International Civil Aviation Organization

The Seventh Meeting of System Wide Information Management Task Force (SWIM TF/7)

Bangkok, Thailand, 09 – 12 May 2023

Agenda Item 3: Updates on the assigned tasks by task leads/contributors including progress report and issues

c) Technical Architecture

- Task 4: Development and Maintenance of Regional Information Exchange Models

UPDATE ON INFORMATION EXCHANGE MODEL DEVELOPMENT TO SUPPORT ATFM OPEARTIONS, ATFM/A-CDM INTEGRATION, AND FF-ICE/TBO IN ASIA/PACIFIC REGION

(Presented by Thailand)

SUMMARY

This paper presents the update on FIXM version 4.2 Extension development to support the ATFM information exchange required for cross-border ATFM operations, ATFM/A-CDM integration, and FF-ICE/TBO in the Asia/Pacific Region. It also provides the details of FIXM version 4.2 Extension developed and tested. Moreover, it gives the update on the possible usage of FLXM to support the exchange of ADP.

1. INTRODUCTION

1.1 It was specified in the Asia/Pacific Regional Framework for Collaborative Air Traffic Flow Management (ATFM), version 3 (August 2017), developed by the Asia/Pacific ATFM Steering Group (ATFM SG) that FIXM (Flight Information Exchange Model) version 3.0 (or later), extended where necessary to accommodate additional requirements, was the agreed ATFM information exchange model for exchanging ATFM data between ATFM systems in the Asia/Pacific Region.

1.2 Under its Terms of Reference (TOR), the Asia/Pacific SWIM Task Force (SWIM TF) is required to support APANPIRG Working Groups and Task Forces regarding information exchange models and examine if any extension to the existing information exchange models, i.e. AIXM (Aeronautical Information Exchange Model), FIXM, and IWXXM (ICAO Meteorological Information Exchange Model), and/or the new information exchange model(s) are required for the Asia/Pacific regional operational requirements.

1.3 In 2017, based on the operational requirements for ATFM data exchange, including the detailed interaction among related stakeholders involving in the cross-border ATFM operation, obtained from ATFM SG, a set of ATFM data attributes was derived and examined against FIXM version 4.0. With the finding that the Calculated Take-Off Time (CTOT) and Calculated Landing Time (CLDT) fields considered necessary to support the cross-border ATFM operations were not included in the FIXM version 4.0 Core, the FIXM version 4.0 Extension including CTOT and CLDT was developed. A system-to-system interconnection test between Singapore and Thailand to validate the exchange of developed FIXM version 4.0 Extension was successfully conducted in August 2017 using the CTOT

Distribution and CTOT Cancellation use cases designed based on the Web Services (HTTP) messaging protocol.

1.4 With the release of FIXM version 4.1 in December 2017, a set of required ATFM data attributes was re-examined and it was still found that both CTOT and CLDT fields were not part of the FIXM version 4.1 Core. The FIXM version 4.1 Extension with CTOT and CLDT included was therefore developed and the validation of developed FIXM version 4.1 Extension was completed in the end of April 2018.

1.5 Based on the operational scenarios developed for the SWIM in ASEAN Demonstration, additional data attributes required to be exchanged among stakeholders involving in A-CDM (Airport-Collaborative Decision Making) operation and to support the integration between ATFM and A-CDM were identified. Consequently, the FIXM version 4.1 Extension was further developed to include these data attributes. In November 2019, the FIXM version 4.1 Extension aforementioned was adopted by APANPIRG/30 to be the Asia/Pacific FIXM version 4.1 Extension for use by Asia/Pacific States/Administrations to support the cross-border ATFM information exchange. This Asia/Pacific FIXM Extension was also uploaded to the ICAO Asia/Pacific Regional Office website. Moreover, the Asia/Pacific FIXM Extension was forwarded to the FIXM Change Control Board (CCB) for review and it was published on the FIXM official website for use by other stakeholders as well. **Table 1** shows the list of data attributes included in the Asia/Pacific FIXM version 4.1 Extension.

