International Civil Aviation Organization

ICAO

Eleventh Meeting of the Air Traffic Management Sub-Group (ATM/SG/11) of APANPIRG

Singapore, 2 – 6 October 2023

Agenda Item 7:   AOP, MET, AIM, SAR

**APAC USE CASES AND USER REQUIREMENTS FOR SWIM-BASED
MET INFORMATION SERVICES SUPPORTING ATFM**

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

SUMMARY

This paper presents the recent updates on the work 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. The paper invites ATM SG to review the updated draft reference document and provide feedback.

1.   **INTRODUCTION**

1.1   At the Asia/Pacific (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 APAC region.

1.2   The ICAO APAC MET/R WG/9 held in May 2020 established an ad-hoc group and endorsed its terms of reference to support this activity. The ad-hoc group consists of MET and ATFM subject matter experts from Australia, Hong Kong China, Japan, Pakistan, Republic of Korea, Singapore, Thailand, Vietnam, CANSO, and IATA (**Attachment B**).

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 a decision (Decision MET SG/24-13) for MET/R ad-hoc group to develop SWIM-based MET information services specifically addressing the needs of ATFM in the APAC Region.

1.4   At MET/R WG/11 held in 2022, the ad-hoc group presented an updated draft reference document and ToR based on the outcomes from MET SG/24 and the following MET/R WG Meeting. The updated ToR included improved scope, coordination with key ICAO APAC and MET Panel working groups, and plan to consider results from the MET-ATM survey results. Furthermore, the updated version included additional use cases on volcanic ash avoidance and diversion due to fog demonstrated in SWIM in ASEAN Demonstration. MET/R WG/11 supported the above proposals and

adopted the following Decision. The ToR is available at **Attachment C**.

> **Decision MET/R WG/11/04:** *Proposed updates to the draft reference document and ToR for the ad hoc group for APAC user requirements for SWIM-based MET information services supporting ATFM*
>
> Endorse the proposed updates to the draft reference document and ToR for the ad hoc group

1.5   Updated papers were presented at the ATFM/SG/13 in April 2023, MET/R WG/12 in May 2023, SWIM TF/8 in May 2023 and MET SG/27 in September 2023. This paper presents an update on the work including the outcomes from the above related groups.

2.   DISCUSSION

2.1   To promote discussion with ATFM user groups and relevant stakeholders in the APAC region for further development of ATFM-specific use cases and user requirements, the updated draft reference document (as per Decision MET/R WG/11/04) was presented at ATFM/SG/13 held on 3-7 April 2023 by the MET/R WG Chair. The ATFM SG/13 was informed that the ad hoc group would consult ATFM experts to better understand the APAC ATFM operations and supplement the use cases with detailed information; and reminded that the designated ad-hoc group of MET/R WG consists of both ATM and MET experts. As a result, the ATFM/SG/13 meeting agreed to the following action item on contributing to the MET/R WG on further refining SWIM-based MET information service scenarios and developing other scenarios.

> **Action Item 13/8**: Provide feedback and additional use cases for *APAC User Requirements for SWIM-based MET Information Services Supporting ATFM* to MET R/WG ad-hoc group.

2.2   At MET/R WG/12, the ad-hoc group presented the recent updates on the work to identify and document use cases and user requirements in coordination with other working groups and presented an updated draft version of the document for consultation. The ad-hoc group proposed to further update the draft reference document to add the following two use cases which demonstrate the potential benefits of MET information services to APAC ATFM operations in SWIM:

- USE CASE 4: Weather impact assessment based on the occupancy of holding area
- USE CASE 5 (potential future use case): Aircraft spacing management based on real-time surveillance information shared in SWIM

The Meeting noted that the use cases document should clearly differentiate the current and future use cases to avoid confusion.

2.3   The MET/R WG/12 meeting requested the ad-hoc group to seek comments and suggestions from the MET/R WG and ATFM/SG members and submit the updates to the MET SG for further review. The Meeting adopted the following Decision:

> **Decision MET/R WG/12-02:** *APAC Use Cases and User Requirements for SWIM-Based MET Information Services Supporting ATFM*
>
> a) The MET/R WG members and ATFM SG members review the proposed updates to the draft reference document in Attachment A to MET/R WG/12 WP/12, provide comments and provide suggestions on additional use cases, if any, to the ICAO Secretariats by 14 July 2023; and
>
> b) Depending on the feedback and information received, the ad-hoc group would submit an updated reference document to MET SG for review.

2.4　　　　The ad-hoc group also presented the recent updates on the work and draft reference document in SWIM TF/7 meeting held on 8-12 May 2023 to seek feedbacks and comments from the SWIM experts.　The SWIM TF/7 meeting appreciated the paper presented and shared that use cases could be potentially included in the Asia/Pacific regional SWIM implementation guidance material which was being drafted by the Editorial Task Ad-hoc Group of SWIM TF.

2.5　　　　MET SG/27 meeting held in September 2023 reviewed recent updates on the work and draft reference document. The Meeting provided inputs to further improve the document and use cases. The Meeting agreed to present the draft document at the ATM SG/11 further review and feedback.

2.6　　　　After the review by members of ATFM SG, MET/R WG, SWIM TF and MET SG, the draft reference document has been revised based on the comments received and is provided in **Attachment A** of this paper.

2.7　　　　The document would be a living reference under regular review by the ad-hoc group and the use cases could be expanded and improved with known events.　It is expected that the reference document would assist in the development of appropriate MET information services to meet the operational needs of ATFM in the APAC Region.

