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APAC User Requirements for SWIM-Based MET Information Services Supporting ATFM

MET/R WG Ad-hoc Group

MET/R WG/13 & ATFM/SG/14

Background

- MET/R WG designated an ad hoc group to identify and document use cases and user requirements for SWIM-based MET information services supporting ATFM in the APAC region.
- The ad-hoc group consists of MET and ATFM subject matter experts.

State / Administration / IO	Name	Position and/or Organization	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	Anfernee Poon	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	KMA	MET
Republic of Korea	Jiwon, LEE	KMA	MET
Singapore	Zhang HuanBin	CAAS	ATFM
Singapore	Aw Ying Kit	CAAS	ATFM
Singapore	Yeo Cheng Xun	MSS	MET
Thailand	Amornrat Jirattigalachote, Amo	AEROTHAI	ATFM/SWIM
Thailand	Dudsadee Sungthong	AEROTHAI	ATFM
Vietnam	Nguyen Van Dung	VATM	MET/ATFM

ToR of the ad-hoc group

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;

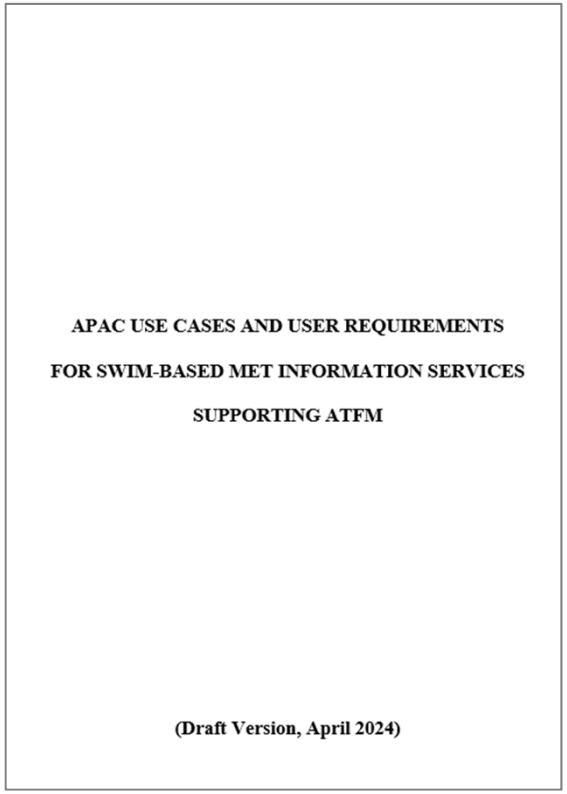
ToR of the ad-hoc group

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.

Purpose of the document

- Reference material to document ATFM use cases and user requirements in the APAC region to promote the development of SWIM-based MET information services
- Includes conceptual use cases to illustrate and publicise how SWIM-based MET information services and the associated SWIM-enabled MET applications could benefit ATFM in the APAC Region in the future
- These examples would increase the awareness and understanding of both MET service providers and ATFM users in APAC on the operational benefits to ATFM to be brought by the exchange of meteorological information together with aeronautical and flight information in SWIM.
- A living reference under regular review by the MET/R WG ad-hoc group.
- Collection of use cases could be further expanded or improved with known events.


