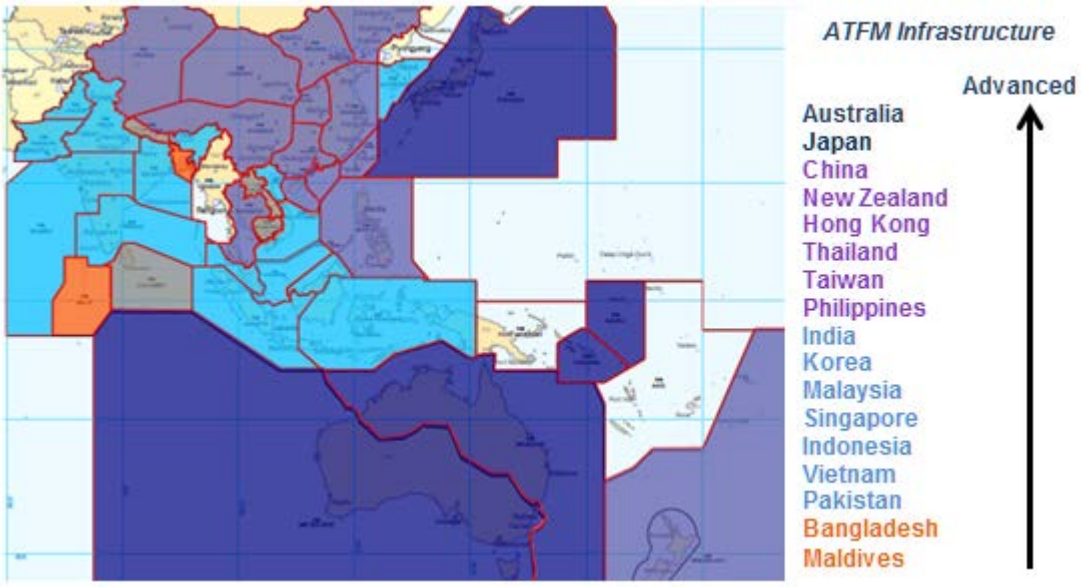

Figure 7: ATFM Infrastructure

CDM Infrastructure and Processes

6.22 Several States with mature ATFM infrastructure had implemented domestic CDM, but CDM between States was minimal. Some ad-hoc CDM was taking place across FIR boundaries when resources were constrained. Cross FIR CDM between Hong Kong, Thailand, Malaysia, and Singapore was under development on a trial basis, establishing initial cross-border procedures and communication. **Figure 8** illustrates CDM capability.

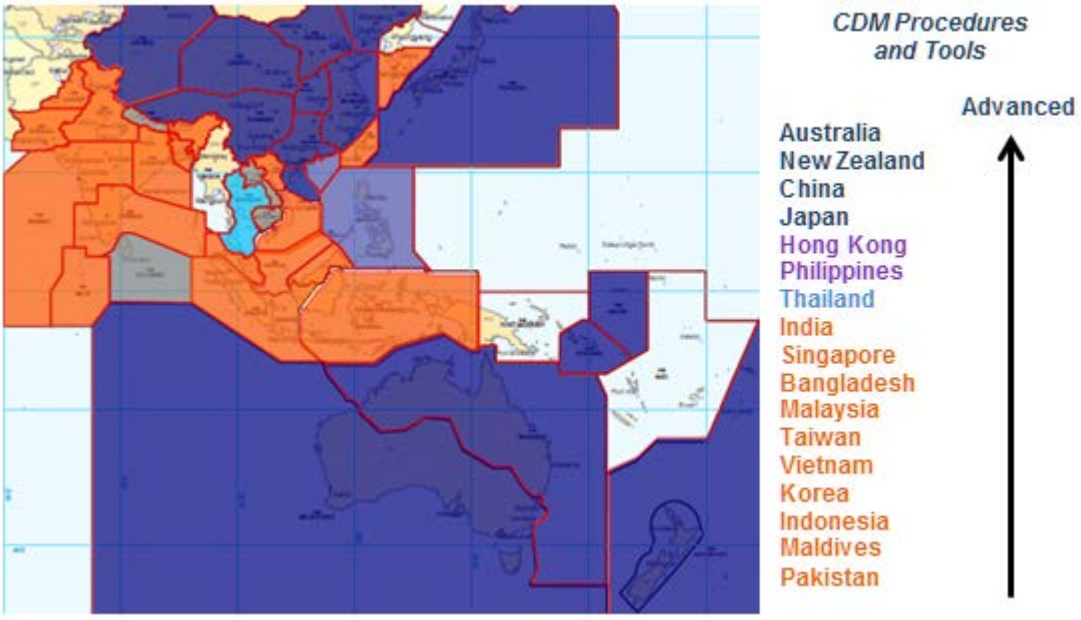

Figure 8: CDM Processes – CDM Procedures and Tools

ATFM Training

6.23 Some training was taking place in States; mostly in-house, but with some States having sent staff to EUROCONTROL and the USA for training. There was an initiative between the EU AATIP and Thailand to develop criteria for ATFM personnel and an ATFM training syllabus.

6.24 The experience of the survey consultant was that that many States in the region needed assistance in general ATFM education and training in all levels of their organizations, and that airline operators in the region had limited knowledge and training in ATFM and CDM.

Airspace and Airport Capacity Declaration

6.25 Defining airport and airspace capacity is fundamental to a domestic ATFM system, and to an interoperable cross-border network. Accurate airport and airspace capacity declarations provide targets for the development of collaborative planning.

6.26 Capacity had been declared for most of the large airports in the region, as they were *slot controlled* airports. Five States had declared capacities for airspace. Airspace capacity (terminal and en-route airspace) declaration needed to be promoted. Many States did not have the ability or knowledge of how to determine airspace capacities.

Strategic Demand and Capacity Balancing (DCB)

6.27 Thirteen States were allocating airport slots to balance demand against capacity in the strategic time frame. Three States included military operations in strategic planning. Apart from these, little strategic ATFM was being undertaken domestically and no formal cross-border strategic ATFM was in place.

Pre-tactical DCB

6.28 Seven States are performing some pre-tactical ATFM. Lack of decision support tools was hampering States from carrying out pre-tactical ATFM. States needed to understand the importance of Pre-tactical ATFM and establish procedures and decision support capabilities to enable it to take place. Very little cross-FIR pre-tactical ATFM was taking place.

6.29 **Figure 9** shows the respondent States performing pre-tactical ATFM.