3.　　ACTION BY THE MEETING

3.1　　　　The meeting is invited to:

a) review the updated draft reference document in **Attachment A** and provide comments, in particular suggestions on additional use cases, if any, for further analysis;

b) discuss any relevant matters as appropriate.

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APAC USE CASES AND USER REQUIREMENTS

FOR SWIM-BASED MET INFORMATION SERVICES

SUPPORTING ATFM

(Draft Version, September 2023)

(Note: Updates made after MET SG/27 are indicated with highlighted text.)

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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. 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.

<u>Global and Regional SWIM Developments related to MET and ATM</u>

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 to 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 services in SWIM is included as part of the Advanced Meteorological Information (AMET) thread in ASBU.

<u>SWIM-based MET Information Services as described in MET-SWIM Plan</u>

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).
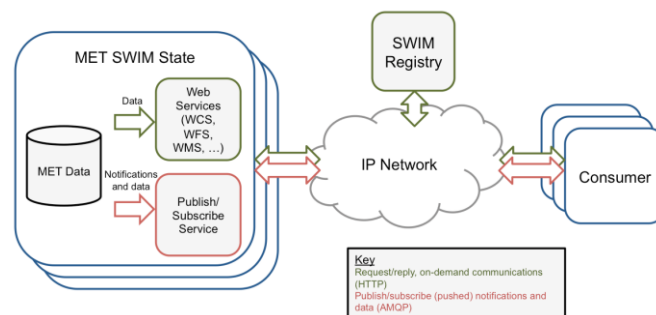

Figure 1: Possible mechanisms of SWIM-based MET Information Exchange Services.

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

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

Section 3

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

3.0.1   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 actor involving in the operation identified.

3.0.2   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: Reduced airport arrival capacity due to tropical cyclone, and the need for ground delay ATFM measure

3.1.1   In this use case, MET information in IWXXM is ingested in the decision supporting tool together 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 applying ground delay ATFM measure for upstream departure aerodromes (Figure 2).
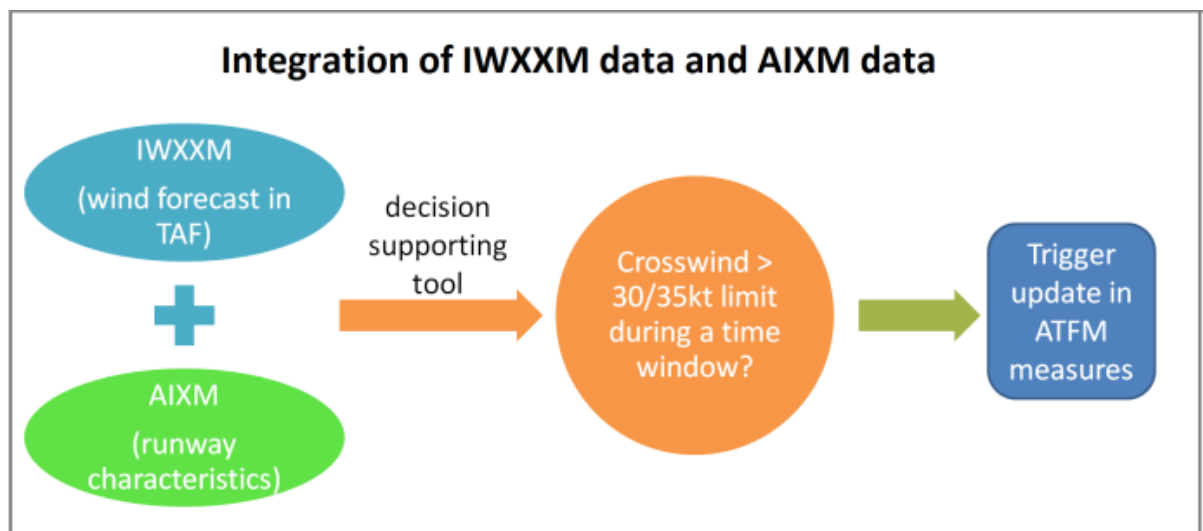

Figure 2: Integration of IWXXM and AIXM Data.

