*International Civil Aviation Organization*

**Eleventh Meeting of the Asia/Pacific Air Traffic Flow Management Steering Group (ATFM/SG/11)**

Video Teleconference, 02 – 06 August 2021

**Agenda Item 5: Regional ATFM Framework and Guidance Material**

# APAC USER REQUIREMENTS FOR SWIM-BASED MET INFORMATION SERVICES SUPPORTING ATFM

(Presented by MET/R WG Ad-hoc Group)

**SUMMARY**

This paper presents the way forward to identify and document use cases and user requirements for SWIM-based MET information services supporting ATFM in the APAC region in coordination with other working groups, and presents a draft version of the document for conducting user consultation.

## 1. INTRODUCTION

1.1 At the APAC Meteorology/Air Traffic Management (MET/ATM) Seminar and the Eighth Meeting of the ICAO APAC Meteorological Requirements Working Group (MET/R WG/8) held in May 2019, Australia, Hong Kong China, and Thailand proposed to develop a regional document on use cases and user requirements for System-Wide Information Management (SWIM) based MET information services specifically to support Air Traffic Flow Management (ATFM) in the Asia/Pacific region.

1.2 The proposal was further revised and presented at MET/R WG/9 in May 2020 (MET/R WG/9 WP/04), addressing the comments received at Meteorological Sub-group (MET SG/23), Air Traffic Management Sub-group (ATM SG/7) and Air Traffic Flow Management Steering Group (ATFM SG/10). MET/R WG/9 then established an ad-hoc group, consisting of MET and ATFM subject matter experts from Australia, Hong Kong China, Japan, Pakistan, Republic of Korea, Singapore, Thailand, Vietnam, CANSO, and IATA (**Attachment A**), and endorsed its terms of reference.

1.3 MET SG/24 meeting held in November 2020 reviewed an updated proposal (MET SG/24 WP/24) on the development of APAC use cases and user requirements for SWIM-based MET information services supporting ATFM, including the Terms of Reference (TOR) the scope and objectives of the work to be conducted by the ad-hoc group established at MET/R WG/9 aforementioned. The meeting supported the updated proposal with some minor adjustments to the TOR, and adopted the following Decision:

| | |
|---|---|
| **Decision MET SG/24-13:** *Development of APAC User Requirements for SWIM-based MET Information Services Supporting ATFM* | |
| **What:** That, the MET SG approves the terms of reference at the **Appendix 8** to the MET SG/24 Report regarding the scope and objectives of the MET/R ad hoc group to develop SWIM-based MET information services specifically addressing the needs of ATFM in the APAC Region. | |
| **Why:** To support efforts for effective MET/ATM integration, provide the baseline for further development of the regional SWIM data catalogue and service catalogue and support the development of future MET Information Exchange Services in the Region. | |
| **Expected impact:**<br>☐ Political / Global ☐ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical | |
| **Follow-up:** ☒Required from States | |
| **When:** As soon as practicable | **Status:** Adopted by Subgroup |
| **Who:** ☒Sub groups ☐APAC States ☒ICAO APAC RO ☐ICAO HQ ☒Other: MET/R WG | |

1.4 This paper presents the way forward to identify and document use cases and user requirements for SWIM-based MET information services supporting ATFM in the APAC region, in coordination with SWIM TF and other related working groups, based on the outcomes of MET/R WG/10 held in May 2021.

## 2. DISCUSSION

2.1 The current version of the TOR regarding the scope and objectives of the MET/R ad-hoc group to develop SWIM-based MET information services specifically addressing the needs of ATFM in the APAC region include the following:

(1) To focus on SWIM-based MET information services specifically addressing the needs of ATFM in the APAC region;

(2) To document user requirements and use cases from ATFM in the APAC region to facilitate the development of future SWIM-based MET information services;

(3) To supplement the global concept described in the MET-SWIM Plan, prepared by the METP WG-MIE, and the MET requirements being developed by the METP Working Group on Meteorological Requirements and Integration (WG-MRI) in a global sense and IWXXM development by METP WG-MIE for effective exchange of MET information supporting AFTM operation;

(4) To assist SWIM TF in identifying and developing the specifications of information services required to support operations based on user needs;

(5) To identify MET and ATFM data to be exchanged using SWIM-based Information Exchange Services in the region to enable the effective MET/ATM integration and to provide the baseline for further development of the regional SWIM data catalogue and service catalogue; and

(6) To identify other granular MET-related requirements from ATFM perspective such as update frequency and forecast lead time of MET information to better support the development of future MET Information Exchange Services in the Region.