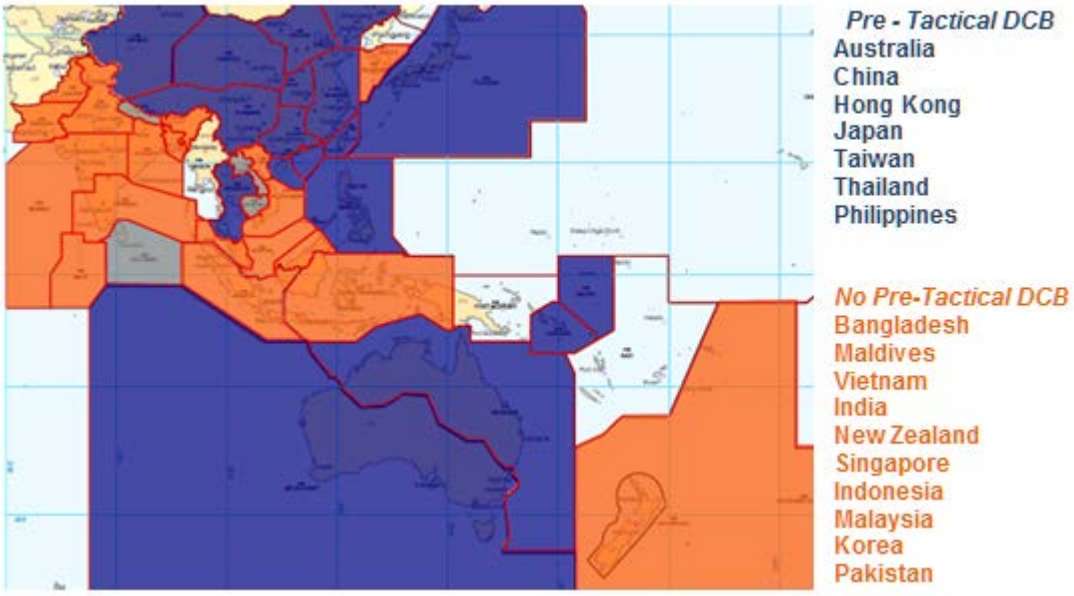

Figure 9: Pre-Tactical Demand and Capacity Balancing

Tactical DCB

6.30 All respondents were performing ATFM in the tactical phase in at least a rudimentary form. However, five States were using ATC slot allocation to balance demand capacity at airports. No ANSP was using ATC slot allocation to perform DCB in terminal or en-route airspace, even though sectors of airspace were capacity constrained.

6.31 Five States had dedicated resources implementing ATFM Measures, and nine States had plans to dedicate resources to implement ATFM Measures in the future.

Interoperability

6.32 A major focus of the study was to establish the interoperability between States with regard to ATFM. The analysis revealed that, while there were initiatives in the early stages of development, there was no substantial interoperability currently taking place. However, interoperability was a key consideration of the multi-nodal ATFM concept trial.

Air Traffic Service (ATS) Message Exchange with Adjoining FIR

6.33 Detailed databases of fundamental ATS routes, route systems, navigation aids (NavAids), airports, airspace status, sectors, and arrival and departure procedures were necessary to support ATFM interoperability.

6.34 The majority of States had automated ATS message exchange capability. The survey consultant's experience suggested that those States that responded in the negative may have misunderstood the question. Current Regional ATFM initiatives required a minimum ATS message exchange capability.

Sharing Airport Acceptance Rate (AAR)/Airport Departure Rate (ADR) and Airspace Capacity

6.35 The stakeholder decision making process associated with DCB for an airport is dependent upon accurate AAR/ADRs. Advanced coordination with stakeholders and implementation of appropriate ATFM Measures based upon AAR/ADR as demand exceeds capacity results in efficient ATFM processes.

6.36 Only three Administrations (Thailand, Singapore, and Hong Kong, China) were AAR/ADR. While the majority of States did not share the AAR/ADR, there are times when an ANSP would ask an adjoining ANSP to reduce the flow of traffic as a result of the AAR being exceeded. No State was sharing airspace capacities with adjoining FIRs, and few States are declaring airspace capacity.

6.37 Operational information exchange of ATFM Measures is fundamental to ATFM. LOAs provide the ability to improve preplanning, reduce tactical coordination, and standardize actions and initiatives.

6.38 A low count of States having ATFM in LOAs with adjoining States was expected as a result of the lack of existing operational initiatives between States (**Figure 10**). The States where LOAs existed had advanced ATFM systems or had a requirement to meter traffic crossing FIRs as a result of demand exceeding capacity at resources. As more cross-FIR ATFM initiatives are implemented, LOAs will need to be developed or further developed.

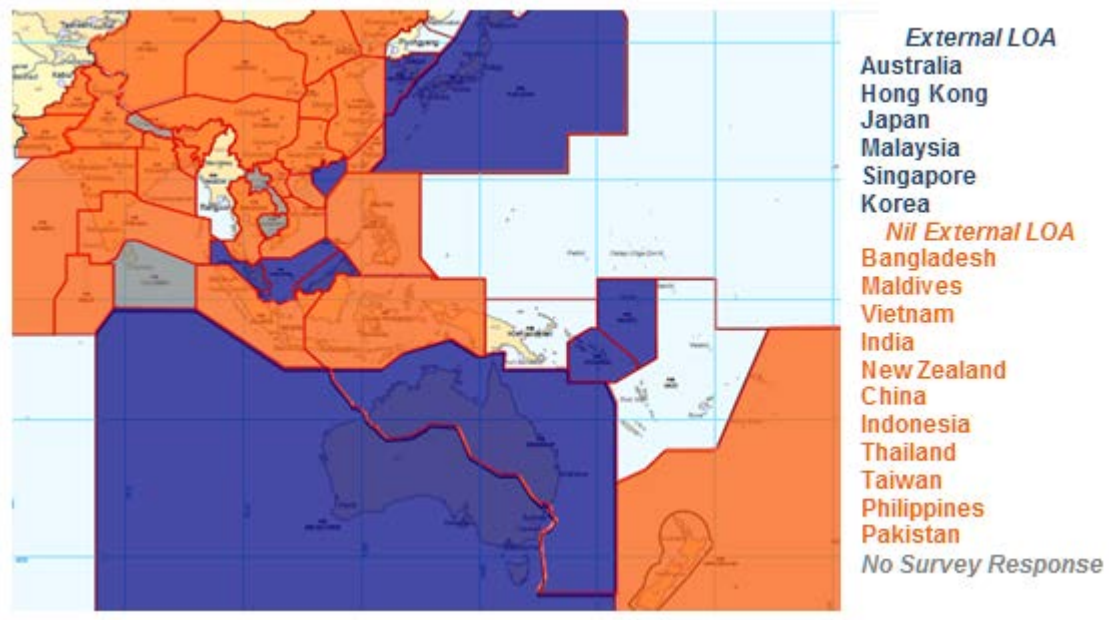

Figure 10: ATFM Measures Communicated in External LOA

External ATFM Measure Communication

6.39 An interoperable network approach necessitates external ATFM Measure communication. While there were only three States with LOAs in place, there was ATFM Measure communication taking place between nine States, including two that had automated communications (China and Republic of Korea). This communication was predominantly in the tactical time frame of ATFM on an as-needed basis, and was expected to increase as initiatives were implemented. Since these communications were not supported by formalized agreements (LOAs), there was little standardization of procedures.