3.1.2   Figure 3 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.
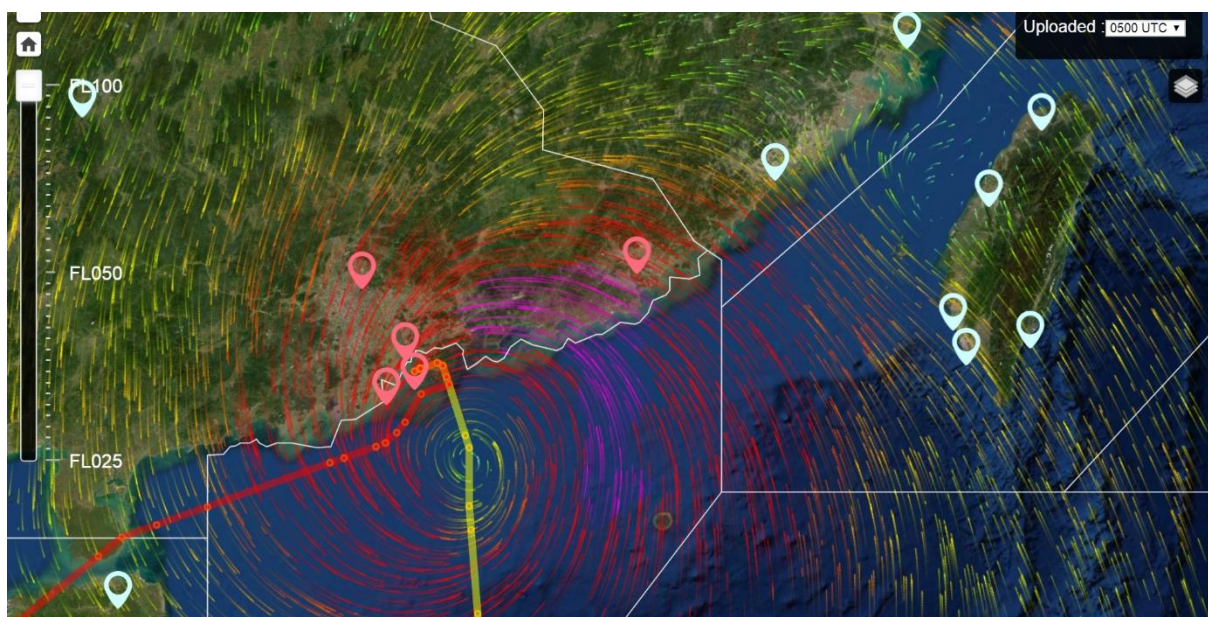

Figure 3: SWIM-enabled MET-ATM Display highlighting aerodromes with landing thresholds exceeded

3.1.3   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 4). This facilitates ATC and airlines to monitor the landing condition also at alternate aerodromes.
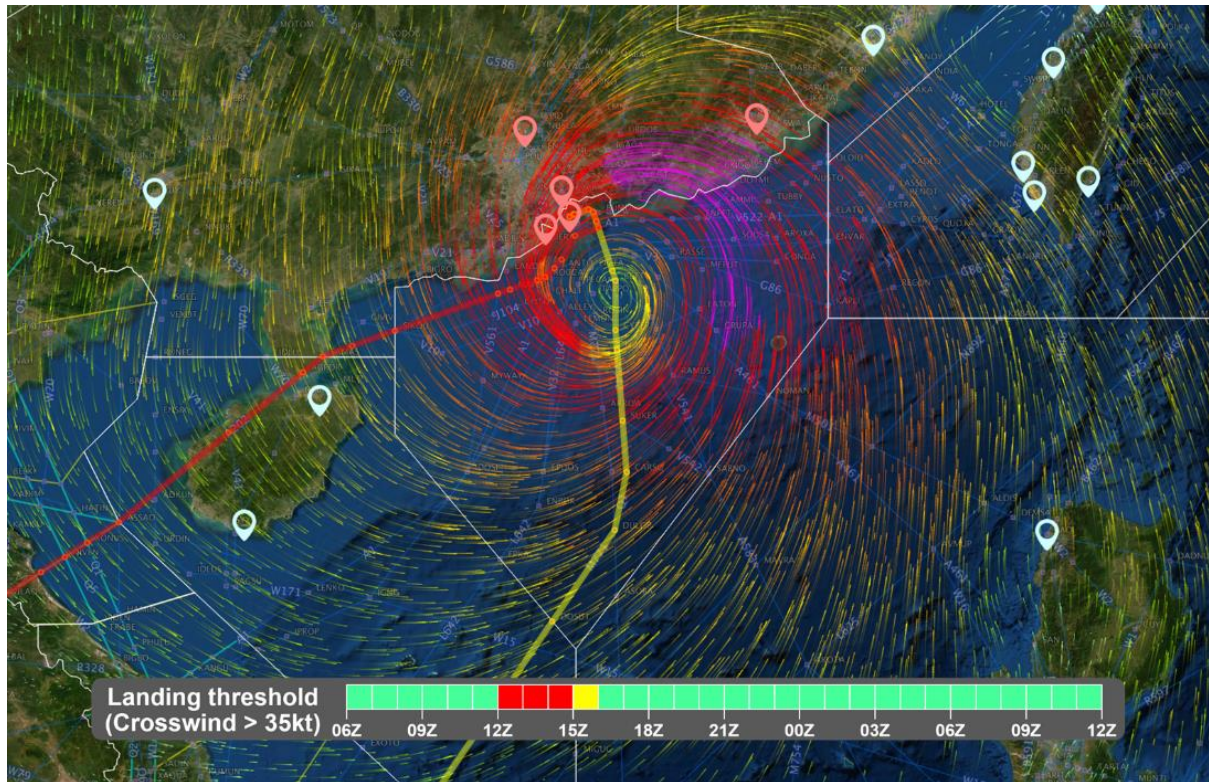

Figure 4: Timeline showing alerts of exceeding user-defined landing threshold

3.1.4   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 35 kts. This information would be used to estimate when the airport arrival rate would be reduced and resumed to support ATFM decision around when to apply or lift the ground delay measure.

USE CASE 2: Airborne rerouting due to turbulence

3.2.1   MET information in IWXXM is integrated with flight information in Flight Information Exchange Model (FIXM) in the decision supporting tool 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).
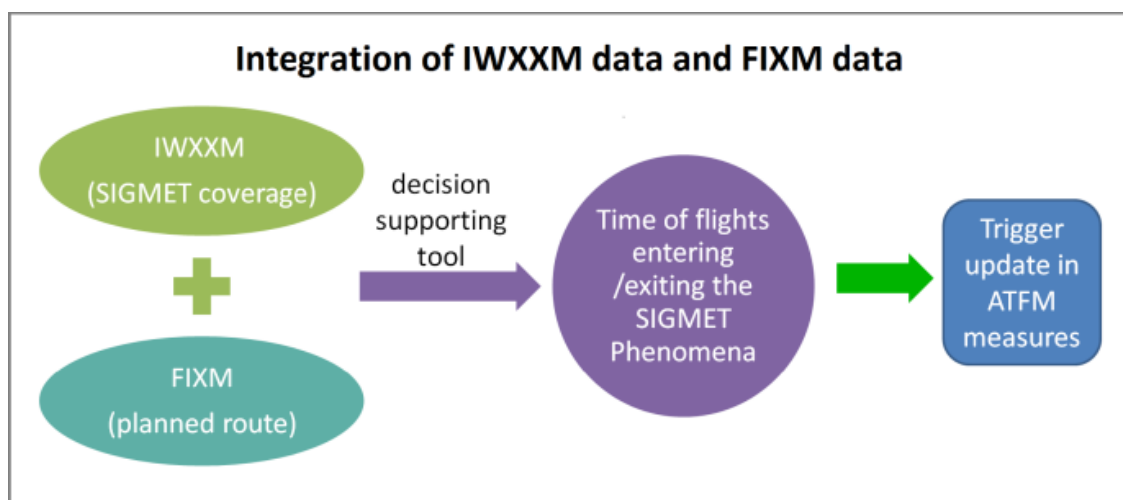