Estimated	**Calculated**	**Target**	**Actual**
		TOBT	AOBT
		TSAT	
	CTOT	TTOT	
ETO	CTO		ATO
ELDT	CLDT		
Other			
Trajectory		**Aircraft Track**	
• ETO • CTO • ATO • Flight level or Altitude • Waypoint		• Ground speed • Heading • Flight level or Altitude • Position (Designator or Latitude/Longitude or Relative Point) • Time over position	

Table 1: Asia/Pacific FIXM version 4.1 Extension Data Attributes

1.6 It is worth mentioning that the Asia/Pacific FIXM version 4.1 Extension was used to support the conduct of operational scenarios regarding cross-border ATFM operations and ATFM/A-CDM integration during the SWIM in ASEAN Demonstration in November 2019. The demonstration results illustrated that, with the SWIM infrastructure and related information services designed and developed for the demonstration, the Asia/Pacific FIXM Extension could be utilized for the efficient information sharing among stakeholders in the distributed ATFM network environment.

2. DISCUSSION

2.1 The Asia/Pacific Regional Framework for Collaborative ATFM was updated to be version 4 (October 2022) and FIXM version 4.2 (or later), extended where necessary, was identified as the agreed ATFM information exchange model for the Asia/Pacific region.

2.2 With the release of FIXM version 4.2 in February 2021, the Asia/Pacific FIXM version 4.1 Extension had been updated to version 4.2. Based on the operational scenarios developed for the Multi-Regional TBO (Trajectory Based Operation) Demonstration Phase 1 and Phase 2A during 2020 and 2022, additional data attributes required to support A-CDM, traffic synchronization, FF-ICE (Flight and Flow Information for a Collaborative Environment), and TBO were identified. FIXM version 4.2

Extension was therefore developed to include these data attributes in addition to the data attributes included in the Asia/Pacific FIXM version 4.1 Extension.

2.3 However, after the thorough examination of FIXM version 4.2 Core, it was found that FIXM version 4.2 Core can support the exchange of some data attributes originally included in the Asia/Pacific FIXM version 4.1 Extension. The list of data attributes included in FIXM version 4.2 Extension, compared to the Asia/Pacific FIXM version 4.1 Extension, is presented in Appendix A.

2.4 A system-to-system interconnection test among Japan, Singapore, and Thailand to validate the exchange of developed FIXM version 4.2 Extension was successfully conducted during the Multi-Regional TBO Demonstration Phase 2A (Lab Demonstration) in May 2022 using simulated operational scenarios, involving the following use cases:

- Exchange of trajectory parameters;
- Sharing of aircraft trajectory information;
- FF-ICE/R2 post-departure (airborne) trajectory negotiation and revision;
- ATFM/AMAN (arrival management) integration;
- Sharing of traffic sequence information; and
- Exchange of A-CDM milestones and the FF-ICE/R1 & A-CDM integration.

Following the test, it was found that the additional options to support the exchange of aircraft track information were required. The FIXM version 4.2 Extension was thus further developed. Namely, the alternatives to exchange aircraft position were extended to be not only latitude/longitude but also designator, relative point, NAVAID, and aerodrome as well. Appendix B provides the details of this FIXM version 4.2 Extension.

2.5 During the Multi-Regional TBO Lab Demonstration aforementioned, the exchange of ATFM Daily Plan (ADP) using the Flow Information Exchange Model (FLXM) version 2.0a, which is the information exchange model developed to support the sharing of ATFM-specific information, was also tested. It was learned that this version of FLXM may not be able to support the exchange of all information contained in the Asia/Pacific regional ADP format. However, this issue may be solved by additionally defining the possible usage of current data attributes in the data dictionary of this FLXM version.