ATFM Initiatives Planned with Adjoining FIRs

6.40 An interoperable network will be driven by stakeholder engagement and operational needs between States. Constraint management can be best achieved through the CDM process. Formal ATFM initiatives between States are often needed because of the widespread effects on the flow of air traffic.

6.41 While States were currently implementing ATFM Measures, which occasionally required adjoining FIR participation, there was only one initiative planned to include multiple FIRs in ATFM Measures, with seven States and four international organizations participating. **Figure 11** illustrates the States with external ATFM initiatives planned.

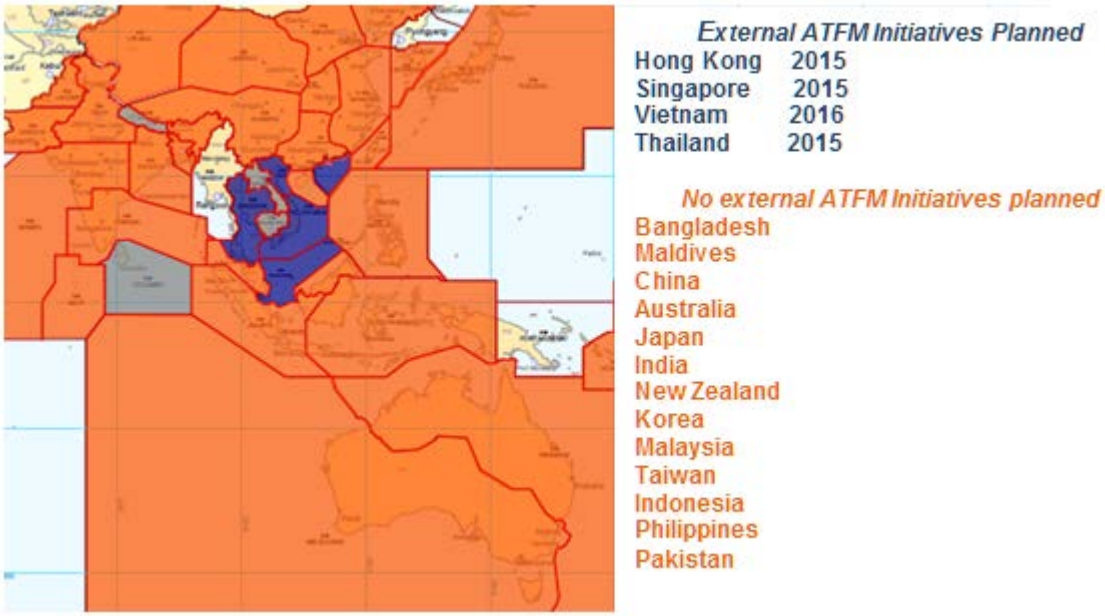

Figure 11: External ATFM Initiatives Planned

ATFM Systems

6.42 All of the advanced ATFM systems implemented in the APAC region were commissioned prior to the publication of ICAO Doc 9971. The systems installed in Japan and Philippines were developed by Japan. New Zealand and China had also developed their own systems. The Australian system was similar to systems in the USA, Canada, and South Africa.

6.43 Many of the States had direct involvement in the compilation of Doc 9971 and all States are now familiar with Doc 9971. It was therefore assumed that future implementations would be in line with recommendations from that document. The Regional ATFM Concept of Operations includes participation from individuals with experience in the FAA, EUROCONTROL, South African and Australian ATFM systems.

ANSP Initiatives

6.44 Most of the States, as a result of operational, ASBU and Seamless ATM Plan requirements, had initiatives to implement ATFM in the future. All the States were at various stages of planning, procurement, or implementation. **Figure 12** provides a timeline indicating current and planned ATFM initiatives.

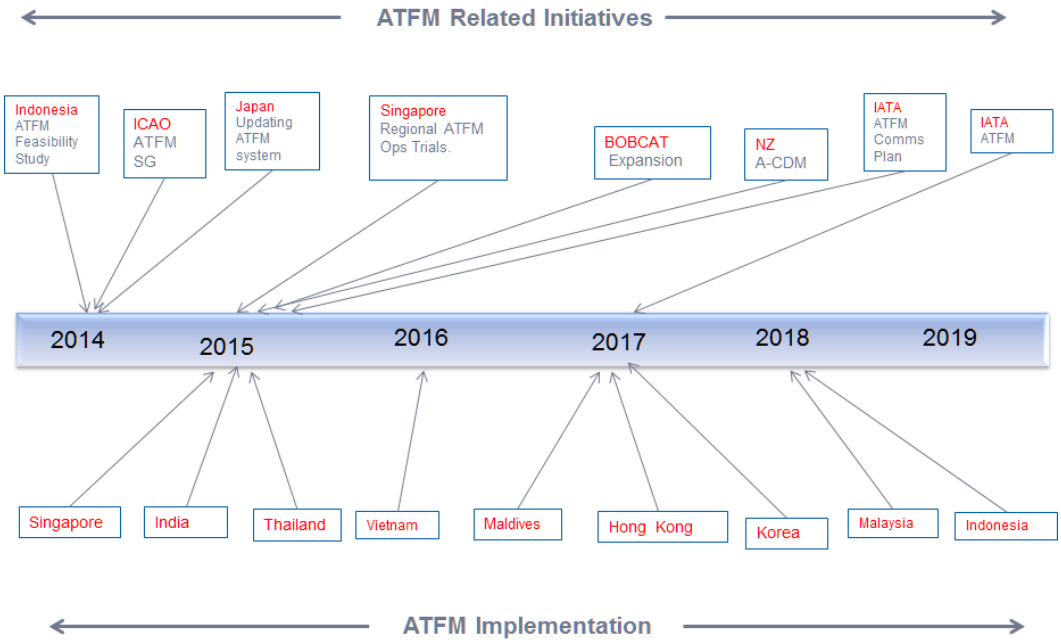

Figure 12: ATFM Implementation Timeline

Opportunities for Integration

6.45 The distributed multi-nodal ATFM concept has been widely accepted as a potential solution for the region, and eight States had joined the plan for an operational trial of the concept starting in June 2015. The trial may be expanded to additional States as feedback is received on the viability of the concept.

6.46 Australia and New Zealand, both having mature ATFM systems, were a possibility for integration. It was understood that discussions had taken place to incorporate traffic from New Zealand into ATFM Measures in Australia. The ATFM system in Australia had the ability to include international traffic into ATFM Measures.