Figure 5: Integration of IWXXM and FIXM Data

3.2.2   ATC or airlines with flight information could subscribe to the hazardous weather service via SWIM to access the weather impacts and the need to plan new flight routes and re-post FIXM. Meanwhile, MET service provider could also subscribe to the flight information exchange service of relevant ANSP to receive the flight plan published in FIXM and show this information on SWIM-enabled MET-ATM Display for situational awareness.
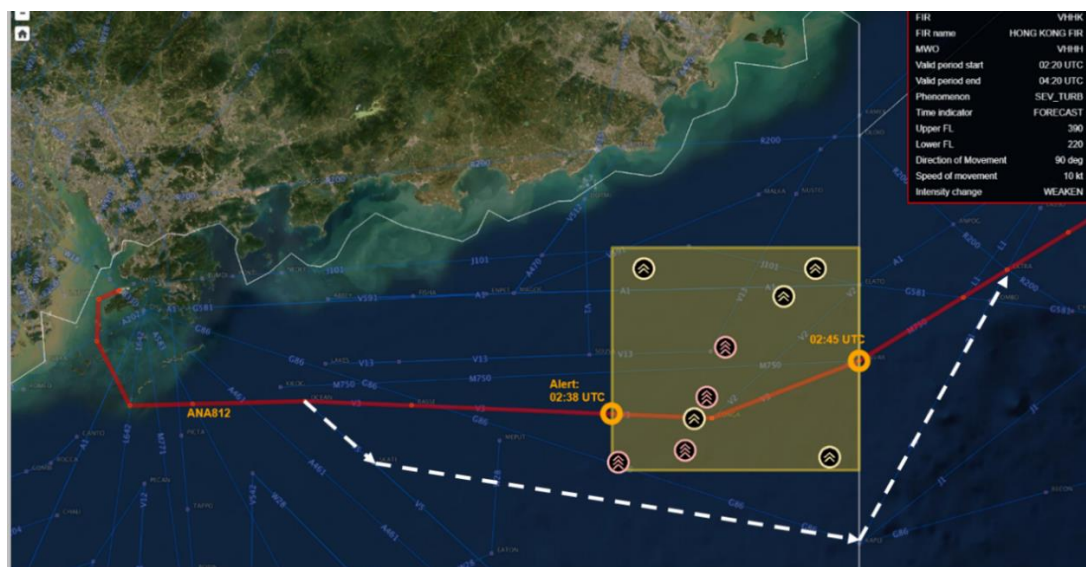

Figure 6: SWIM-enabled MET-ATM Display showing alerts of the estimated timing for a specific flight entering a SIGMET area and the timing for the flight to depart the SIGMET area

3.2.3   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.

3.2.4   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: Volcanic ash avoidance

3.3.1   This scenario explores gate-to-gate flight operations and where SWIM enabled ANSPs, Airspace Users and MET Service Providers can enhance ATM System performance through timely sharing of interruptions and trajectory and flow updates. This provides downstream Area Control Centres (ACCs) and other ATM Stakeholders with SWIM capabilities, advance situational awareness of an incoming flight, which can then be used to support common situational awareness across stakeholders, create more accurate demand predictions and improve operational planning and predictability. For this scenario, a flight is planned from Bangkok (VTBS) to Sydney (YSSY).

3.3.2   One hour into the flight, a Volcano Observatory Notice for Aviation (VONA) is issued by the Observatories advising of an eruption of Mt Agung on Bali with ash cloud detected to FL400 moving swiftly and primarily to the west-north-west. A Volcanic Ash Advisory (VAA) was issued by Darwin Volcanic Ash Advisory Centre based on VONA, and subsequently a Volcanic Ash SIGMET in IWXXM was issued by the MET service provider based on the VAA. The IWXXM SIGMET is received by Brisbane and Melbourne Air Traffic Service Centres (BN ATSC and ML ATSC, respectively) and Airline Operations Centre (AOC).
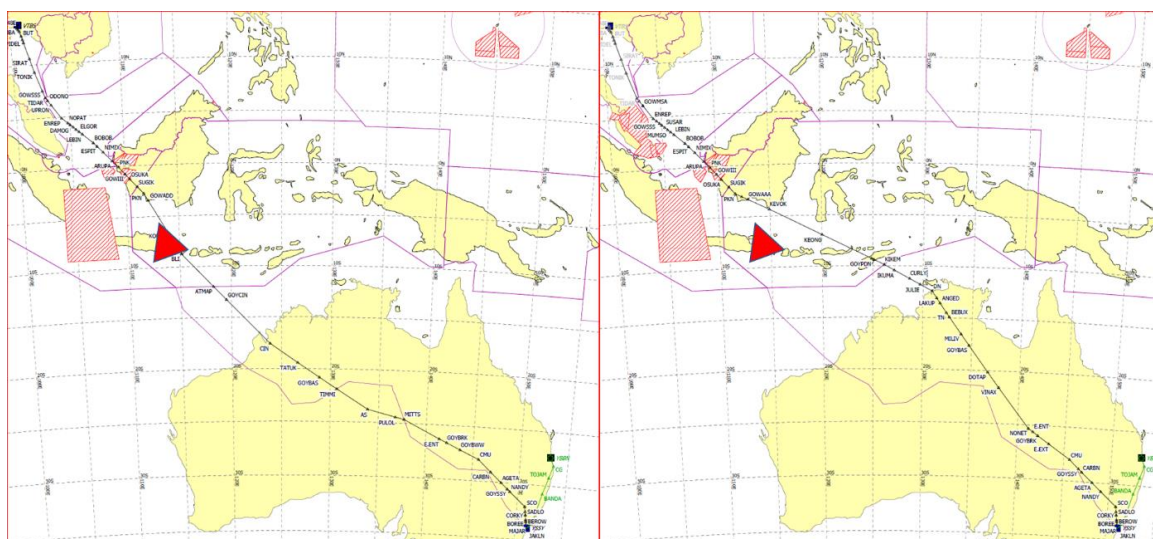

