



ICAO

International Civil Aviation Organization

WORKING PAPER

Tenth Meeting of the Asia/Pacific Meteorological
Requirements Working Group (MET/R WG/10)

Virtual Meeting (Online), 24 -28 May 2021

Agenda Item 5: Coordination between MET and ATM services**APAC USER REQUIREMENTS FOR SWIM-BASED MET INFORMATION
SERVICES SUPPORTING ATFM**

(Presented by Australia, Hong Kong China, and Thailand)
(Proposal for the newly established MET/R WG Ad-hoc Group)

SUMMARY

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

1. INTRODUCTION

2.1 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.

2.2 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 MET SG/23, ATM SG/7 and ATFM SG/10. MET/R WG/9 then established an ad-hoc group, consisting of subject matter experts from MET and ATFM experts from Australia, Hong Kong China, Japan, Pakistan, Republic of Korea, Singapore, Thailand, Vietnam, CANSO, and IATA, and endorsed its terms of reference.

2.3 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 regarding 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 terms of reference, and adopted the following Decision:

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Decision MET SG/24-13: <i>Development of APAC User Requirements for SWIM-based MET Information Services Supporting ATFM</i>	
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: <input type="checkbox"/> Political / Global <input type="checkbox"/> Inter-regional <input type="checkbox"/> Economic <input type="checkbox"/> Environmental <input checked="" type="checkbox"/> Ops/Technical	
Follow-up: <input checked="" type="checkbox"/> Required from States	
When: As soon as practicable	Status: Adopted by Subgroup
Who: <input checked="" type="checkbox"/> Sub groups <input type="checkbox"/> APAC States <input checked="" type="checkbox"/> ICAO APAC RO <input type="checkbox"/> ICAO HQ <input checked="" type="checkbox"/> Other: MET/R WG	

2.4 This paper introduces a proposal for the MET/R WG Ad-hoc Group on documentation of use cases and user requirements for SWIM-based MET information services supporting ATFM in the APAC region.