PERFORMANCE IMPROVEMENT PLAN

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

Structure of the Performance Improvement Plan

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

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

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

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

- ATFM Regulations
- ATFM Systems
- (Strategic ATFM, Pre-Tactical ATFM or Tactical ATFM)
  - Capacity and Demand Monitoring and Analysis
  - Capacity Improvement
  - ATFM Execution
  - ATFM Measures
  - Post-Operations Analysis

ATFM Program Airports

7.4 *ATFM Program Airports*, referenced in the performance objectives, are:

- The busiest Asia/Pacific Region aerodromes as defined in the Asia/Pacific Region Seamless ATM Plan;
- Airports where strategic slot allocation is implemented under these performance objectives; and
- All other airports designated by the relevant authority as requiring or potentially requiring ATFM implementation.

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

REGIONAL ATFM CAPABILITY PHASE IA

Expected implementation by 12 November 2015

ATFM Regulations

7.5 All States where air traffic demand at times exceeds, or is expected to exceed declared capacity, should enact regulations for the implementation of ATFM.

Annex 11 to the Convention on Civil Aviation section 3.7.5 refers.

Strategic Capacity and Demand Monitoring and Analysis

7.6 A regular program of bi-annual strategic airport and airspace capacity and demand analysis should be implemented for all international airports and associated terminal area airspace, and for all en-route ATC sectors supporting the busiest Asia/Pacific city pairs[6] (**Figure 13**), including consideration of:

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

[6] The Asia/Pacific Seamless ATM Plan lists the busiest Asia/Pacific aerodromes:

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

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

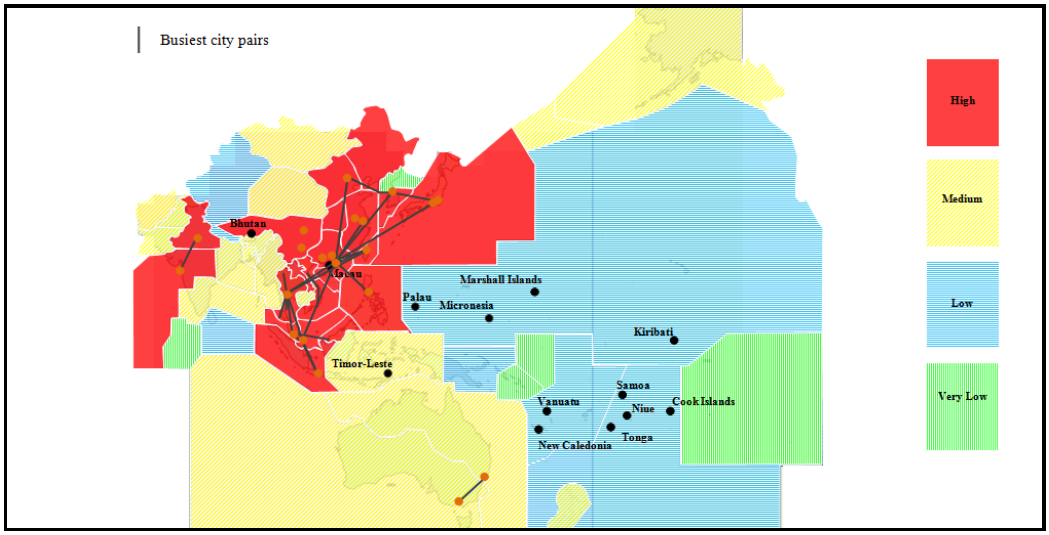

Figure 13: Asia/Pacific High Density FIRs, showing Busiest City Pairs
(Source: Asia/Pacific Seamless ATM Plan)

Pre-Tactical Capacity and Demand Monitoring and Analysis

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

i. expected runway and airspace configurations;

ii. forecast meteorological phenomena;

iii. ATC resources, facilities and equipment;

iv. other known or expected capacity constraints; and

v. updated flight schedule and flight plan information.

Pre-Tactical ATFM Execution

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

ADP should be distributed to stakeholders by either:

i. Web-based ATFM network; or

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

iii. Email distribution.

Relevant stakeholders include:

iv. Neighbouring ATFMUs or, where not provided, ATSUs

v. ATSUs supported by the originating ATFMU;

vi. Relevant airport operators; and

vii. Participating aircraft operators.

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

Post-Operations Analysis

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

REGIONAL ATFM CAPABILITY PHASE IB

Expected implementation by 25 May 2017

ATFM Systems

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

7.13 Requirements should be published in all relevant State AIP, specifying that FPL for flights operating to ATFM Program airports should be submitted not less than 3 hours prior to EOBT.

The requirement for FPL submission not less than 3 hours prior to EOBT is currently stipulated in other Regions for ATFM purposes. However, it should be noted that some airspace user flight planning systems are limited to maximum prior submission less than 3 hours.

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

7.15 Where the delay is the result of a GDP, the DLA message should be sent by the ATFMU responsible for the destination airport, addressed to the ATS unit serving the departure aerodrome for subsequent transmission in accordance with the provisions of ICAO Doc 4444 *PANS-ATM*.

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

7.17 ATFM, AMAN/DMAN and A-CDM systems should be integrated through the use of common fixes, terminology and communications protocols to ensure complementary operations.

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

Where full ATFM network communications capability is not yet established, ATFM messages conforming to ADEXP version 3.1 may be used for distribution of ATFM measures.

Capacity Improvement

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

7.19 Where necessitated by demand, and using a performance-based approach, terminal area ATS route structure improvements including CCO/CDO should be implemented to reduce ATC and pilot workload and enable better use of aircraft capability to meet ATFM measures.

Strategic ATFM Execution

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

Pre-Tactical Capacity and Demand Monitoring and Analysis

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

Pre-Tactical ATFM Execution

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

Tactical Capacity and Demand Monitoring and Analysis

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

7.24 Tactical ATFM at ATFM Program Airports should be implemented using:

i. Ground Delay Programs (CTOT) for aircraft inbound from:

   a. domestic airports;

   b. international airports sufficient to ensure participation of more than 70% of total inbound traffic;

ii. Minutes in trail (MINIT) or miles in trail (MIT) for aircraft inbound from airports where CTOT may not be applied.

7.24 CTOT for individual aircraft should, where necessary, be revised, cancelled, suspended or de-suspended.

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

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

Post-Operations Analysis

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

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

ICAO Doc 9971 – Manual on Collaborative ATFM Part II-4-8 provides guidance on post-operations analysis

REGIONAL ATFM CAPABILITY PHASE II

Expected implementation by 08 November 2018

ATFM Systems

7.28 Distributed multi-nodal ATFM information distribution capability utilizing FIXM version 3.0 (or later) should be implemented, including:

i. Sharing of ADP and dynamically updated demand and capacity data for all ATFM program airports, and for en-route airspace supporting the busiest city pairs and high density major traffic flows;

ii. Slot allocation information for all flights subject to ATFM programs, including as a minimum CTOT, CTO and CLDT information;

iii. Authorized user functions for slot amendment, cancellation or suspension (ATFMU), and slot-swapping (aircraft operator and ATFMU); and

iv. Automated slot compliance monitoring and reporting, supplemented where necessary by authorized inputs by ATFMU, ATSU or airspace operator.