APAC USE CASES AND USER REQUIREMENTS

FOR SWIM-BASED MET INFORMATION SERVICES

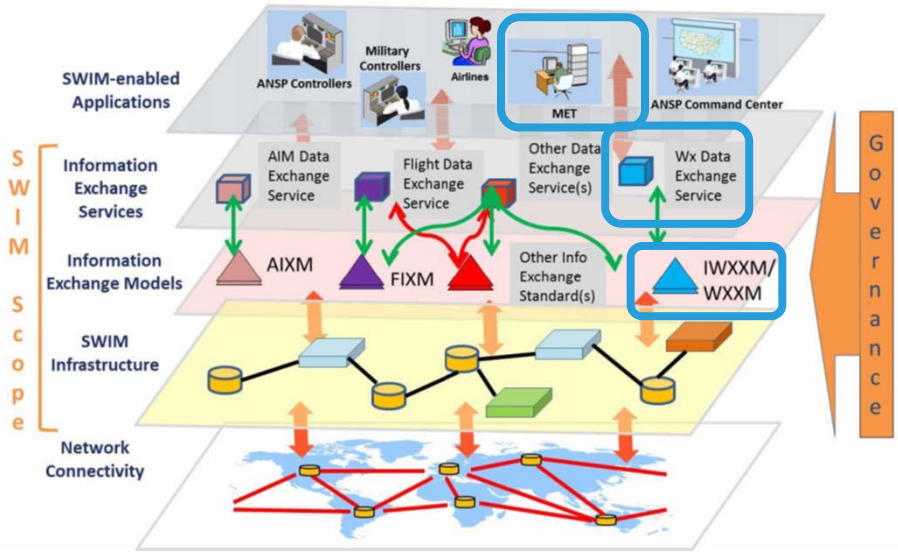
SUPPORTING ATFM

(Draft Version, April 2024)

SWIM-based MET Information Services and Examples of use cases to support ATFM

SWIM-based MET information services

- Requested information is consumed by SWIM-enabled Applications via Information Exchange Services to meet end-users' needs.



SWIM Global Interoperability Framework
ICAO Manual on SWIM (Doc 10039)

SWIM-based MET information services

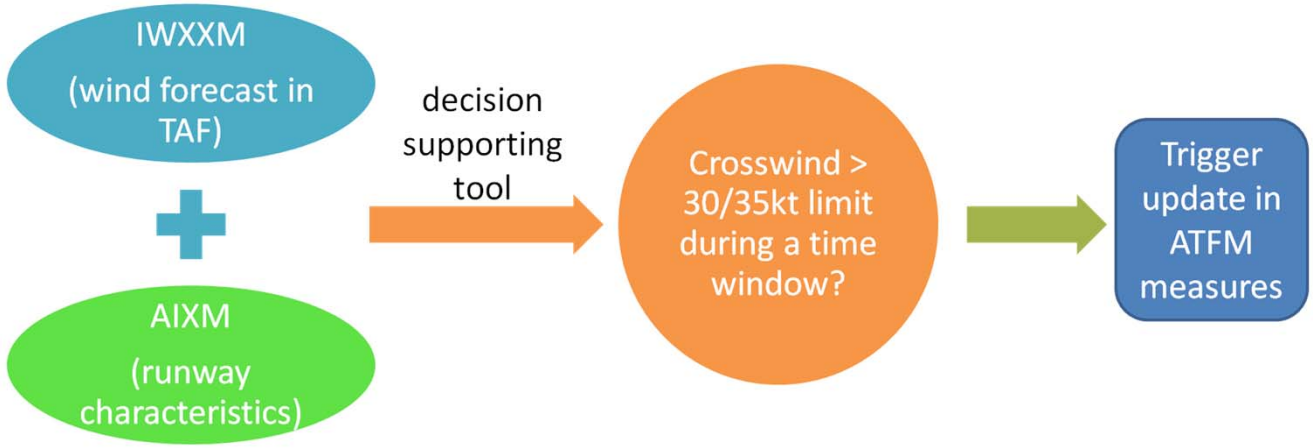
- capable to geospatially and/or temporally filter a data set to provide the users' system only the tailored information required by the user

Sample data to be exchanged via SWIM-based MET Information Services to support ATFM operations

MET data catalogue (draft)	ATFM data catalogue (draft)
Aerodrome Phenomena: • Cloud amount and type • Lightning/thunderstorm • QNHRVR • Surface wind and wind gusts • Temperature and dew point • Turbulence • Visibility • Windshear Products: • Radar data **Enroute** Phenomena: • Thunderstorm • Clear air turbulence • Icing • Wind • Temperature • Tropopause height Products: • 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 • Satellite data	• 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)

Use case example 1

- Integration of MET information in IWXXM with aerodrome information in AIXM to assess the crosswind at destination within a requested time period