2.6 The Extension development and test progress was presented at the Fifth Meeting of SWIM TF (SWIM TF/5) and the Twelfth Meeting of ATFM SG (ATFM SG/12) in August 2021 and September 2022, respectively. Furthermore, the Thirteenth Meeting of ATFM SG (ATFM SG/13) held in April 2023 was informed, by the Technical Sub-Group of the AMNAC (Asia-Pacific Cross-Border Multi-Nodal ATFM Collaboration) Core Team, of the need to identify the specific FIXM version to support the harmonized implementation across the Asia/Pacific region in the future, and that the FIXM version 4.2 with Extension was identified. The ATFM SG/13 was also shared that the FIXM version to be selected should be able to support not only the ATFM information exchange but also the transition to the FF-ICE/R1 operation.

2.7 Noting the need for system-to-system ATFM information exchange between enabled ATFM Nodes as well as for ATFM/A-CDM integration as described in the Asia/Pacific Regional Framework for Collaborative ATFM, version 4 (October 2022) and discussion at the ATFM SG/13, it is proposed that this FIXM version 4.2 Extension be adopted as the Asia/Pacific FIXM version 4.2 Extension and be made available for immediate use by Asia/Pacific Administrations. It is further proposed that this FIXM Extension be presented to the FIXM Change Control Board (CCB) for review and publication on the FIXM official website.

<table>
<tr><td colspan="3">Draft Conclusion SWIM/TF/7/xx – Asia/Pacific Regional FIXM version 4.2 Extension</td></tr>
<tr><td colspan="2">What: The FIXM version 4.2 Extension described in SWIM/TF/7 WP/16 Appendix B be:
a) adopted as the Asia/Pacific FIXM version 4.2 Extension;
b) uploaded to the ICAO Asia/Pacific Regional Office website for immediate use by Asia/Pacific Administrations, where capability to do so exists, for cross-border ATFM information exchange and to support ATFM/A-CDM integration; and
c) presented to the FIXM CCB for review and publication on the FIXM official website.</td><td>Expected impact:
☐ Political / Global
☐ Inter-regional
☐ Economic
☐ Environmental
☒ Ops/Technical</td></tr>
<tr><td>Why: To provide the information exchange model necessary to support cross-border ATFM and ATFM/A-CDM integration in the Asia/Pacific Region, in order to support the implementation of performance objectives of the Asia/Pacific Regional Framework for Collaborative ATFM</td><td colspan="2">Follow-up: ☐Required from States</td></tr>
<tr><td>When: 12-May-23</td><td colspan="2">Status: Draft to be adopted by PIRG</td></tr>
<tr><td colspan="3">Who: ☒Sub groups ☐APAC States ☒ICAO APAC RO ☐ICAO HQ ☐Other: XXXX</td></tr>
</table>

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this paper;

b) discuss the proposal on the adoption of the Asia/Pacific FIXM version 4.2 Extension and agree to Draft Conclusion proposed in Paragraph 2.7; and

c) discuss any relevant matter as appropriate

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Appendix A

FIXM version 4.2 Extension Data Attributes

Data Attribute	FIXM version 4.2
Originally included in the Asia/Pacific FIXM version 4.1 Extension	
ETO (Estimated Time Over)	Core
ELDT (Estimated Landing Time)	Core
CTOT (Calculated Take-Off Time)	Core
CTO (Calculated Time Over)	Core
CLDT (Calculated Landing Time)	Core
TOBT (Target Off-Block Time)	Extension
TSAT (Target Start-up Approval Time)	Extension
TTOT (Target Take-Off Time)	Extension
AOBT (Actual Off-Block Time)	Extension
ATO (Actual Time Over)	Extension
Trajectory • ATO • Flight level or Altitude • Position (Designator or Latitude/Longitude or Relative point)	Extension
Aircraft Track • Ground speed • Flight level or Altitude • Heading • Position (Designator or Latitude/Longitude or Relative point or NAVAID or Aerodrome) • Time over position (Report time)	Extension
Newly identified	
EIBT (Estimated In-Block Time)	Core
TIBT (Target In-Block Time)	Extension
TTO (Target Time Over)	Extension

Appendix B

Apac XSD Description

Namespace	Description
Apac	FIXM Extension containing data attributes to support cross-border Air Traffic Flow Management (ATFM) operations and the integration between ATFM and Airport-Collaborative Decision Making (A-CDM), in accordance with Distributed Multi-Nodal ATFM Network concept and the Airport-Collaborative Decision Making operations in the Asia/Pacific region.