7.29 Full interoperability of cross border ATFM, A-CDM, AMAN, DMAN, ATM automation and airspace user systems should be implemented, utilizing FIXM 3.0 (or later) , to provide seamless gate-to-gate collaborative ATFM operations.

Pre-Tactical Capacity and Demand Monitoring and Analysis

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

Tactical Capacity and Demand Monitoring and Analysis

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

Tactical ATFM Measures

7.32 ATFM measures including MIT, MINIT and, where necessary, CTO at AFIX or RFIX, should be applied to flights through constrained airspace.

7.33 Ground Delay Programs utilizing CTOT should be applied to:

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

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

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

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

RESEARCH AND FUTURE DEVELOPMENT POSSIBILITIES

Research and Development

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

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

ATFM Interface Control Document

8.3 The ATFM Information Requirements Small Working Group (ATFM/IR/SWG) will develop an operational requirements document and an ICD for networked, cross-border multi-nodal ATFM information exchange, to be delivered to ATFM/SG for consideration before then being referred to the 4th Meeting of the ATM Sub-Group of APANPIRG (ATM/SG/4) in August 2016.

Collaborative ATFM Concept Developments

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

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

8.6 **FIXM Extension** – may be required for implementation of any Asia/Pacific region ATFM practices or procedures that are not covered in FIXM version 3.0 or later versions deployed by States.

8.7 **Application of ATFM Measures to Long Range Flights** – will improve equity in ATFM processes, and contribute to better outcomes in those ATC sectors where long range flights are currently exempt from all but minimal en-route delays. This will require further development of ATFM measures the CTO ATFM measure, and the formulation of regionally agreed limits on the total ATFM+AMAN delay that may be applied to long range and ultra-long range flights.

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

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

8.10 The development of a collaborative trajectory options program in the Asia/Pacific Region, particularly in South East Asia, will require a coordinated multi-partite effort to improve the regional ATS route network and ATS surveillance/communications infrastructure, and to provide sufficient ATS route options for the program. ATS route specification and implementation of surveillance and communications infrastructure are included in the performance objectives of the Seamless ATM Plan.

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

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

MILESTONES, TIMELINES, PRIORITIES AND ACTIONS

Milestones and Timelines

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

Regional ATFM Capability Phase	Expected Implementation
Phase 1A	12 November 2015
Phase 1B	25 May 2017
Phase 2	08 November 2018

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

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

Priorities

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

Actions

9.5 This Plan is iterative in nature, and will require further development as experience is gained in operational trials of the distributed multi-nodal ATFM network concept. ATFM/SG, under its terms of reference, should continue to oversee and coordinate the development of the concept and subsequent amendment of the Framework, facilitate the coordination and alignment of CDM/ATFM programs being conducted within the Region, and review the effectiveness of existing and planned ATFM programs. An important project being conducted by the ATFM/SG is the development of a Regional Interface Control Document (ICD) for ATFM, which is expected to be completed for consideration by ATFM/SG, then presented to the ATM Sub-Group of APANPIRG in August 2016.

APPENDIX A: COLLABORATIVE ATFM PRINCIPLES

General Principles

1. Increased capacity is the primary and central method for management of increasing demand.

2. FIR boundaries should not limit the delivery of ATFM messages and the coordination and application of ATFM measures.

3. Collaborative Decision-Making (CDM) to achieve optimum ATFM network outcomes while taking into account stakeholder goals.

4. An emphasis on delivery of ATFM services based where practicable on CNS capability, resulting in flexible, dynamic systems delivering optimal ATFM network outcomes while providing equity of access.

5. Regional distributed multi-nodal network model of inter-connected sub-regional ATFM networks or State ATFM systems, based on system-wide CDM, serving the busiest terminal airspace and major sub-Regional traffic flows.

6. Harmonized regional ATFM rules and guidelines based on the ICAO Manual on Collaborative Air Traffic Flow Management (Doc 9971).

People: Aviation Regulations, Standards and Procedures

7. Regionally harmonized methodology for the continuous monitoring and declaration of airport and airspace demand and capacity, the dynamic updating and sharing of capacity information, and for daily post-operations analysis.

8. Prioritization of ATFM implementation for high density airports and the busiest city pairs and FIRs.

9. Demand and Capacity inputs from automated data feeds including ATM automation systems, ATN/AFTN, and from FMPs and FOCs using web-based manual ATFM interfaces.

10. The minimum necessary ATFM Measures applied, for the shortest necessary time period and only to operations at or in capacity constrained airports or airspace.

11. Pre-tactical and tactical coordination of airport and airspace capacity constraints and proposed ATFM programs and measures with all affected Stakeholder organizations, before the independent execution of the program or measure in the ATFM system of the responsible ANSP.

12. Participation by at least 70% of aircraft operating in or to the constrained resource.

13. Aircraft operator options for delay absorption through the flexible distribution of total ATFM measure delay per aircraft to gate hold, surface hold and/or airborne delay.

14. Except in the case of flexible aircraft operator options for absorption of delay, separate ATFM measures should not be cumulatively applied to a flight.

15. Harmonized ATFM, runway sequencing (AMAN/DMAN) and A-CDM processes using common reference points and information exchange.

16. Exemption from ATFM measures of emergency, humanitarian, declared medical evacuation, search and rescue, and Head-of-State flights, and other flights as determined by the State authority.

17. Direct coordination between aircraft operator and airport operator to determine maximum gate delay and surface delay.

18. Direct input of delay absorption intent into the ATFM system by aircraft operators.

19. Pilot-in-command responsibility for adherence to operational procedure for requesting speed, route or level changes where flexible delay option is exercised.

20. Continuous monitoring of compliance with ATFM measures, supported by procedures for the real-time and post-operational management of non-compliance.

21. Bi-lateral or multilateral agreements where necessary to support common business rules for departure, destination and en-route ANSPs and airport operators.

22. 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.

23. The use of high-fidelity simulators to train controllers and ATFM personnel in ATFM procedures and techniques.

ATM Coordination

24. 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

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

ATFM Systems

26. Collaboration by ANSPs for evaluation and planning of harmonized ATFM facilities.

27. Optimization of ATFM facilities through automated, networked, central flow management centres and units or equivalent virtual platforms.

28. Independent FMP/ATFM systems operated by each ANSP, connected to the sub-regional or regional ATFM network.

29. Continuous supervision, operation, adjustment, monitoring and executive control of ATFM systems and their output by dedicated ATFM or designated ATC personnel.

30. ATFM communications via existing internet/telecommunications networks, or via the Asia/Pacific Common Regional Virtual Network when implemented.

31. Preference for relevant ATFM data and notifications from each ANSP, including slot assignments, distributed to stakeholders via web interfaces.