2.2 To facilitate the development of the use cases and user requirements, the draft reference document with two sample use cases were prepared and presented at MET/R WG/10 (MET/R WG/10 WP/07). It was proposed to use this draft document as a basis to promote discussion with ATFM user groups and relevant stakeholders in APAC region for further development of ATFM-specific use cases and user requirements.

2.3 The MET/R WG/10 WP/07 also presented a proposed collaborative approach by which the ad hoc group, including both MET and ATFM experts, would identify the use cases and user requirements. The user engagement would allow MET experts to better understand the APAC ATFM operations in actual environment and drive the development of SWIM-based MET information services which could better support users' decisions and operational processes.

2.4 The MET/R WG/10 and some ad-hoc group members reviewed the draft reference document and the collaborative approach proposed. Based on comments received and the subsequent discussion at MET/R WG/10, the meeting requested the ad hoc group to:

- Coordinate its work with SWIM TF and other related sub groups, working groups;
- Consider the outcomes from the related global discussion and plan led by ICAO MET Panel and relevant groups;
- Consider the results from the *Survey of State Meteorological Information Supporting Air Traffic Management* (to be conducted in August 2021);
- Revisit the definition of "use case"; and
- Ensure the document does not infer any obligation on States to implement the SWIM-based MET Information Services described.

2.5 In view of the discussion above, the meeting proposed updates to the work plan of the ad-hoc group as follows:

a) In coordination with other related sub groups, working groups, etc.,
   - identify MET factors affecting ATFM operations;
   - identify how often the current MET products be provided and the rules for updates to meet the ATFM needs; and
   - identify any other MET information required by ATFM and gaps to meet the needs of ATFM users.

b) Identify MET and ATFM data to be exchanged using SWIM-based Information Exchange Service

c) Based on the findings (above), develop the APAC use cases and user requirements document for future SWIM-based MET information services supporting ATFM

2.6 The ad-hoc group may consider revising its TOR to make sure that the updated work plan as stated above and the TOR are aligned.

2.7 The proposed draft reference document was updated based on the comments received from MET/R WG/10 and ad-hoc group members and provided in Attachment B for feedback and suggestions and further improvements by ATFM SG/11. Compared to the version presented at MET/R WG/10, the updates to partly address feedback received at MET/R WG/10 as stated in paragraph 2.4, are highlighted in yellow.

## 3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) review the proposed reference document in **Attachment B** and provide suggestions on additional use cases, if any, for further analysis;

b) discuss any relevant matters as appropriate.

…….

**Attachment A**

**Members of MET/R WG Ad-hoc Group for Development of APAC Use Case and User Requirements for SWIM-based MET Information Services Supporting ATFM (Updated in July 2021)**