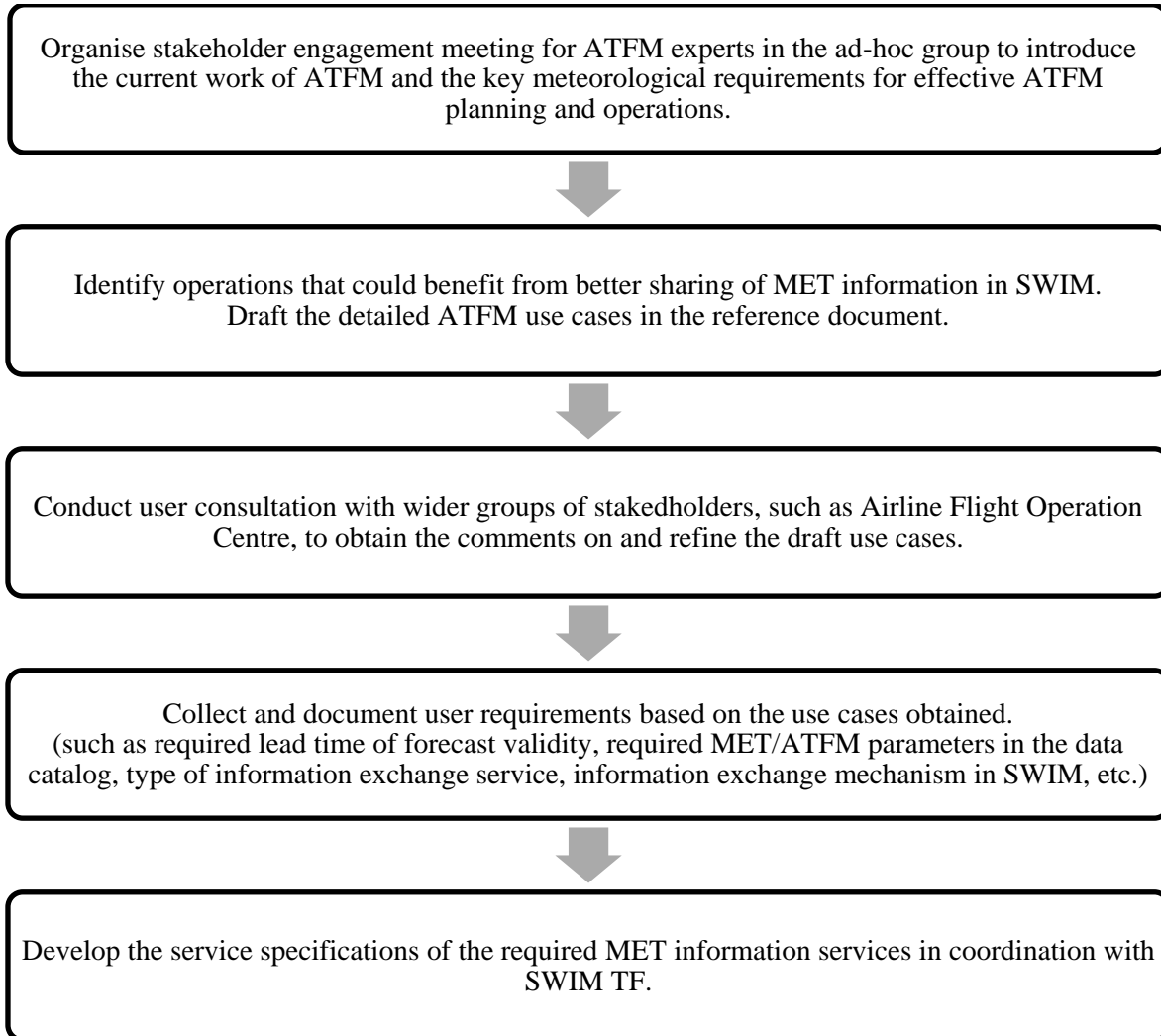
2. DISCUSSION

2.1 The terms of reference 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 ATFM 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, two sample use cases are included in the draft reference document as shown in the **Attachment**, and it is 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 It is proposed that the ad-hoc group plans to take the following collaborative approach involving both MET experts and ATFM experts to identify the use cases and user requirements:



2.4 It is expected that the above user engagement could help understand the APAC ATFM operations in actual environment and drive the development of SWIM-based MET information services which could better support users’ decision and operational processes.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

- a) discuss the proposed reference document in **Attachment** and provide additional use cases, if any, for further analysis;
- b) review the proposal on collaborative approach mentioned in paragraph 2.3; and
- c) discuss any relevant matters as appropriate.

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

(Draft Version, May 2021)

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(Draft)

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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.

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).

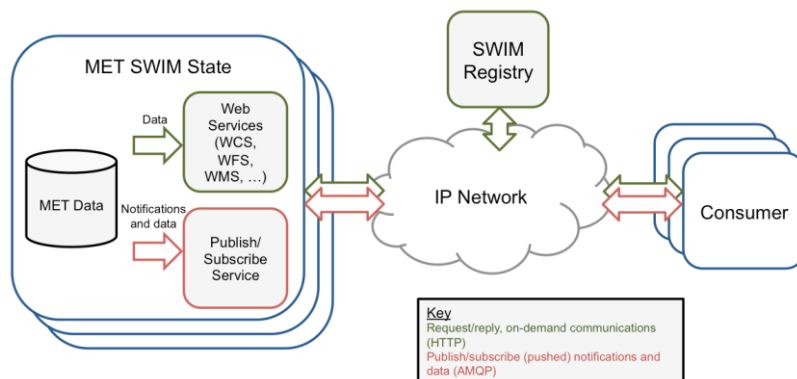


Figure 1: Mechanisms of SWIM-based MET Information Exchange Services.

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,

¹ Note that the current version of ASBU can be referred to at <https://www4.icao.int/ganportal/ASBU>

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tropical cyclone advisory information, space weather advisory information, METAR and SPECI, TAF, SIGMET and AIRMET. The METP WG-MIE has proposed actions with regards 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 Requirements and Use Cases 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. 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.

3.2 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: Weather at Aerodrome - 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).