Figure 7: Route diversion for volcanic ash avoidance

3.3.3   Flight operations (Flight OPS) decide that the flight should track via a diversion route east of the ash cloud and that the diversion will preferably commence from a waypoint in WSSS airspace and follow a new track east of Bali to avoid the cloud. This will now take the flight directly into YBBB FIR and not entering into YMMM FIR.

3.3.4   Flight OPS submits a proposed CHG to FPL in FIXM format via SWIM to all affected ANSPs. The pilot requests the amended tracking and is cleared by VTBB ATC. The flight re-cleared via new flight plan track. The pilot updates the Flight Management Computer (FMC) to send Flight OPS a new set of trajectory estimates, which are shared with BN ATSC in FIXM format via SWIM.

3.3.5   Because of the SWIM connectivity, the flight became aware of the volcanic event two FIRs prior to the disrupted airspace. The airline was able to identify an alternate route within the flight's fuel capability that would still enable it to reach its original destination. Furthermore, this provided additional benefit to all SWIM-enabled stakeholders, as a new clearance time was issued much in advance which assisted with making early decisions.

USE CASE 4: Flight diversion due to fog

3.4.1   For the same flight planned from Bangkok (VTBS) to Sydney (YSSY) mentioned in Use Case 3 above, when the flight is approaching Lombok on the ash avoidance route, an Amended TAF for YSSY is published via SWIM, forecasting heavy fog starting prior to the flight's ETA and to last late into the morning with associated significant delays. Flight OPS considers the new expected holding requirement coupled with the additional fuel used for the ash avoidance and decides at that time to divert the flight to YBBN (Brisbane).

3.4.2   Flight OPS again publishes a proposed new route via SWIM and shares with the aircraft and BN ATSC and ML ATSC.   The pilot makes the request to ATC directly and is cleared with the new route. The pilot updates the FMC to send Flight OPS a new set of trajectory estimates, which are shared in FIXM format via SWIM with BN ATSC.
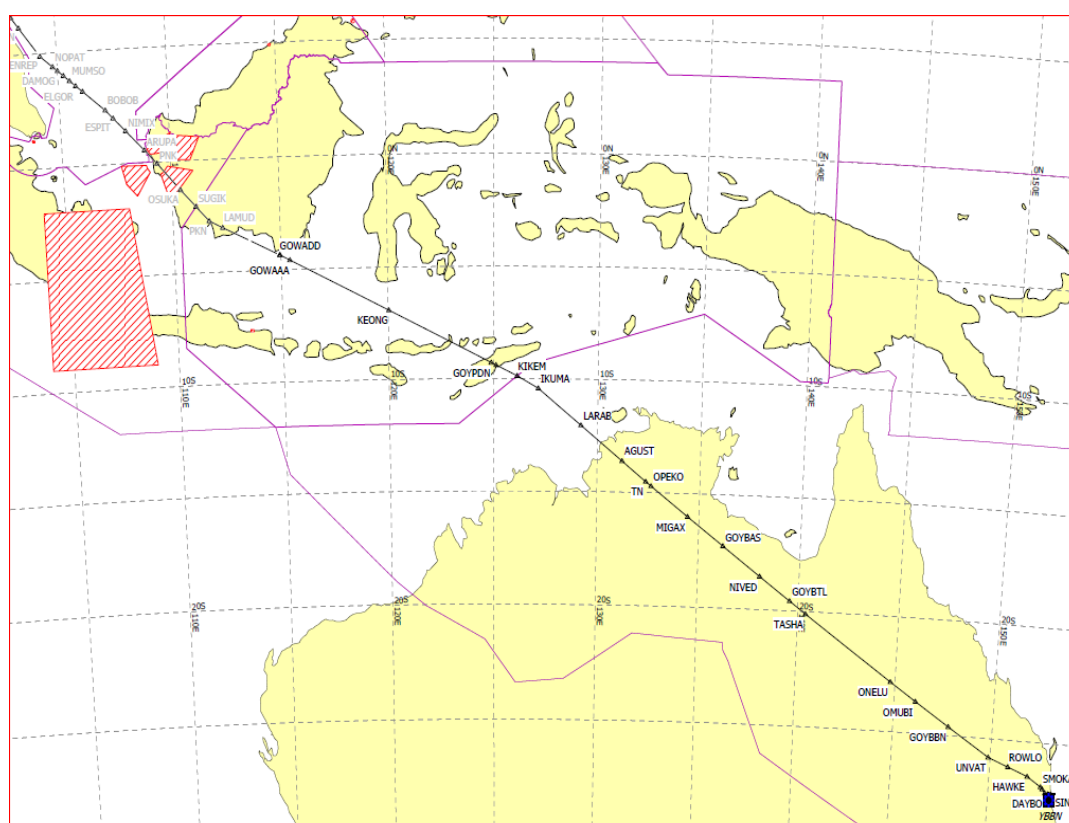