| State / Administration / IO | Name | Position and/or Organisation | Expertise |
|---|---|---|---|
| Australia | Jesper Bronsvoort | Airservices Australia | ATFM |
| Australia | Ashwin Naidu | BOM | MET |
| CANSO | Stuart Ratcliffe | CANSO | ATFM |
| Hong Kong China | Marco Kok (**Rapporteur**) | HKO | MET/SWIM |
| ~~Hong Kong China~~ | ~~Peter Chadwick~~ | ~~Senior Air Traffic Control Specialist (Strategic Planning) / HKCAD~~ | ~~ATFM~~ |
| Hong Kong China | (Mr) Anfernee Poon | Project Officer / HKCAD | ATFM |
| IATA | John Moore | IATA | ATFM/MET |
| Japan | ITOU Miho | JCAB | ATFM |
| Japan | IKEDA Michiko | JMA | MET |
| Pakistan | Fazal Ur Rehman | PCAA | ATFM |
| Pakistan | Syed Ali Baqadar Shah | PCAA | MET |
| Republic of Korea | Dong-won, LEE | Assistant of Director / KMA | MET |
| Republic of Korea | Jiwon, LEE | Assistant of Director / KMA | MET |
| ~~Singapore~~ | ~~Clarence Foo~~ | ~~Head, ATM development/CAAS~~ | ~~ATFM~~ |
| Singapore | Zhang HuanBin | ~~Head, ATC Specialist/CAAS~~ Head, ATM development/CAAS | ATFM |
| Singapore | Aw Ying Kit | Senior Engineer, ATM Systems /CAAS | ATFM |
| Singapore | Yeo Cheng Xun | MSS | MET |
| Thailand | Amornrat Jirattigalachote (Amo) | Strategic Planning Manager /AEROTHAI | ATFM/SWIM |
| Thailand | Dudsadee Sungthong | Strategic ATFM Team/AEROTHAI | ATFM |
| Vietnam | Mr. Nguyen Van Dung | VATM | MET/ATFM |

**Attachment B**

# APAC USER REQUIREMENTS

# FOR SWIM-BASED MET INFORMATION SERVICES

# SUPPORTING ATFM

**(Draft Version, July 2021)**

**Table of Contents**

(Draft)

## Section 1

## Introduction

Purpose

1.1 The purpose of this reference material is to document ATFM use cases and user requirements in the APAC region to facilitate the development of SWIM-based MET information services. This document does not infer any obligation on States to implement the SWIM-based MET Information Services described.

Background

1.2 The APAC Regional Framework for Collaborative ATFM has been developed and maintained by the Air Traffic Flow Management Steering Group (ATFM/SG) to provide, among other things, the performance improvement plan to address the ATFM implementation and operational issues in the region. The core concept of the Framework is the Distributed Multi-Nodal ATFM Network, i.e. a network of Air Navigation Service Providers (ANSPs) and/or Sub-Regional Groups leading independent ATFM operation within their area of responsibility and connecting to each other through information sharing framework.

1.3 In the APAC region, the SWIM Task Force (SWIM TF) has been established since 2017 to develop SWIM-related components and supporting materials required for the implementation in the APAC region. The work of SWIM TF also includes the coordination with other Working Groups/Task Forces under APANPIRG to ensure that the operational requirements, particularly the ones specific to the region, are reflected and incorporated accordingly in the regional implementation strategies.

1.4 A SWIM Demonstration project was initiated in 2016 under the cooperation framework between Association of Southeast Asian Nations (ASEAN) and the USA. Since then, Singapore and Thailand had been working with the USA to plan out the Demonstration with the main objective to showcase the operational benefits enabled by SWIM in ASEAN and Asia/Pacific region. The SWIM in ASEAN Demonstration was conducted with great success in November 2019, in Bangkok, Thailand and Singapore, with wide participation of aviation stakeholders in ASEAN and Asia/Pacific region, including Civil Aviation Authorities (CAAs), Air Navigation Service Providers (ANSPs), airport operators, airlines, and international organizations such as ICAO APAC Office, IATA. The outcomes of the SWIM in ASEAN Demonstration were captured in detail in the Demonstration Report which covered the details of the demonstration development, including (*i*) development of operational scenarios, including ATFM scenarios, (*ii*) SWIM infrastructure, information services, and SWIM-enabled applications design, development, and test, and (*iii*) observations and lessons learnt recorded.

1.5 SWIM TF/3 held in May 2019 agreed that the SWIM implementation to support cross-border ATFM operation should be given high priority. To prepare for the transition of the provision of MET information in a SWIM environment, a regional document for SWIM-based MET information services to support the specific operational mode of cross-border ATFM in APAC Region, as detailed in the aforementioned Framework, is proposed to be formulated at MET/R WG/8.

## Section 2

## Global Development

2.1 This section provides a brief introduction of globally standardized information exchange models to support the sharing of MET and ATFM information, exchange patterns, and relevant reference documents at global level.