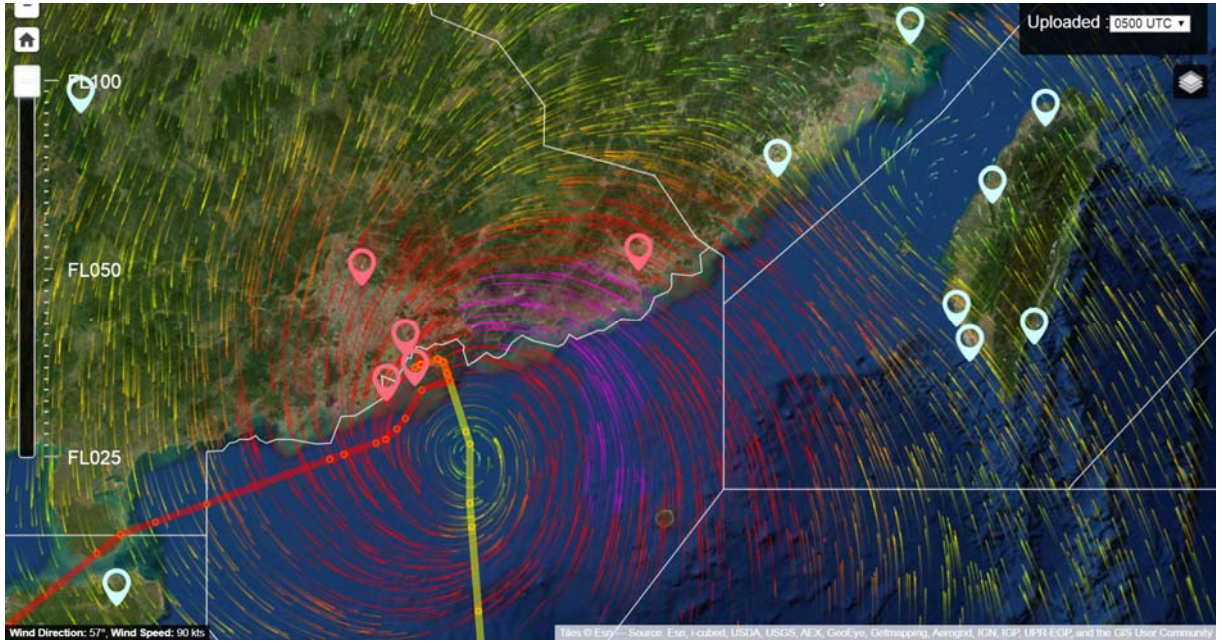


Use case 1: Ground Delay Program

- SWIM-enabled MET-ATM graphical display – Landing weather thresholds of aerodromes
- for ATC and airline to monitor the landing condition at alternate aerodromes

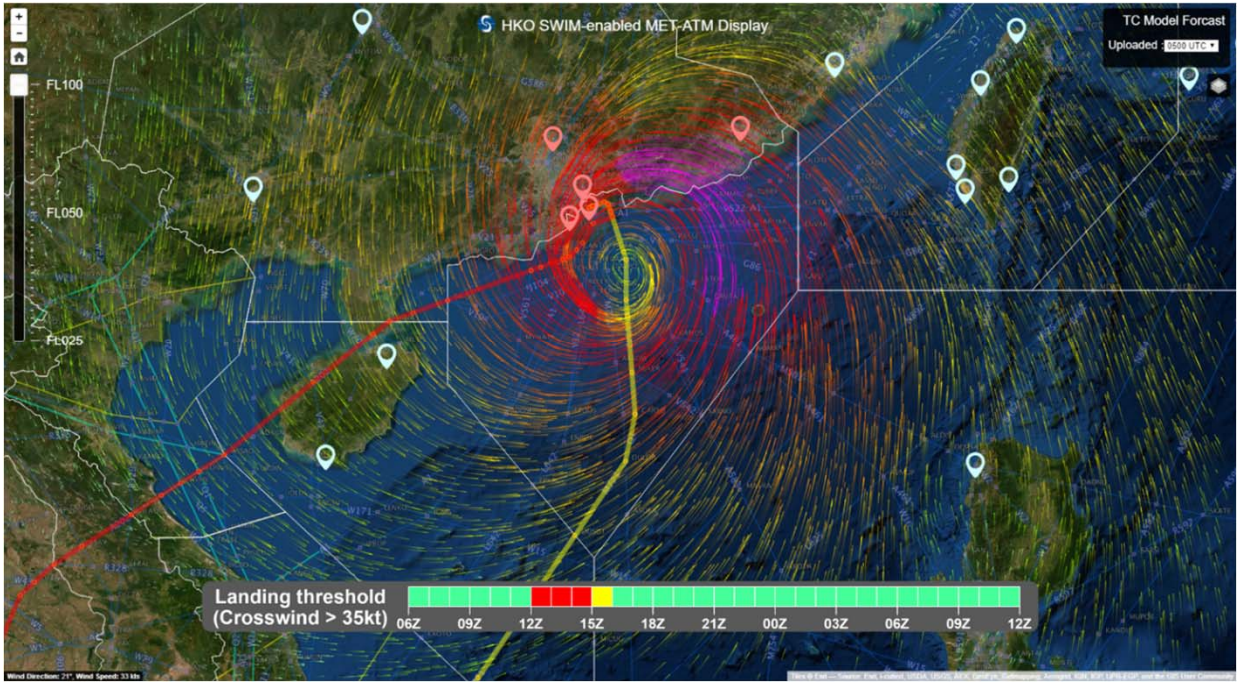
Based on user-specified operation thresholds