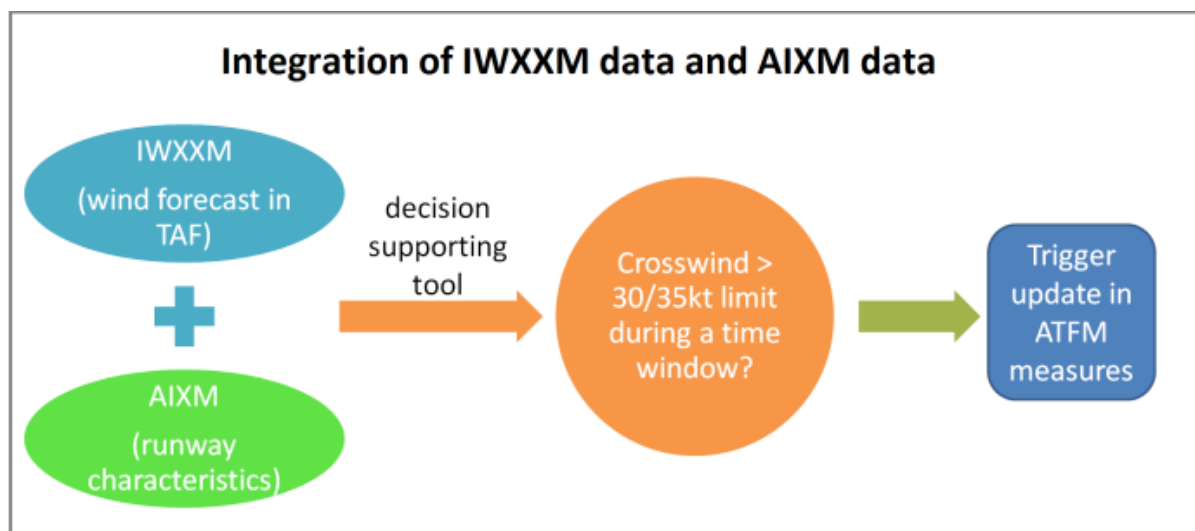


Figure 2: Integration of IWXXM and AIXM Data.

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.

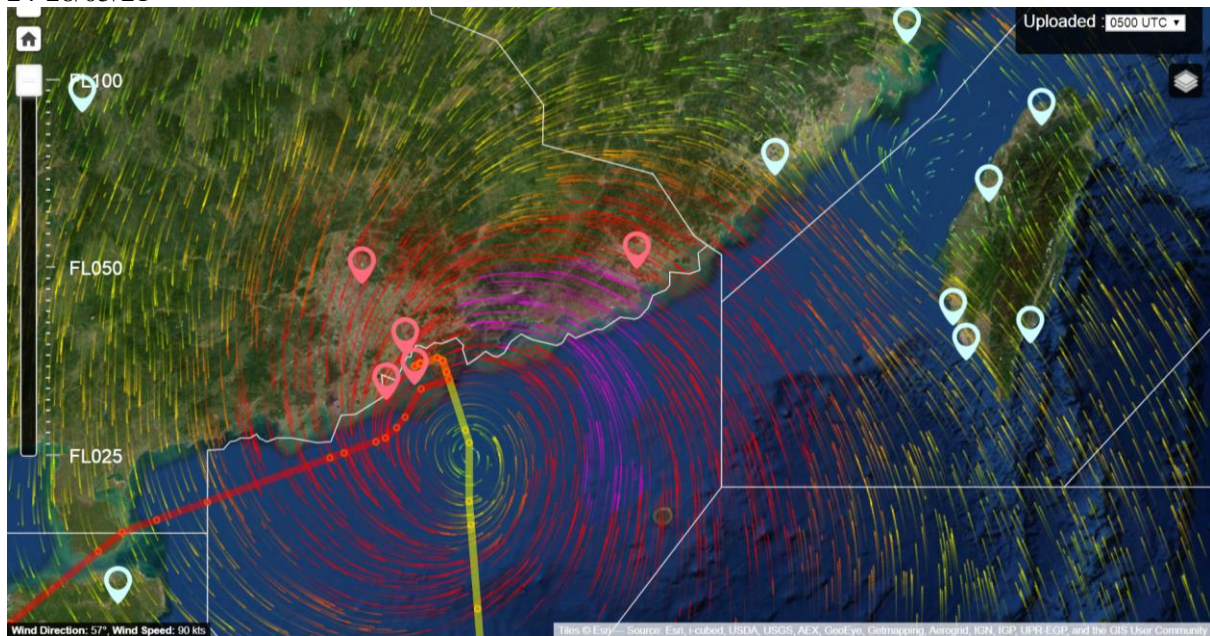


Figure 3: SWIM-enabled MET-ATM Display highlighting aerodromes with landing thresholds exceeded

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.