Global and Regional SWIM Developments related to MET and ATM

2.2 According to the Sixth Edition of the ICAO Global Air Navigation Plan (Doc 9750 GANP) Aviation System Block Upgrades (ASBU) SWIM-B2 (2025-2030)[1], the communication based on System-Wide Information Management (SWIM) concept (refer ICAO Doc. 10039 Manual on System Wide Information Management (SWIM) Concept) will improve the current human-to-human communication with machine-to-machine interconnection, enhancing efficiency in data distribution and accessibility through global interoperability among aviation stakeholders. In particular, dissemination of MET information using MET information service in SWIM is included as part of AMET thread in ASBU.

SWIM-based MET Information Services as described in MET-SWIM Plan

2.3 According to the MET-SWIM Plan, being developed by the ICAO Meteorology Panel Working Group on Meteorological Information Exchange (WG-MIE), the exchange of MET information between information producers and information consumers in the SWIM environment can be achieved using two main messaging mechanisms, namely request/reply and publish/subscribe information exchange patterns (Figure 1).

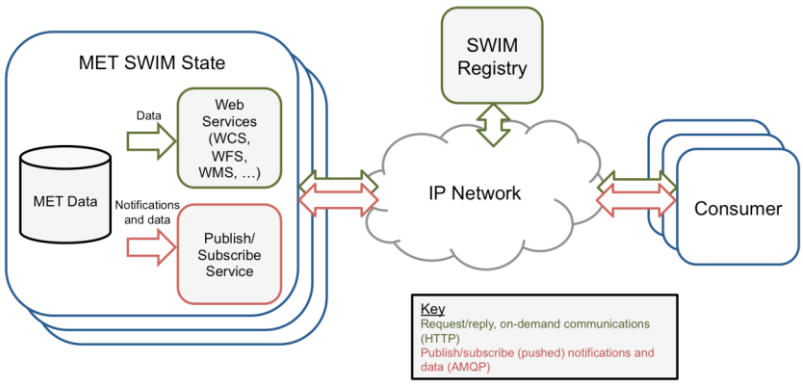


Figure 1: Possible mechanisms of SWIM-based MET Information Exchange Services.

2.4 MET information to be exchanged in SWIM includes ICAO Meteorological Information Exchange Model (IWXXM) messages, gridded products and imageries. IWXXM is the model for exchange of MET information including volcanic ash advisory information, tropical cyclone advisory information, space weather advisory information, METAR and SPECI, TAF, SIGMET and AIRMET. The METP WG-MIE has proposed actions with regards

[1] Note that the current version of ASBU can be referred to https://www4.icao.int/ganpportal/ASBU

to harmonization of IWXXM with other Exchange Models (XMs) and with the ATM Information Reference Model (AIRM) to support interoperability in SWIM.

## Section 3

## Use Cases and User Requirements for SWIM-based MET Information Services to Support ATFM Operation in APAC

3.1 This section provides examples of user requirements and use cases for SWIM-based MET information services to support ATFM operation in APAC. Use case refers to a specific operational scenario in which MET information or service could potentially be used in a real-world environment, including the details of activities conducted by each actors involving in the operation identified.

3.2 Some examples of use cases involve integration of MET and ATFM information in SWIM environment and its potential benefits in supporting cross-border ATFM in APAC. With the MET and ATFM data to be made available via SWIM-based Information Exchange Services, relevant MET data and ATFM data could be integrated to provide new fit-for-purpose information to better support ATFM in the region.

### USE CASE 1: Ground delay ATFM measures at departure aerodromes due to tropical cyclone affecting destination aerodrome

3.3 In this use case, MET information in IWXXM is integrated with aerodrome information in Aeronautical Information Exchange Model (AIXM) to assess the crosswind at destination aerodrome within a specific time period that in turn can be used to evaluate the impact on airport capacity and the need for ATFM measure (Figure 2).