32. Collaborative development of A-CDM, ATFM, AMAN and DMAN capability.

33. Encourage the 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 Modernization Projects

34. Inter-regional and sub-regional cooperation (‘clustering’) for the research, development and implementation of ATFM projects.

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APPENDIX B: CDM/ATFM TRIAL TIERED PARTICIPATION LEVELS

Air Navigation Service Providers

Note: Outside ATFM Ops Trial ANSPs may already have been asked to support ATFM Operations through Minimum Departure Intervals between flights or providing longitudinal separation between flights such as Miles-in-Trial or Minutes-in-Trail

Level 1 – Observe Trial

- Participate in CDM/ATFM Meetings
- Participate in Operational Trial Planning process

Level 2 – Facilitate CTOT for Departures (includes Level 1)

- Receive CTOT for departure to other Demand-Capacity imbalance airports
- Facilitate airline operator CTOT compliance for departing flights

Level 3 – Demand-Capacity Balancing Capability (includes Levels 1 and 2)

- Evaluate Traffic Demand
- Evaluate and update Airport Acceptance Rate (AAR)
- Distribute CTOT to airline operators and ANSPs

Aircraft Operators

Level 1 – Participate in the Trial

- Receive CTOT for departure to other Demand-Capacity imbalance airports
- Manage flight operations and coordinate with ATCs and Airport Operators to achieve CTOT compliance for departures
- Participate in the ATFM / CDM Operational Trial Project and Focus Group meetings
- Participate in the Operational Trial planning process

Level 2 – Slot Swapping and CTOT User Inputs (includes Level 1)

- Optimize flight operations through slot swapping and CDM process
- Provide CTOT User to ATFM portal (advanced Operational Trial – later phase)
- Evaluate and update on outcomes of ATFM measures
- Refine CDM process for optimized flight operations

APPENDIX C: ATFM DAILY PLAN SAMPLE TEMPLATE

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

CAPACITY and CONSTRAINTS			
Location (AD or SECT)	**Applicable Period**	**AAR (landings per hour)**	**CONSTRAINT/REMARK**

ATFM MEASURES			
Location (AD or SECT)	**Applicable Period**	**AAR (landings per hour)**	**CONSTRAINT/REMARK**

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

EXAMPLE ATFM DAILY PLAN

ATFM Daily Plan	RJJJ	1504022000 - 1504031959

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

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

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

……

APPENDIX D: ATFM TERMINOLOGY AND COMMUNICATIONS

ATFM Terminology - General

Acronym	Term	Definition
AAR	Airport Acceptance Rate	Arrival capacity of an airport normally expressed in movements per hour
ADR	Airport Departure Rate	Departure Capacity of an airport normally expressed in movements per hour
ASD	Aircraft Situation Display	ATC Aircraft/Traffic Situation Display
AFIX	Arrival Fix	A waypoint during the arrival phase of a flight. In the context of ATFM it could a waypoint where an ATFM Measure may be applied
CDM	Collaborative Decision-Making	Process which allows decisions to be taken by amalgamating all pertinent and accurate sources of information, ensuring that the data best reflects the situation as known, and ensuring that all concerned stakeholders are given the opportunity to influence the decision. This in turn enables decisions to best meet the operational requirements of all concerned.
CDR	Conditional Route	ATS route that is available for flight planning and use under specific conditions
DFIX	Departure Fix	The first published fix/waypoint used after departure of a flight.
DMAN	Departure Manager	A planning system to improve the departure flows at an airport by calculating the Target Take-Off Time (TTOT) and Target Startup Approval Time (TSAT) for each flight, taking multiple constraints and preferences into account
FCA	Flow Constrained Area	An sector of airspace where normal flows of traffic are constrained, which could be caused by weather, military exercise etc.
FMP	Flow Management Position	A position in any ATCC that monitors traffic flows and implements or requests ATFM measures to be implemented"

Acronym	Term	Definition
GDP	Ground Delay Program	ATFM process where aircraft are held on the ground in order to manage capacity and demand in a specific volume of airspace or at a specific airport. In the process departure times are assigned and correspond to available entry slots into the constrained airspace or arrival slots into the constrained airport
GS	Ground Stop	A tactical ATFM measure where some selected aircraft remain on the ground
MINIT	Minutes in Trail	A tactical ATFM measure expressed as the number of minutes required between successive aircraft. It is normally used in airspace without air traffic surveillance or when transitioning from surveillance to non-surveillance airspace, or even when the spacing interval is such that it would be difficult for a sector controller to measure it in terms of miles
MIT	Miles in Trail	A tactical ATFM measure expressed as the number of miles required between aircraft (in addition to the minimum longitudinal requirements) to meet a specific criterion which may be separation, airport, fix, altitude, sector or route specific. MIT is used to organize traffic into manageable flows as well as to provide space to accommodate additional traffic (merging or departing) in the existing traffic flows. It will never be less than the separation minima.
RFIX	En-route Fix	A waypoint during the en-route phase of a flight. In the context of ATFM it could a waypoint where an ATFM Measure may be applied
SUB	Slot Swapping	The ability to swap departure slots gives AUs the possibility to change the order of flight departures that should fly in a constrained area
-	ATFM Measure	ATFM Measure which will balance demand against capacity or assist in the safe expeditious flow of traffic

ATFM Terminology – Phase of Flight

Acronym	Term	Definition
SOBT	Scheduled off Block Time	The time that an aircraft is scheduled to depart from the parking position
EOBT	Estimated Off Block Time	The estimated time that an aircraft will start movement associated with departure
TOBT	Target Off - Block Time	The time that an aircraft Operator or Ground handler estimates that an aircraft will be ready to startup/pushback immediately upon reception of clearance from the tower.
TSAT	Target Start Up Approval Time	The time provided by ATC taking into account TOBT, CTOT and/or the traffic situation that an aircraft can expect start up/push back approval
COBT	Calculated Off Block Time	A time calculated and issued by ATFM Unit, as a result of tactical slot allocation, at which a flight is expected to pushes back / vacates parking position so as to meet a CTOT taking into account start and taxi time.
AOBT	Actual Off Block Time	The time the aircraft pushes back / vacates parking position (Equivalent to Airline / Handlers ATD – Actual Time of Departure & ACARS=OUT)
STOT	Scheduled Take Off Time	The estimated take off time derived from an aircraft operators schedule, typically based on a standard taxi-out time
PTOT	Planned Take Off Time	Time aircraft is expected to take off derived from the flight plan.
TTOT	Target Take Off Time	The Target Take off Time taking into account the TOBT/TSAT plus Estimated Taxi-Out Time
CTOT	Calculated Take off Time	A time calculated and issued by ATFM Unit, as a result of tactical slot allocation, at which a flight is expected become airborne
ETOT	Estimated Take Off Time	The Estimated take off time taking into account EOBT plus Estimated Taxi-Out Time
ATOT	Actual Take Off time	The time that an aircraft takes off from the runway (Equivalent to ATC ATD–Actual Time of Departure, ACARS = OFF)
SEET	Scheduled Estimated En-route Time	The estimated elapsed time of a flight derived from the aircraft operators schedule