Figure 8: Early flight diversion from Sydney to Brisbane due to fog

3.4.3   BN ATSC analyses the new route of this flight due to the forecast fog in Sydney and modifies their long-range ATFM program for the morning to allocate a slot at Brisbane for this flight. The flight is allocated a gate time Calculated Time Over (CTO) for an arrival fix that requires 10 minutes delay from current estimate and this CTO is shared with Flight OPS. Flight OPS communicates with the flight proposing that they make a request to ATC for commencing a fuel-efficient speed reduction from their present position to absorb the delay as much as possible. Finally, BN ATSC applies a short set of vectors on descent for sequencing but no holding is incurred.

3.4.4   Overall, early notice of the amended TAF and associated delays permitted the airline to identify the need for a diversion to alternate destination and to share and receive that amended clearance prior to entering Australian airspace so that any small track efficiencies could be realised (no fuel wasted continuing towards MEL and then diverting later).

USE CASE 5: Weather impact assessment based on actual air traffic volume over Standard Terminal Arrival Routes (STARs)

3.5.1   MET service providers routinely share weather forecast and warnings with ANSPs that predicts timing of weather phenomena affecting airspace, including terminal control area where there is a relatively high volume of air traffic.

3.5.2   If air navigation service providers (ANSPs) could share surveillance data and/or FIXM data with MET service providers via SWIM, more advanced MET information service would become possible. In this case MET service providers could provide services for the targeted busy routes or airspace only. For example, the more advanced MET information service could provide the estimated time of approach of severe thunderstorms to specific Standard Terminal Arrival Routes (STARs) or the associated critical airspace (Figure 9).
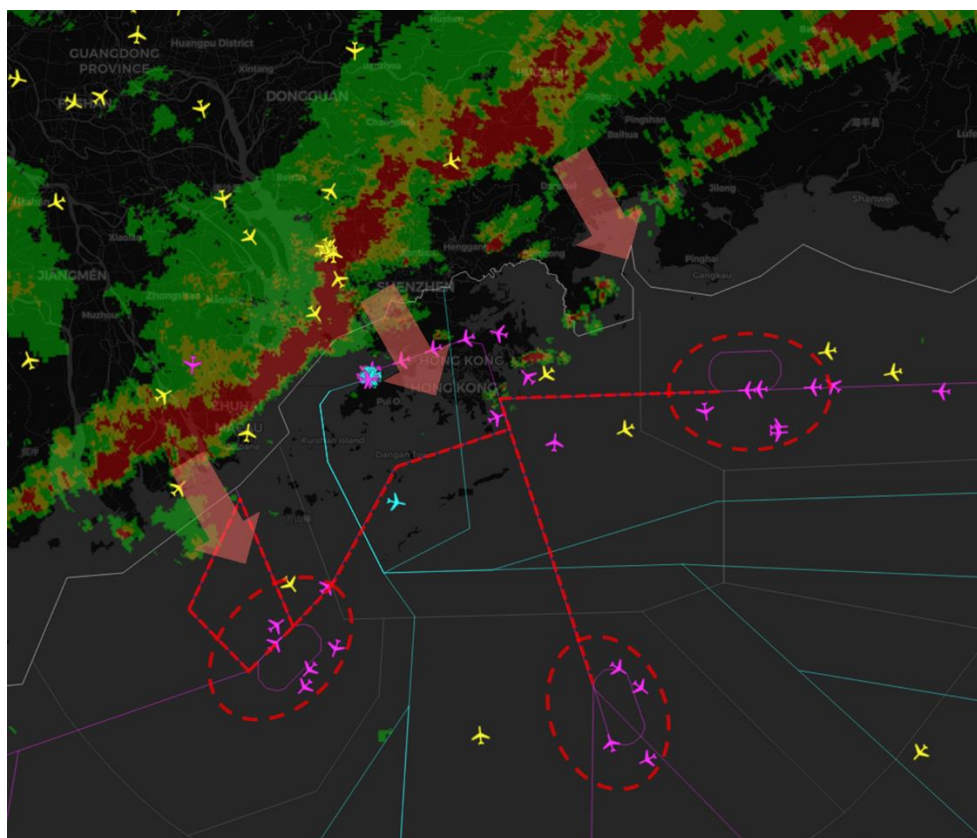

Figure 9: Illustration of severe thunderstorms approaching and posing potential impact on Standard Terminal Arrival Routes (dotted lines) and associated critical airspace (dotted ellipses) with high air traffic volume