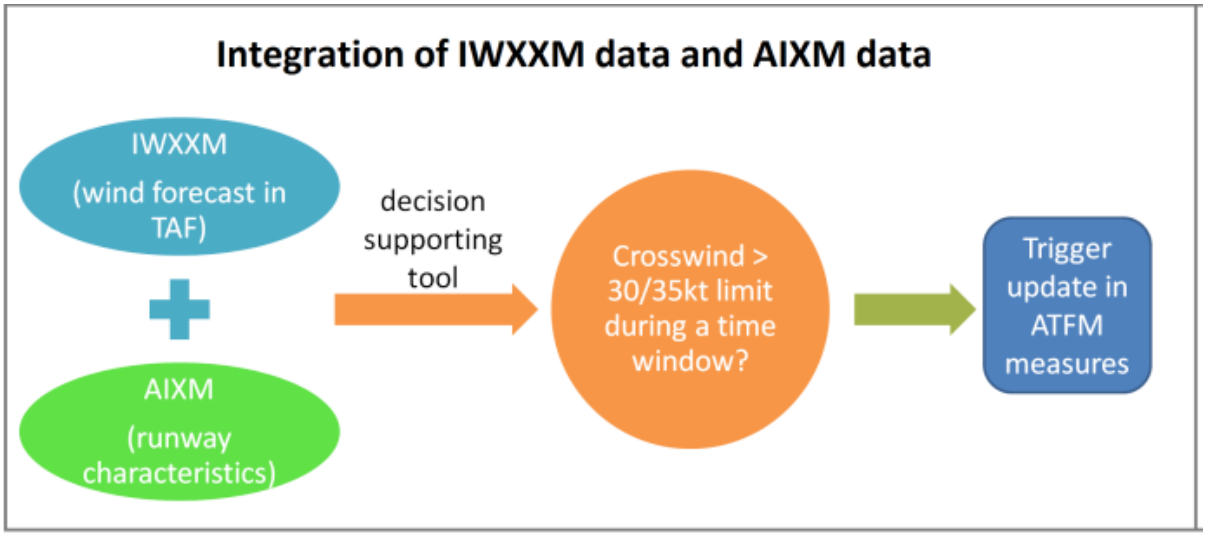


Figure 2: Integration of IWXXM and AIXM Data.

3.4 Figure 2 shows an example of SWIM-enabled MET-ATM Display. It provides a regional overview to allow Air Traffic Controller (ATC) and Flight Operations Center (FOC) to monitor the change in weather impact over the region. It makes use of request/reply information exchange mechanism in SWIM and display how weather change based on users' requested time and flight level inputted.

