



International Civil Aviation Organization

THE SECOND MEETING OF AERONAUTICAL COMMUNICATION SERVICE (ACS) IMPLEMENTATION CO-ORDINATION GROUP OF APANPIRG (ACSICG/2)

Bangkok, Thailand, 20 - 22 May 2015

Agenda Item 7: System Wide Information Management (SWIM)

ATFM STEERING GROUP OUTCOMES

(Presented by the Secretariat)

SUMMARY

This paper presents outcomes from the Asia/Pacific Air Traffic Flow Management Steering Group (ATFM/SG), related to the development of an interface control document for the proposed regional ATFM network.

1. Introduction

1.1 The Asia/Pacific Air Traffic Flow Management Steering Group (ATFM/SG), originally formed by APANPIRG/20 in 2009, held its first meeting December 2010. Having completed all tasks, including the development of an Asia/pacific Region ATFM Concept of Operations, the group went into recess.

1.2 APANPIRG/24 (Bangkok, Thailand, 24 to 26 June 2013) reconvened the ATFM/SG under *Conclusion 24/15: Asia/Pacific ATFM Steering Group*, in order to develop a common Regional ATFM framework addressing ATFM implementation and operational issues in the Asia/Pacific Region.

1.3 ATFM/SG/5 (Bangkok, Thailand, 30 March – 3 April 2015) produced the final draft version of the *Asia/Pacific Region Framework for Collaborative Air Traffic Flow Management*, which will be presented to the ATM Sub-Group of APANPIRG before then being presented for endorsement by APANPIRG/26 in September 2015.

2. Discussion

Draft Framework for Collaborative ATFM

2.1 In drafting the Framework for Collaborative ATFM, ATFM/SG recognized the impracticability of establishing a central ATFM facility to serve the Asia/Pacific Region, such as the EUROCONTROL network management facility. The group consequently adopted the *Distributed Multi-Nodal ATFM Network* as a concept. The concept is envisaged as interconnected States and/or sub-Regional groups of States operating in an ATFM network without the need for a central, physical facility providing the network management function. Untried elsewhere, the concept originated in a Regional ATFM Concept of Operations, developed as a collaborative effort between Singapore and industry partners, later expanded to include Hong Kong China, Malaysia and Thailand. **Figure 1** illustrates the concept.

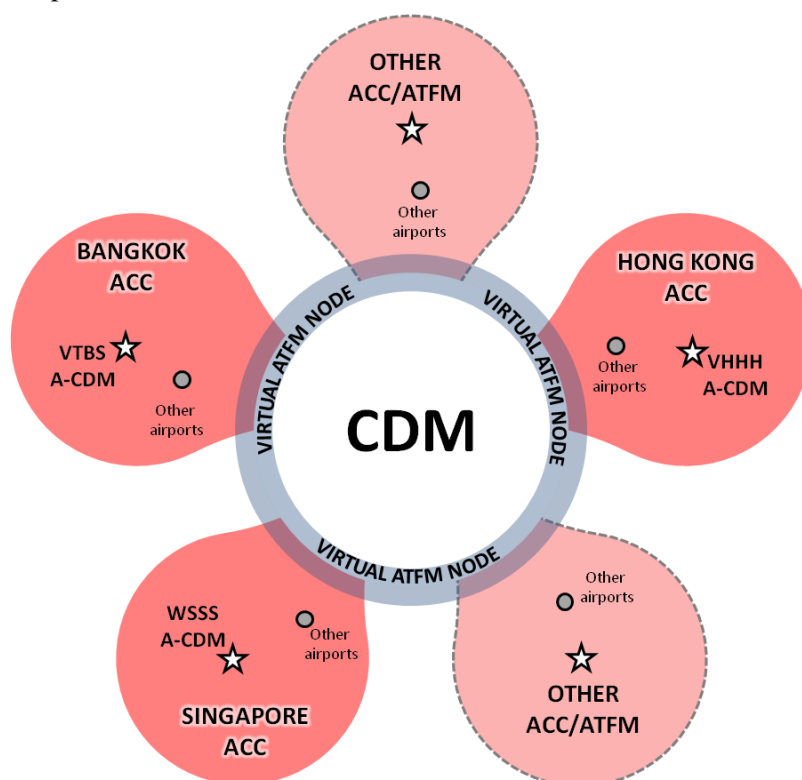


Figure 1: A Distributed Multi-Nodal ATFM Network

2.2 The Draft Regional Framework for Collaborative ATFM is appended to the ATFM/SG/5 meeting report, available on the ICAO Asia/Pacific Regional Office meetings web-page at <http://www.icao.int/APAC/Meetings/Pages/2015-ATFM-SG5.aspx>.

Interoperability is the Key

2.3 The Draft 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

Draft Framework was developed in line with ATM performance improvement elements of Asia Pacific Seamless ATM Plan.

2.4 A key consideration in the drafting of the Framework 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).

ATFM Terminology

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

2.6 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.