3.5.3   When real-time surveillance data are shared in SWIM and integrated into the MET information services, new products such as weather impact risk matrix for air traffic could be developed (Figure 10) for determining the level of impact on aviation traffic based on the air traffic volume over the STARs or the associated critical airspace. For example, if the timing of severe thunderstorm matches with the timing with higher air traffic volume over STARs, the risk level of the weather impact on arrival would be higher, and vice versa. Such enhanced MET information services would better support ATM in the monitoring and assessment of the weather impact on the actual air traffic for ensuring the aviation safety and operational efficiency.
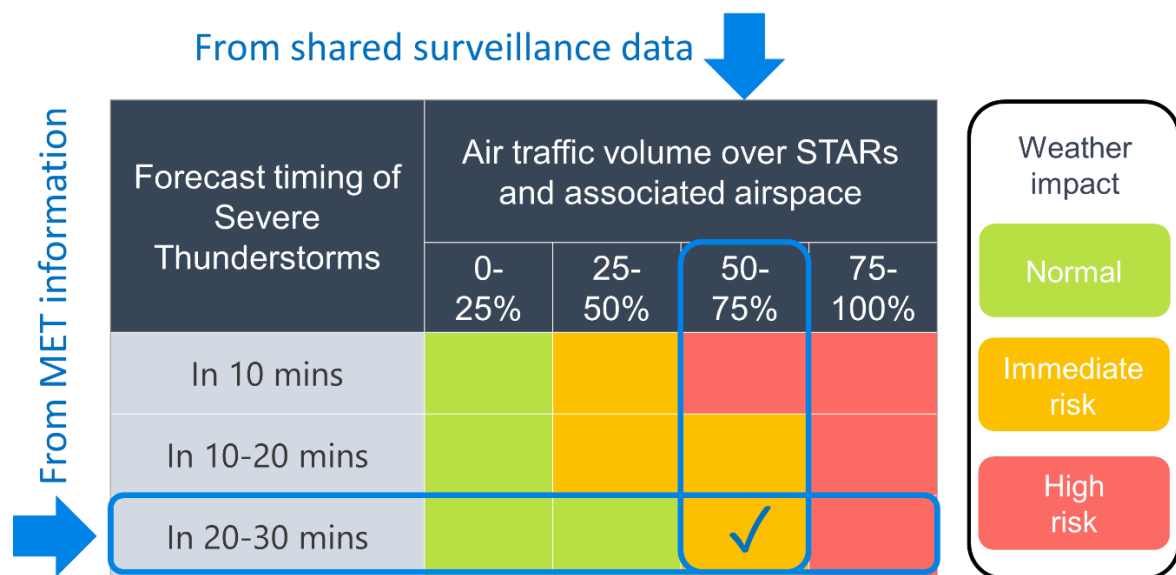
Figure 10: Risk matrix for accessing the risk level of weather impact on a Standard Terminal Arrival Route and the associated critical airspace if surveillance data could be integrated into MET information services in SWIM

USE CASE 6 (potential future use case): Aircraft spacing management based on real-time surveillance information shared in SWIM

3.6.1 To avoid aircraft being disrupted by wake turbulence created by preceding aircraft, flights are traditionally separated by certain distances depending on the pair of aircraft types and the wake vortex size created by the preceding aircraft. The stronger the headwind, the slower the ground speed will be and so it would take longer to travel the same distance. With distance-based separation, strong headwinds on approach could significantly reduce arrival rates and cause arrival delays.

3.6.2 Wake vortices generally dissipate faster in strong headwind conditions, so aircrafts could be separated by a shorter time. Also, the effect of wind on the arrival rate could be counteracted if the distance-based separation is replaced by time-based separation.

3.6.3 The benefits of time-based separation could be realised if live Mode-S Downlinked Aircraft Parameters (DAPs) or wind data from an aircraft could be downlinked, incorporated in the surveillance data and shared with MET system through SWIM. This would allow the SWIM-enabled MET system to dynamically generate the best estimation of actual wind profile along the approach path (Figure 11). The wind profile in high spatial and temporal resolution along the approach path could then be provided through the SWIM-based MET information service to ATC tool for determining the optimal safe time-spacing between arriving aircraft, allowing separation distances to be dynamically adjusted.
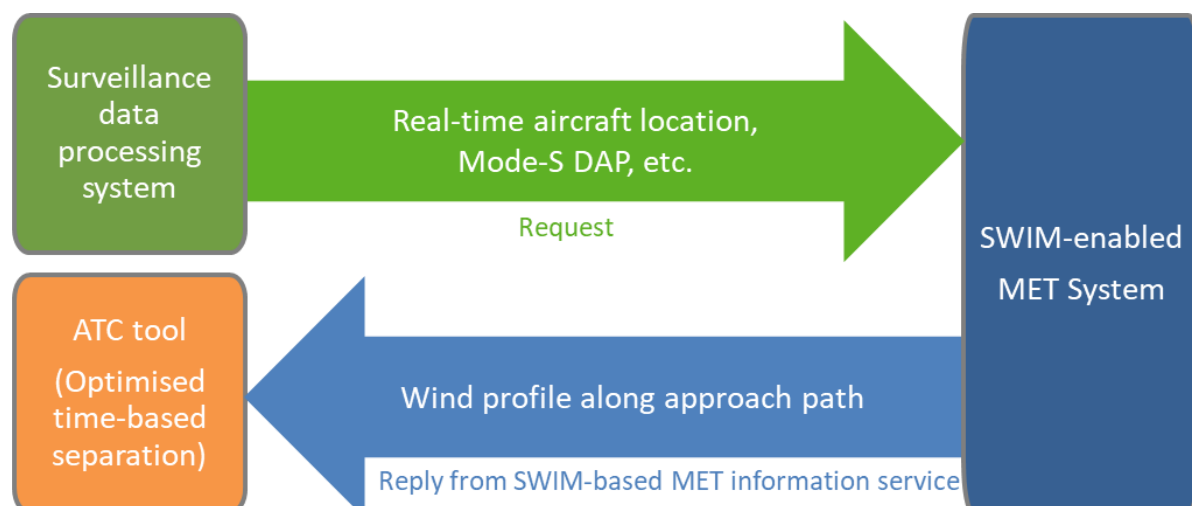