Acronym	Term	Definition
ETO	Estimated Time Over	Estimated time at which an aircraft would be over a fix, waypoint or particular location typically where air traffic congestion is expected
CTO	Calculated Time Over	Time calculated and issued by ATFM Unit, as a result of tactical slot allocation, at which flight is expected to be over a fix, waypoint or particular location typically where air traffic congestion is expected (referred to in FIXM 2.0 as "Airspace Entry Time - Controlled")
PLDT	Planned Landing Time	The expected landing time of a flight derived from the flight plan
SLDT	Scheduled Landing Time	Scheduled time aircraft is expected to land on a runway, typically based on Scheduled In-Block Time (SIBT) and a standard taxi-in time
TLDT	Target Landing Time	Targeted Time from the Arrival Management process at the Threshold, taking runway sequence and constraints into account; Progressively refined planning time used to coordinate between arrival and departure management processes
CLDT	Calculated Landing Time	A landing time calculated and issued by ATFM unit, as a result of tactical slot allocation at which a flight is expected to land on a runway
ELDT	Estimated Landing Time	The estimated time that an aircraft will touch-down on the runway (equivalent to ETA)
ALDT	Actual Landing Time	Actual time an aircraft lands on a runway (Equivalent to ATC ATA –Actual Time of Arrival = landing, ACARS=ON)
SIBT	Scheduled In Block Time	The Time that an aircraft is scheduled to arrive at its first parking position.
CIBT	Calculated In Block Time	An in block time calculated and issued by ATFM unit, as a result of tactical slot allocation at which a flight is expected to be at its first parking position.
AIBT	Actual in block time	The time that an aircraft arrives in-blocks (Equivalent to Airline/Handler ATA –Actual Time of Arrival, ACARS = IN)

ATFM Terminology Map

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

ATFM Phraseology

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

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

Circumstance	Phraseology
Denial of Start-up when requested too early to comply with the given CTOT. (Where supported by State regulation or procedure)	UNABLE TO APPROVE START-UP CLEARANCE DUE SLOT (*time*), REQUEST START-UP AT (*time*)

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APPENDIX E: ATFM TRAINING REQUIREMENTS

[Final version to be provided by end May 2015]

Air Traffic Flow Management Steering Group

Task List

(last updated ATFM/SG/5 3 April 2015)

ACTION ITEM	DESCRIPTION	TIME FRAME	RESPONSIBLE PARTY	STATUS	REMARKS
2/1	Research guidance on qualifications and competencies for ATFM operators	~~ATFM/SG/5~~ 31 May 2015	Specialist Team/Secretariat	Open	~~First Draft of Training Requirement Document has been provided.~~ Final version to be provided
2/2	Research guidance material on ATFM compliance	~~ATFM/SG/5~~ ATFM/SG/6	Specialist Team/Secretariat	Open	Can be sourced from EUROCONTROL
2/3	Further develop draft Regional Framework for Collaborative ATFM.	ATFM/SG/5	Specialist Team/Secretariat	~~Open~~ Closed	Second draft to be compiled from outcomes of ATFM/SG/4
2/4	Produce interim regional ATFM guidance (extracted from draft Regional Framework).	18 July 2014	Specialist Team/Secretariat	Closed	Reconsidered need for Interim Guidance. Final draft version of Framework can be used as interim guidance pending APANPIRG adoption and further concept development
2/5	Align Asia/Pacific BANP Volume 1 ATFM provisions with the ATFM framework and Doc 9971	~~ATFM/SG/5~~ ATM/SG/6	Secretariat	Open	In consultation with ATFM/SG May require longer time frame due to transition to EANP.
2/6	Develop Regional priorities, targets and performance monitoring metrics for ASBU Module B0-NOPS	March 2014	Specialist Team/Secretariat	Completed	To be provided to APANPIRG Sub-Group Chairs by March 2014

ACTION ITEM	DESCRIPTION	TIME FRAME	RESPONSIBLE PARTY	STATUS	REMARKS
2/7	Conduct study to establish regional baseline of ATFM capability and develop recommended implementation strategies.	ATFM/SG/4 ATFM/SG/5	IATA	~~Open~~ Completed	Decision 2/2. Study Phase 1 completed and provided to ATFM/SG/4
3/1	Provide copy of Indonesia Manual of Runway and Airspace Capacity Measurement	28 March 2014	Indonesia	Closed	Requires translation from Bahasa Indonesia.
3/2	Provide information on airport and airspace capacity assessment methodology for framework development	ATFM/SG/4	China	Completed	ATFM/SG/4 WP/19
3/3	Coordinate with MET/R TF Secretary for information on potential Annex 3 amendments including MSTA	18 July 2014	Secretariat	Completed	ATFM/SG/4 IP/02
3/4	Provide Points of Contact for IATA Study	21March 2014	States/ATFM/SG Participants	Completed	
3/5	Coordinate with MET/R TF to invite appropriate Aviation Meteorology experts to participate in ATFM Specialist Team activities.	Ongoing	Secretariat	Open	
3/6	Develop a list of ATFM terminologies, definitions, their meanings and application, identifying a minimum set for interoperability	ATFM/SG/5	CANSO, India Japan Singapore, Thailand	~~Open~~ Completed	Minor amendments to be coordinated following ATFM/SG/4 WP/06 review.
3/7	Provide list of airport and airspace capacity improvements Incorporate Thailand capacity improvement suggestions (ATFM/SG/3 WP14)	ATFM/SG/5	CANSO Secretariat	~~Open~~ Completed	Capacity improvements suggestions received. Require some explanatory notes for inclusion in Framework.
3/8	Provide list of aptitudes, skills, experience recommended for Flow Managers and ATFMU operators	ATFM/SG/5	CANSO	~~Open~~ Completed	Received by Secretariat. Will also be updated as part of Training guidance
3/9	Research and extract appropriate information and guidance from Eurocontrol A-CDM Manual to use as guidance material in the Regional ATFM Framework	ATFM/SG/4	ICAO/Secretariat/Specialist Team	Closed	Referred to AOP/WG
3/10	Expand and develop CDM Project assessment form to include assessment of ATFM implementation	ATFM/SG/5	Secretariat/Specialist Team	~~Open~~ Closed	