Class	Definition	Reference/Remark
ApacDepartureType	Class containing ATFM data related to departure aerodrome	This class is to be included in extension field under Departure Type class.
Data Attribute	Definition	Reference/Remark
actualOffBlockTime	A time the aircraft is pushed back / vacates parking position (equivalent to airline/handlers ATD – Actual Time of Departure and ACARS=OUT)	ICAO Doc 9971 Manual on Collaborative ATFM, 3rd Edition, 2018
targetOffBlockTime	A time that an Aircraft Operator or Ground Handler estimates that an aircraft will be ready to receive start-up approval/push-back clearance	ICAO Asia/Pacific Regional Framework for Collaborative ATFM, Version 4, October 2022
targetStartupApprovalTime	A time provided by ATC taking into account TOBT, CTOT, and/or the traffic situation that an aircraft can expect start-up/push back approval	ICAO Asia/Pacific Regional Framework for Collaborative ATFM, Version 4, October 2022
targetedTakeOffTime	A time that an aircraft is targeted to be airborne, taking into account TOBT, TSAT, and other factors such as EXOT, wake turbulence, SID, etc.	● ICAO Asia/Pacific Regional Framework for Collaborative ATFM, Version 4, October 2022 ● EUROCONTROL A-CDM Implementation Manual, Version 5.0, March 2017

Class	Definition	Reference/Remark
ApacArrivalType	Class containing ATFM data related to destination aerodrome	This class is to be included in extension field under Arrival Type class.
Data Attribute	Definition	Reference/Remark
targetInBlockTime	A time, calculated by an automation system, that an aircraft is expected to be at its first parking position	This time value is not EIBT (Estimated In-Block Time) – The estimated time that an aircraft will arrive in blocks (Ref. EUROCONTROL A-CDM Implementation Manual, Version 5.0, March 2017)

Class	Definition	Reference/Remark
ApacAircraftTrackType	Class containing aircraft track data	This class is to be included in extension field under Flight Type class.
Data Attribute	Definition	Reference/Remark
speed	Current aircraft speed	speed can be in the following forms, • Ground speed; and/or • Indicated airspeed
level	Current flight level	level can be in the following forms, • Flight level; or • Altitude.
heading	Current aircraft heading	
position	Current aircraft position	position can be in the following forms, • Designator; • Latitude/Longitude; • Relative point; • NAVAID; or • Aerodrome.
time	Time when all data in this class is reported	

Class	Definition	Reference/Remark
ApacActualTrajectoryType	Class containing all trajectory elements of a flight	This class is to be included in extension field under Flight Type class.
Data Attribute	Definition	Reference/Remark
element	A list of trajectory elements	

Class	Definition	Reference/Remark
ApacActualTrajectoryElementType	Class containing composition of each trajectory element(s) specified in ApacTrajectoryType	
Data Attribute	Definition	Reference/Remark
level	An estimated flight level of the aircraft at this trajectory element	level can be in the following forms, ● Flight level; or ● Altitude.
point	A specified position of this trajectory element	point can be in the following forms, ● Designator; ● Latitude/Longitude; or ● Relative point.
actualTimeOver	An actual time of the aircraft over routePoint	

Class	Definition	Reference/Remark
ApacRouteTrajectoryElementType	Class containing traffic synchronous information	
Data Attribute	Definition	Reference/Remark
targetTimeOver	A time, calculated and issued by an ATS unit, that an aircraft is requested to be over a fix, waypoint, or particular location	Use case: a time progressively calculated and issued by arrival management (AMAN) system

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ATFM, Version 4, October 2022] [EUROCONTROL A-CDM Implementation Manual,
Version 5.0, March 2017]</xs:documentation>
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