Figure 11: Conceptual data flow diagram showing the provision of SWIM-based MET information services for wake turbulence separation via request/reply

3.6.4 Such wind-dependent optimisation of separation would provide the opportunity to enhance traffic capacity. It could maximise the arrival rate and reduce the chance to activate ATFM measures due to strong headwinds on approach (Figure 12).
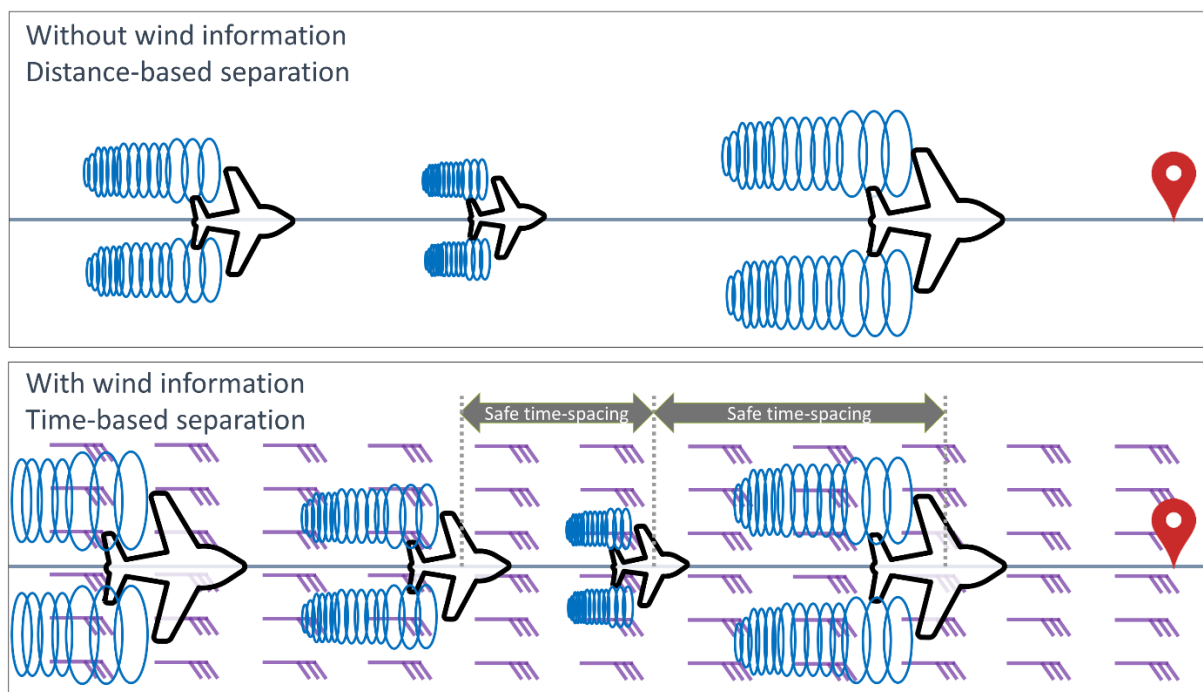
Figure 12: Illustration of the benefits of optimised time-based separation if the provision of high-resolution wind profile along the approach path is made available through SWIM information service

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 elements 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)
Aerodrome • Cloud amount and type • Crosswind • Headwind • Lightning • QNH • Radar data • RVR • Surface wind and gust • Temperature and dew point • Turbulence • Visibility • Windshear Enroute • Satellite data • Thunderstorms forecast • Clear air turbulence forecast • Icing forecast • Wind • Temperature • Tropopause height • WC SIGMET (thunderstorms, turbulence, icing, mountain waves, dust / sand storms, radioactive clouds) • WV SIGMET (volcanic ash) • WC SIGMET (tropical cyclone) • Volcanic ash advisory • Tropical cyclone advisory • Space weather advisory • Volcano Observatory Notice for Aviation (VONA) • Quantitative Volcanic Ash (QVA) Concentration Information	• 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)

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Members of MET/R WG Ad-hoc Group - Development of APAC Use Cases and User Requirements for SWIM-based MET Information Services Supporting ATFM

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Australia	Jesper Bronsvoort	Network Performance & Analysis Manager, Airservices Australia	ATFM
Australia	Ashwin Naidu	Aviation Customer Lead, BoM	MET
CANSO	Stuart Ratcliffe	Co-Chair, CANSO ATFM WG	ATFM
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Hong Kong China	John Chong	Scientific Officer, HKO	MET
Hong Kong China	Anfernee Poon	Acting Senior Operations Officer (Strategic Planning), HKCAD	ATFM
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Republic of Korea	Jiwon, LEE	Assistant of Director, KMA	MET
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Singapore	Jack Toh	Head (ATM Info System), CAAS	ATFM
Singapore	Yeo Cheng Xun	Senior Meteorologist, MSS	MET
Thailand	Amornrat Jirattigalachote (Amo)	Strategic Planning Manager, AEROTHAI	ATFM/SWIM
Thailand	Dudsadee Sungthong	Executive ATFM Officer, AEROTHAI	ATFM
Vietnam	Nguyen Van Dung	Deputy Director of Department of Air Traffic Services, VATM	MET/ATFM

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

Terms of Reference

The scope and objectives of the work to be conducted by the MET/R WG ad-hoc group are:

(1) To document user requirements and use cases from ATFM in the APAC region to assist SWIM TF in the development of future SWIM-based MET information services specifically addressing the needs of ATFM in the APAC region;

(2) 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 Development (WG-MRAD) in a global sense and IWXXM development by METP WG-MIE for effective exchange of MET information supporting AFTM operation;

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

(4) 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

(5) 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.