- Visibility
- Cloud base
- Wind gust
- Crosswind



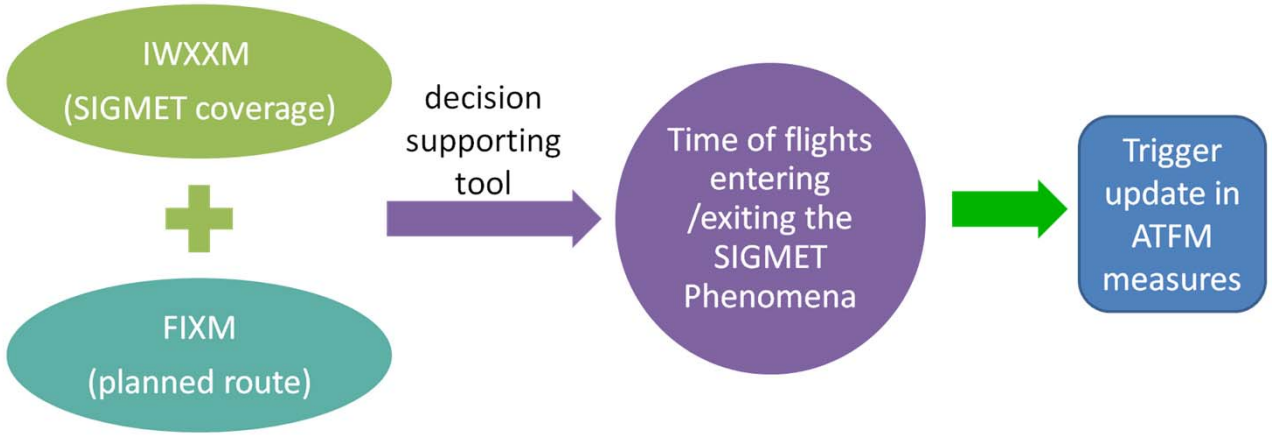
Use case 1: Ground Delay Program

- Based on weather elements extracted in digital TAF (received in IWXXM format)
- To support ATC's decision-making on when the airport arrival rate should be reduced and resumed normal