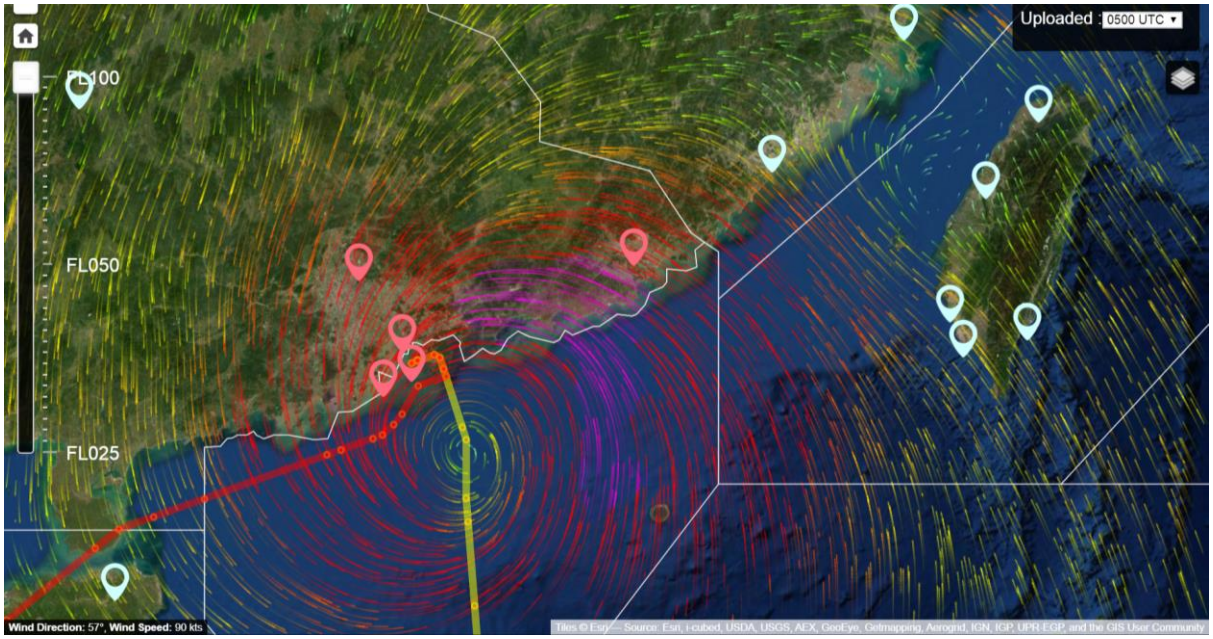


Figure 3: SWIM-enabled MET-ATM Display highlighting aerodromes with landing thresholds exceeded

3.5 In the SWIM-enabled MET-ATM Display, the aerodromes could be highlighted if the weather conditions exceed user-specified operational landing thresholds (such as Visibility, Cloud base, Wind gust, Crosswind) (Figure 3). This facilitates ATC and airlines to monitor the landing condition also at alternate aerodromes.

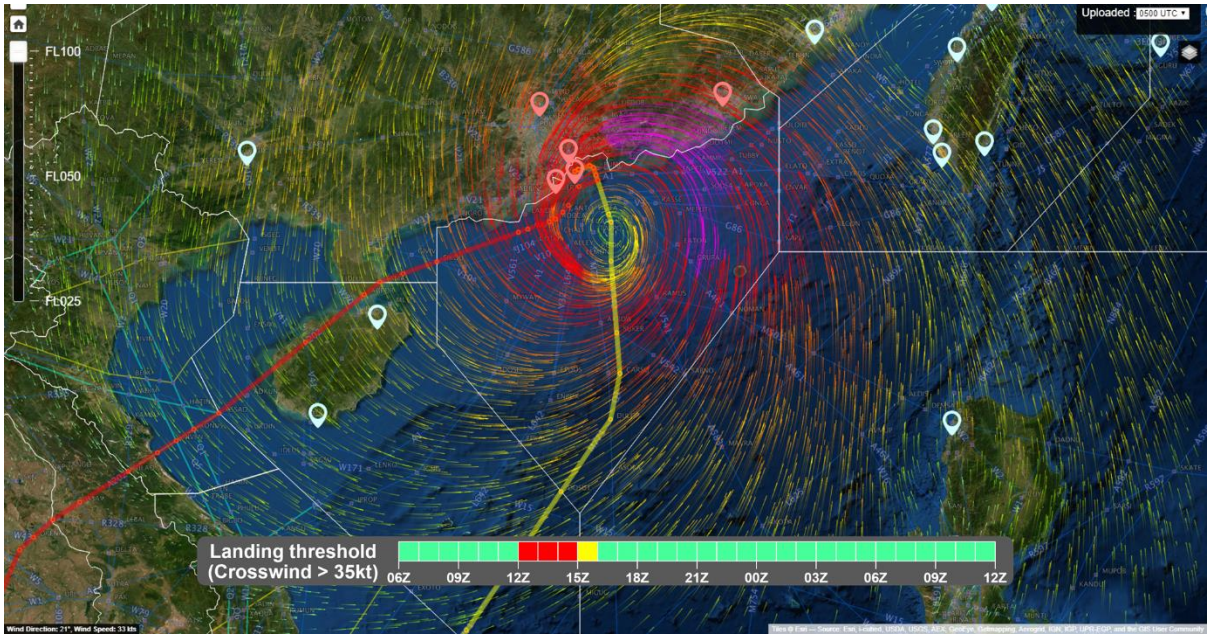


Figure 4: Timeline showing alerts of exceeding user-defined landing threshold

3.6 With the TAF messages exchanged in IWXXM, one of the benefits is that the automatic decision supporting tool could be developed to check whether landing thresholds of aerodromes have been exceeded with respect to time, based on specific weather elements extracted from IWXXM. Figure 4 shows the timeline alerting the time window with expected

crosswinds greater than 35kts. This information would be used to better support ATFM decision making on when the airport arrival rate should be reduced and resumed normal.