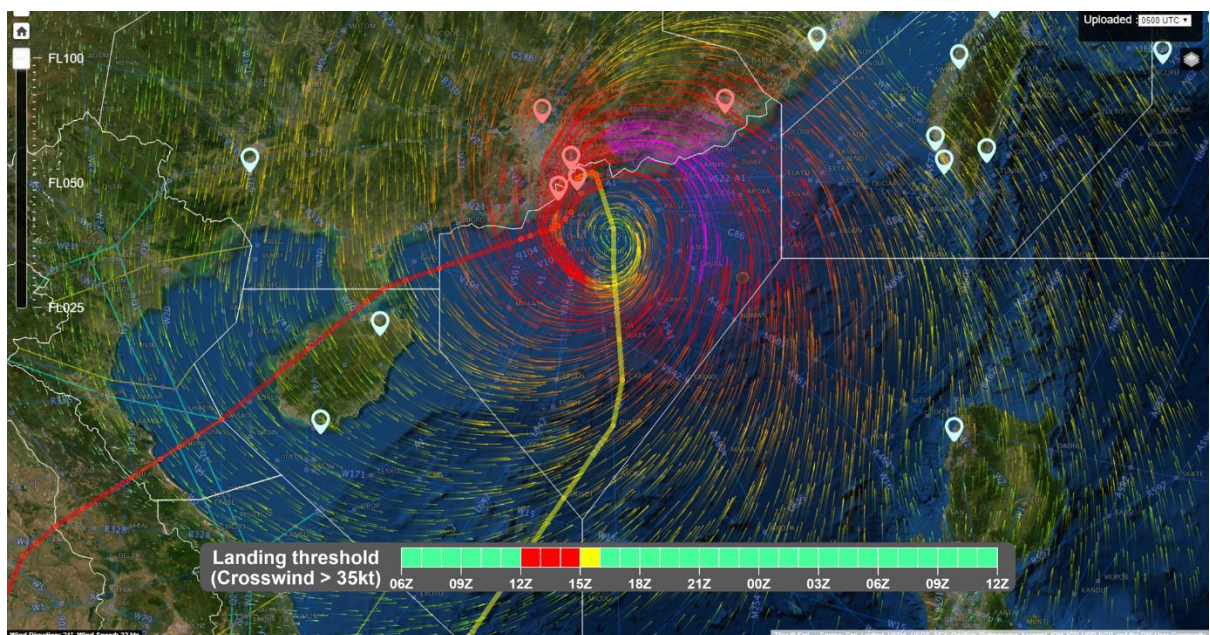


Figure 4: Timeline showing alerts of exceeding user-defined landing threshold

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: En-route weather – Airborne rerouting

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).

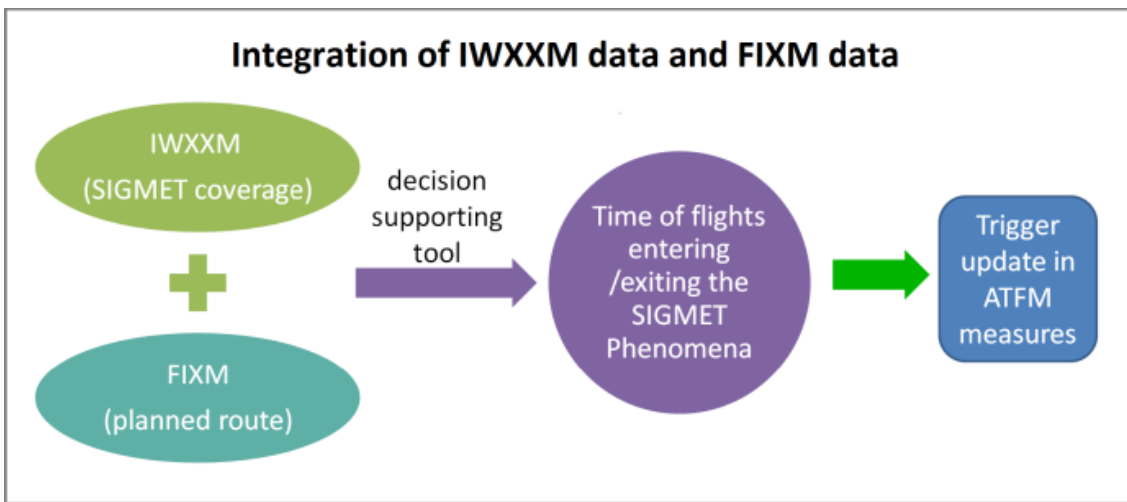


Figure 5: Integration of IWXXM and FIXM Data

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.