2.7 ATFM/SG developed a standardized ATFM terminology for the Asia/Pacific Region to promote harmonization and interoperability of CDM/ATFM systems and procedures. 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. The terminology will define each item of information that is exchanged in the distributed multi-nodal ATFM network.

2.8 The terminologies developed by ATFM/SG are provided in **Attachment A**.

ATFM System Communications

2.9 Regional and Global interoperability of communications is critical to the implementation of effective, network-based cross-border ATFM. The FIXM was recognized by ATFM/SG as being 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 intended as a data interchange format

for sharing information about flights throughout their lifecycle, among all relevant domains (**Figure 2**).

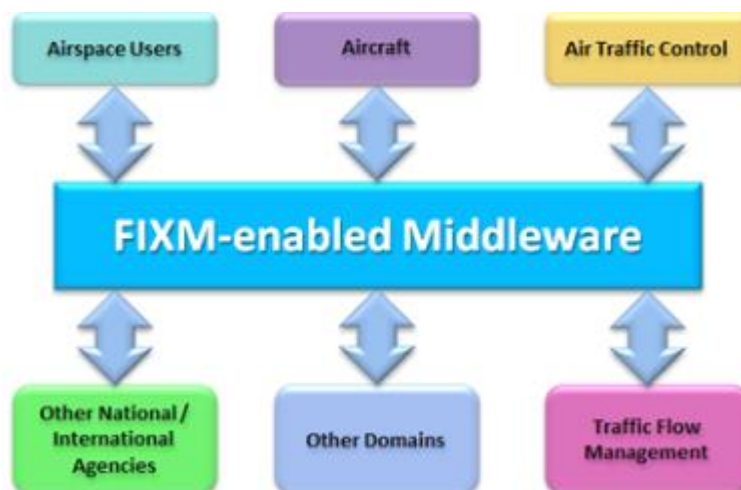


Figure 2: FIXM Interoperability among Domains

2.10 FIXM is referenced in Global Air Navigation Plan's Aviation System Block Upgrades (ASBU) modules and roadmap:

- **ASBU B1-FICE** – Increased Interoperability, Efficiency and Capacity through Flight and Flow Information for a Collaborative Environment Step-1 (FF-ICE/1)¹ application before Departure;
 - Introduces FF-ICE, Step 1 providing ground-ground exchanges using a common flight information reference model (FIXM) and extensible markup language (XML) standard formats before departure.
- **ASBU B1-DATM** – **Service Improvement through Integration of all digital ATM Information Implements the ATM information reference model, integrating all ATM information, using common**
 - Implements the ATM information reference model, integrating all ATM information, using common formats (UML/XML and WXXM) for meteorological information, FIXM for flight and flow information and Internet protocols.

¹ 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.

2.8 ATFM/SG determined that FIXM version 3.0 (or later), extended where necessary to accommodate additional regional requirements, will be the agreed ATFM information exchange model for exchanging ATFM data between ATFM systems in the Asia/Pacific Region. More information on FIXM is available at www.fixm.aero.

ATFM Information Distribution

2.9 The Draft Framework proposes that ATFM Daily Plans (ADP) 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

2.10 Considering the scope and performance objectives of this version of the Draft 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.

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

2.11 The acronyms used in Table 1 are explained the ATFM Terminology section of the Draft Framework, provided in **Attachment A** to this paper.

ATFM Communications by AFS

2.12 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.

2.13 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.

2.14 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.

2.15 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 website².

Operational and Technical Requirements for the Exchange of ATFM Information

2.11 ATFM/SG/5 discussed the need for development of an operational requirements document for the exchange of ATFM information, and an interface control document (ICD) for technical ATFM communications solutions. The meeting made 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 **Attachment B**.

2.12 The meeting is invited to note that the ATFM/IR/SWG TOR require that the ICD is developed in cooperation with ACSICG.

2.13 The composition of the SWG is currently being finalized. It is envisaged that its initial work, commencing in the near future, will include *inter-alia* the drafting of a skeletal ICD based on templates used for Asia/Pacific Region ICDs.

ATFM Performance Objectives

2.14 The Draft Framework includes a Performance Improvement Plan, comprised of performance objectives that, where practicable, are aligned with or expand upon the performance objectives of the Asia/Pacific Region Seamless ATM Plan. The Framework’s performance improvement plan is structured in 3 phases:

2.15

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

2.16 The first performance objective requiring the network capability to exchange information is expected to be implemented in Phase 1B:

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.

3. Action by the Meeting

3.1 The meeting is invited to:

- a) note the information contained in this paper;
- b) agree to cooperate in the development of a regional ICD for ATFM information exchange, including the offline provision of expert input where requested ; and
- c) discuss any relevant matters as appropriate.

ATTACHMENT A: ATFM TERMINOLOGY

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.
RFX	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

ATTACHMENT B: ATFM/IR/SWG TOR

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.