**USE CASE 2: Airborne rerouting due to turbulence**

3.7 MET information in IWXXM is integrated with flight information in Flight Information Exchange Model (FIXM) to assess the number of flights crossing areas of significant weather phenomena mentioned in SIGMET reports (such as CBs and associated SEV TURB and SEV ICE) within a requested time period (Figure 5).

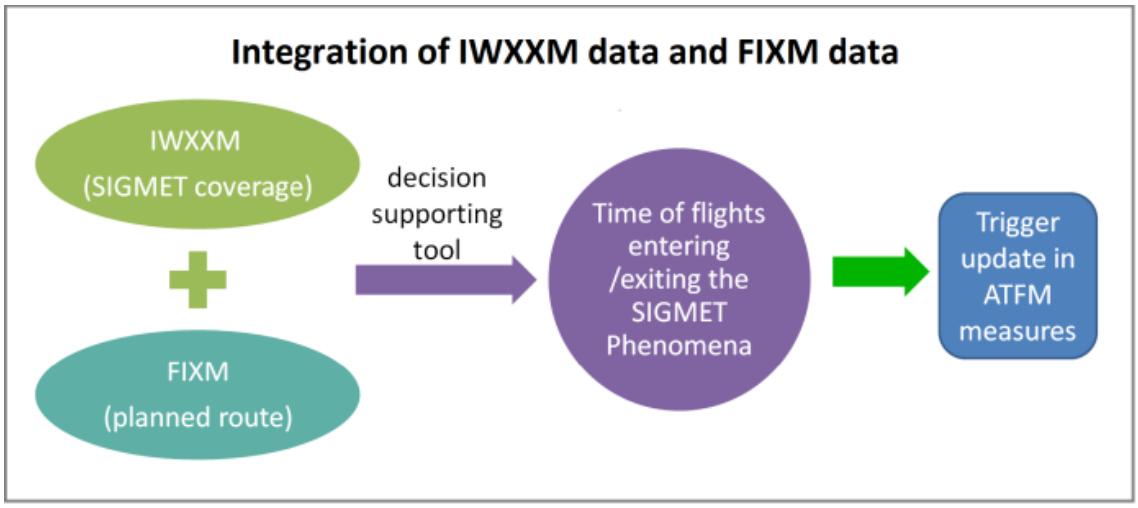


Figure 5: Integration of IWXXM and FIXM Data

3.8 MET service provider could subscribe to the flight information exchange service of relevant ANSP to receive the flight plan published in FIXM and show this information in SWIM-enabled MET-ATM Display.