ACTION ITEM	DESCRIPTION	TIME FRAME	RESPONSIBLE PARTY	STATUS	REMARKS
3/11	Further develop concept of ATFM Categories of Airspace	ATFM/SG/5	Secretariat/Specialist Team	~~Open~~ Completed	Refinement/simplification commenced. Further refinement following ATFM/SG/4 review
3/12	Develop draft training curriculum topics based on Thailand suggested. ATFM/SG/3 IP05	ATFM/SG/5	Secretariat/Specialist Team	~~Open~~ Completed	Draft Training Document presented to ATFM/SG/4. Undergoing further development before inclusion in Framework
3/13	Research best practice for development of ICD by ICAO regional groups.	~~ATFM/SG/5~~ ATFM/SG/6	Secretariat	Open	Requires specialist skills. May require formation of a technical group.
3/14	Adapt Thailand CDM/ATFM Concept of Operations for inclusion in Regional Framework (ATFM/SG/3 WP15)	ATFM/SG/5	Secretariat/Thailand/Specialist Team	~~Open~~ Completed	Initial work done. Minor amendments to be made to render charts generic.
3/15	Adapt multi-nodal distributed network concept for inclusion in Regional Framework. Add discussion of airspace capacity constraints and emphasis on *cross-border* ATFM.	ATFM/SG/5	Secretariat/Specialist Team	~~Open~~ Completed	Initial work done and reviewed by ATFM/SG/4.
4/1	Provide draft guidance on CDM processes for inclusion in Framework	ATFM/SG/5	India/Secretariat	~~Open~~ Completed	
4/2	Develop simple guidance on capacity assessment .	ATFM/SG/5	Secretariat/Specialist Team	~~Open~~ Completed	ATFM/SG/4 WP/19
4/3	Further refinement of ATFM Principles	ATFM/SG/5	Secretariat/Specialist Team	~~Open~~ Completed	ATFM/SG/4 WP/10
4/4	Update ASBU Applicability (Framework Background Info)	ATFM/SG/5	Secretariat/Specialist Team	~~Open~~ Completed	ATFM/SG/4 WP/11
4/5	Further develop concept of minimum information exchange interaction, ATFM phrases, AFTN messages, and exchange mechanisms for information such as capacity constraints and ATFM daily plan	ATFM/SG/5	Secretariat/CANSO	~~Open~~ Closed	ATFM/SG/4 WP/12
4/6	Coordinate ATFM terminology and proposed communications formats/protocols with AOP/WG	~~ATFM/SG/5~~ 30 April 2015	Secretariat	Open	ATFM/SG/4 WP/14

ACTION ITEM	DESCRIPTION	TIME FRAME	RESPONSIBLE PARTY	STATUS	REMARKS
4/7	Develop guidance for factors to be considered when determining MET products to support ATFM	ATFM/SG/5	Secretariat/specialist Team	~~Open~~ Completed	ATFM/SG/4 WP/21
~~4/7~~ **4/8**	Clarify ATFM/SG Terms of Reference and other APANPIRG information relating to the expected term of the Steering Group	ATFM/SG	Secretariat	Open	Firm view of the group that ATFM/SG should continue beyond the production of Version 1.0 of the Framework.
5/1	Poor on time performance of BOBCAT aircraft subject to ATFM procedures has direct impact on efficiency of ATFM procedures. All parties to undertake investigation as to reason for poor on-time performance including: a) Incorrect flight planned EET, b) Non compliance with BOBCAT AWUT – early and late departures c) Non compliance with BOBCAT Kabul entry time – early and late at Kabul entry fix.	~~Update SAIOCG/~~5 ATFM/SG/6	Affected States, IATA	Open	Transferred to ATFM/SG by SAIOACG/5 Poor punctuality performance is actively being monitored and rectified where possible by IATA/States. SAIOACG/5: this is still problematic.
5/2	More information from BOBCAT to be made available for tactical decisions in addition to the Kabul FIR entry	~~2013~~ ATFM/SG/6	Thailand, India	Open	Transferred to ATFM/SG by SAIOACG/5 Thailand will communicate with stakeholders about an upgrade in terms of sharing information more like a CDM system. It needs to be clear that the extra information was not a ‘controlling’ tool.

ACTION ITEM	DESCRIPTION	TIME FRAME	RESPONSIBLE PARTY	STATUS	REMARKS
5/3	BOBCAT slot allocation may be considered beyond 2000 – 2359UTC ATFM/SG/5: Need information on what the problems are: e.g. incomplete implementation of 50NM separation, concentration of flights on too few routes. Capacity constraints.	~~2013~~ ATFM/SG/6	India/Thailand	Open	Transferred to ATFM/SG by SAIOACG/5 India to provide data to support an extension. All involved to consider operational impact. Thailand to consider operational impact of the extension – need to share data and airlines to look at impact. Such change will require a 90-day notice.
5/4	~~Sanya FIR Restrictions~~ Cross-boundary restrictions on flights through the Sanya FIR (several States)	ATFM/SG/6	China/Hong Kong China/RSO	Open	Transferred to ATFM/SG by SEACG/22 The SEACG/21 meeting was apprised of concerns that the Sanya FIR was occasionally imposing increased longitudinal spacing requirements. The parties to meet and discuss a resolution plan.
5/5	Finalize Training Requirements Guidance Document for inclusion in Draft Framework	31 May 2015	EU(AATIP), supported by Thailand	Open	EU/AATIP advised ATFM/SG/5 that the document would be finalized by 31 May 2015, following inclusion of other material presented at the meeting and final consultation with EUROCONTROL.

ACTION ITEM	DESCRIPTION	TIME FRAME	RESPONSIBLE PARTY	STATUS	REMARKS
5/6	Circulate Framework for Collaborative ATFM in whole form for final ATFM/SG comment.	17 April 2010	Secretariat	Open	All document sections finalized at ATFM/SG/5
5/7	State Letter to provide States with prior notification of Framework presentation to ATM/SG	30 April 2010	Secretariat	Open	
5/8	FIXM extension to support CTO at AFIX and any other requirements identified	30 November 2018	SWG	Open	May be needed to support CTO at RFIX/AFIX, for Framework Performance Improvement Plan Phase II (Nov 2018)
5/9	Provide names/contact details of ATFM/IR/SWG contacts	17 April 2015	SWG States	Open	
5/10	Develop Draft Operational Requirements Document	ATFM/SG/6	ATFM/IR/SWG	Open	Dependent on meeting schedule cycle
5/11	In cooperation with the ACS ICG, develop an interface control document (ICD) for cross border ATFM described in the Regional Framework for Collaborative ATFM	ATFM/SG/6	ATFM/IR/SWG	Open	Dependent on meeting schedule cycle
5/12	Research and Development (from Framework)	ATFM/SG/8	ATFM/SG/7	Open	Dependent on meeting schedule cycle
5/13	Research ATFM for long range flights	ATFM/SG/6	India	Open	
5/14	Review of Regional Collaborative Framework for ATFM	Ongoing	ATFM/SG	Open	
5/15	IATA Study Phase 2 Development of Detailed Implementation Recommendations	ATFM/SG/6	IATA	Open	
5/16	WP to ATM SG relating to the continuance of the ATFM/SG	ATM/SG	Co-Chairs and IATA	Open	