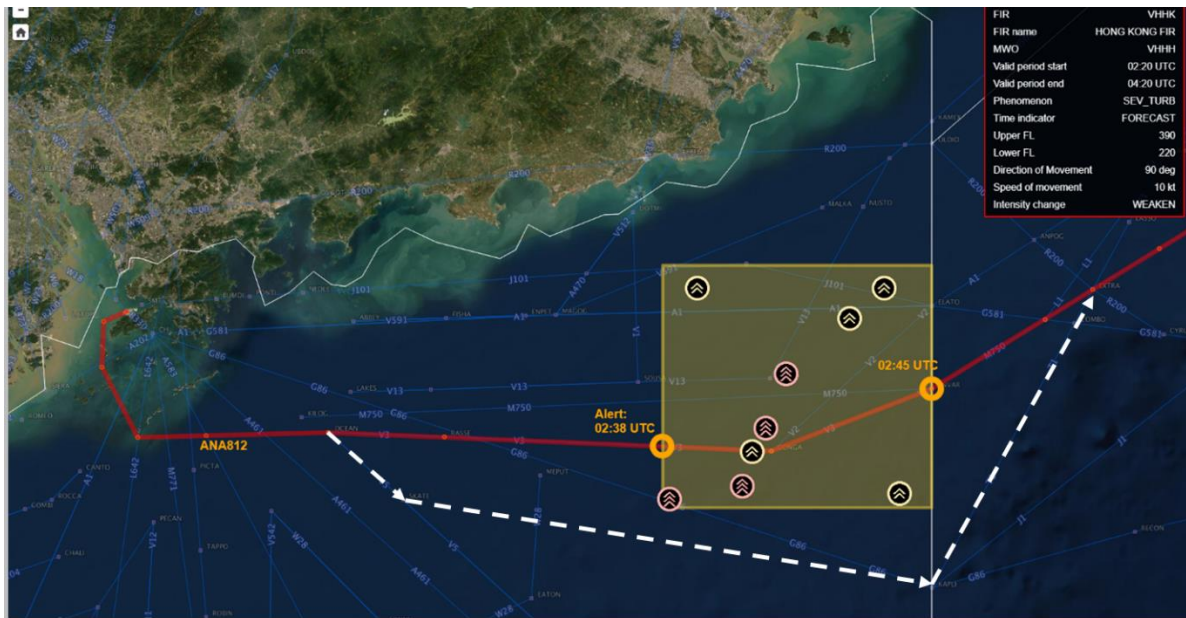


Figure 6 : SWIM-enabled MET-ATM Display showing alerts of the estimated timing for a specific flight entering a SIGMET area and the timing for the flight to depart the SIGMET area

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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: (To be determined)

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)
<p><u>Aerodrome</u></p> <ul style="list-style-type: none"> ● Surface wind and gust ● Headwind ● Windshear ● Turbulence ● Crosswind ● QNH ● Temperature and dew point ● RVR ● Visibility ● Cloud amount and type ● Lightning ● Radar data ● Wake vortex ● Weather phenomenon and intensity <p><u>Enroute</u></p> <ul style="list-style-type: none"> ● Wind ● Temperature ● CB clouds / deep convection area ● Icing ● Clear air turbulence ● Tropopause height ● SIGMET phenomenon and intensity ● Volcanic ash cloud ● Tropical cyclone ● Satellite data 	<ul style="list-style-type: none"> ● Departure aerodrome ● Destination aerodrome ● Flight identification ● Planned route/trajectory ● Estimated Off-Block Time (EOBT) ● Estimated Take-Off Time (ETOT) ● Estimated Landing Time (ELDT) ● Estimated Elapsed Time (EET) ● Calculated Take-Off Time (CTOT) ● Calculated Landing Time (CLDT) ● Target Off-Block Time (TOBT) ● Target Start Up Approval Time (TSAT) ● Target Take-Off Time (TTOT) ● Actual Off-Block Time (AOBT) ● Estimated Time Over (ETO) ● Calculated Time Over (CTO) ● Actual Time Over (ATO)