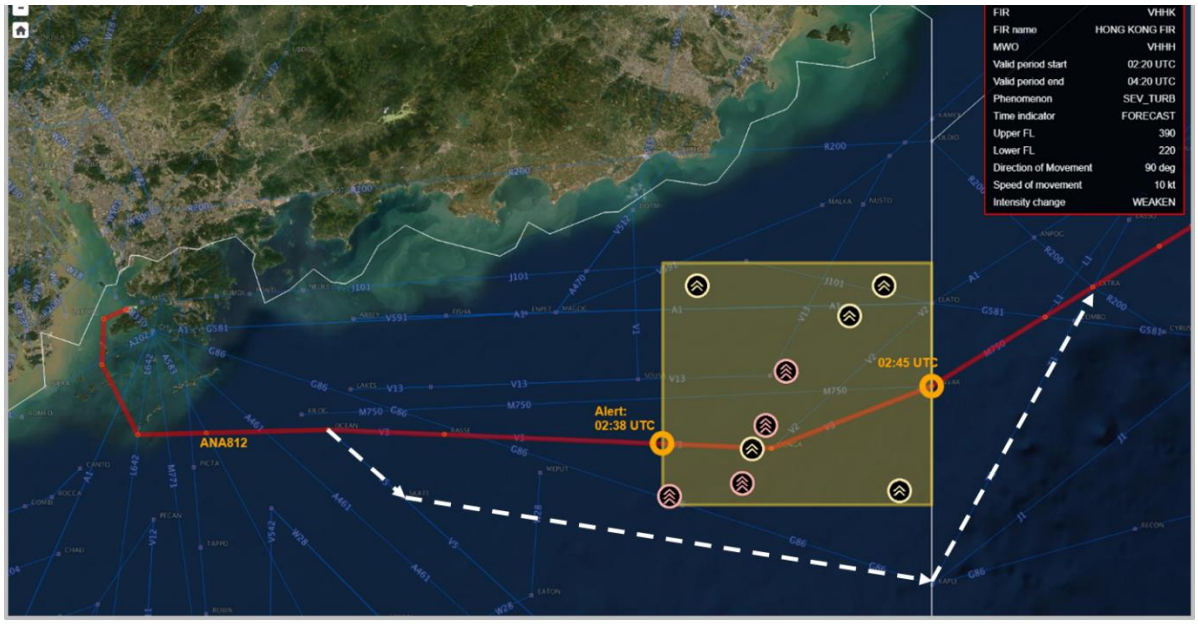


Figure 6 : SWIM-enabled MET-ATM Display showing alerts of the estimated timing for a specific flight entering a SIGMET area and the timing for the flight to depart the SIGMET area

3.9 Figure 6 shows the turbulence reports received from the previous flights crossing the same area. ATC relayed the pilot report (PIREP) to aviation forecasters at MET office. After aviation forecasters analyze these actual turbulence reports together with the model forecast, forecasters predict severe turbulence is likely to persist for two more hours over the same region and issue the severe turbulence SIGMET.

3.10 With the flight plan and SIGMET exchanged in SWIM-based formats, one of the benefits is that flight and MET information could be integrated together in the automatic decision-supporting tool. The tool could provide flight-specific alerts of the estimated timing for the flight entering the turbulence area and the timing for the flight to depart the turbulence area. Such SWIM-enabled MET application could allow the users to respond faster and better support the timely tactical decision making by the ATC and FOC.

**USE CASE 3: Diversions due to volcanic ash**

[Referring to an operational scenario in SWIM in ASEAN Demonstration; details to be developed]

**USE CASE 4: (To be determined)**

## Section 4

## MET Data Catalogue and ATFM Data Catalogue for SWIM-based Operation

4.1 The SWIM-based MET Information Exchange Services have the capability to geospatially and/or temporally filter a data set to provide the users' system with only the tailored information required to fulfill the specific users' needs.

4.2 The table below provides MET and ATFM data which could be exchanged using SWIM-based Information Exchange Services. Such data element identified in the data catalogue could assist the SWIM TF in developing the relevant service catalogue for the APAC region.

| MET data catalogue (draft) | ATFM data catalogue (draft) |
|---|---|
| <u>Aerodrome</u><br>• Surface wind and gust<br>• Headwind<br>• Windshear<br>• Turbulence<br>• Crosswind<br>• QNH<br>• Temperature and dew point<br>• RVR<br>• Visibility<br>• Cloud amount and type<br>• Lightning<br>• Radar data<br>• Wake vortex<br>• Weather phenomenon and intensity<br><br><u>Enroute</u><br>• Wind<br>• Temperature<br>• CB clouds / deep convection area<br>• Icing<br>• Clear air turbulence<br>• Tropopause height<br>• SIGMET phenomenon and intensity<br>• Volcanic ash cloud<br>• Tropical cyclone<br>• Satellite data | • Departure aerodrome<br>• Destination aerodrome<br>• Flight identification<br>• Planned route/trajectory<br>• Estimated Off-Block Time (EOBT)<br>• Estimated Take-Off Time (ETOT)<br>• Estimated Landing Time (ELDT)<br>• Estimated Elapsed Time (EET)<br>• Calculated Take-Off Time (CTOT)<br>• Calculated Landing Time (CLDT)<br>• Target Off-Block Time (TOBT)<br>• Target Start Up Approval Time (TSAT)<br>• Target Take-Off Time (TTOT)<br>• Actual Off-Block Time (AOBT)<br>• Estimated Time Over (ETO)<br>• Calculated Time Over (CTO)<br>• Actual Time Over (ATO) |

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