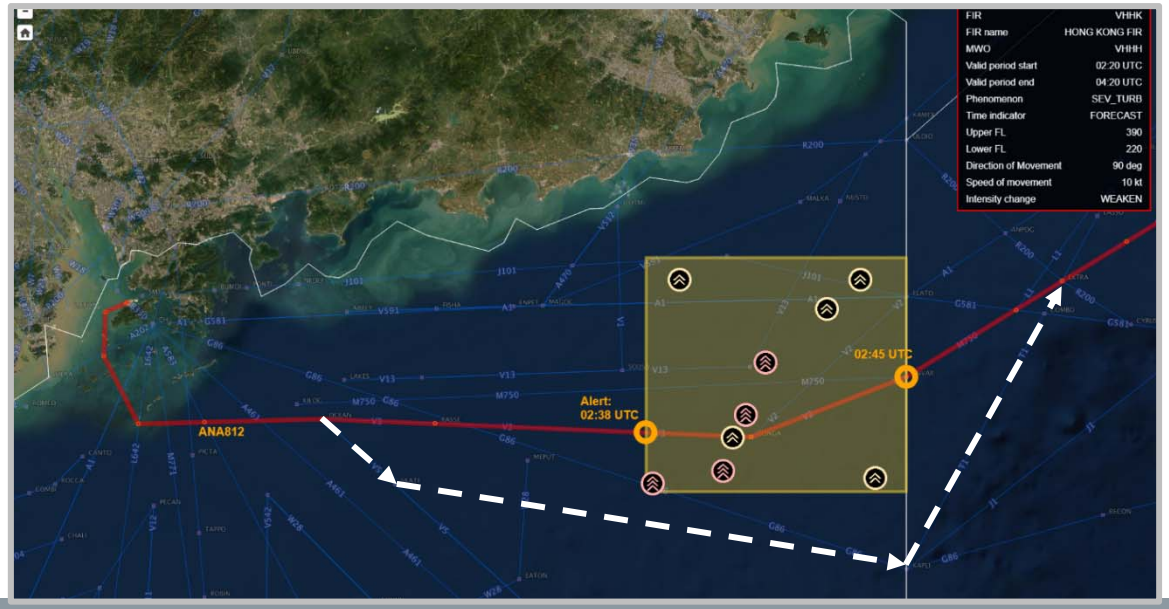
Use case 2

- Integration of MET information in IWXXM with flight information in (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

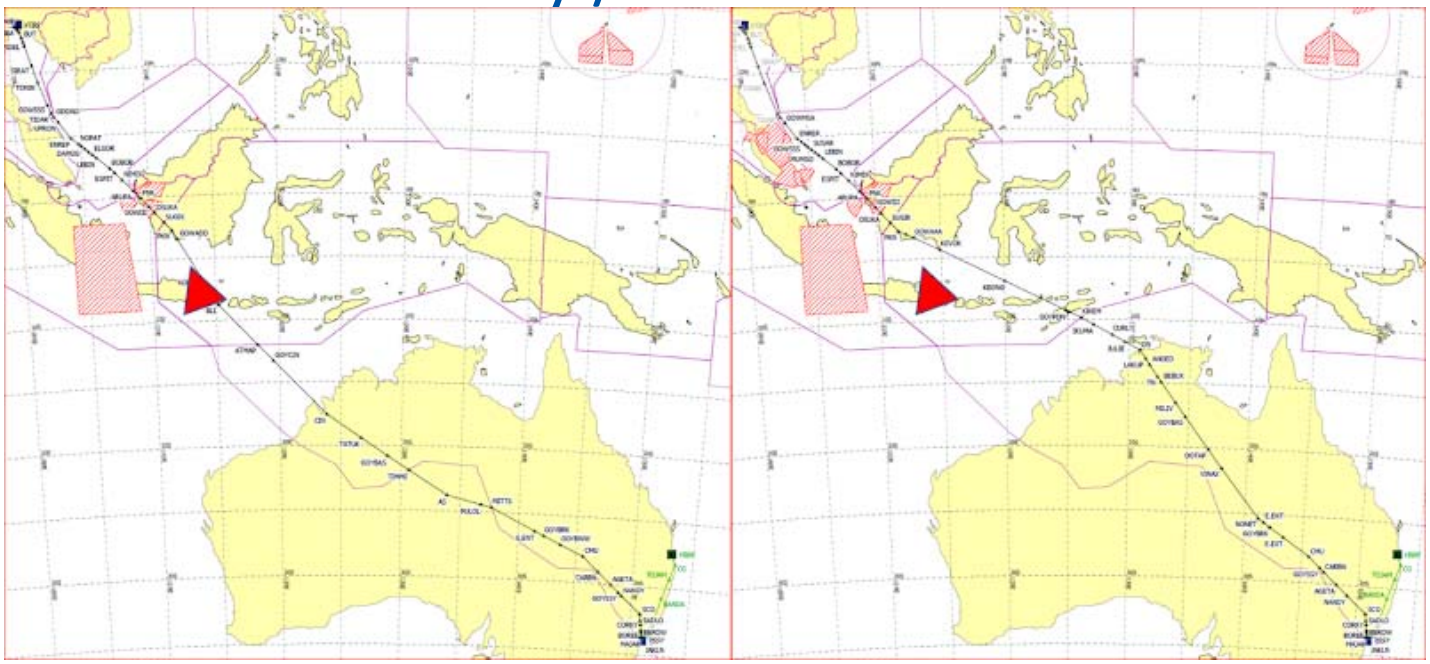


Use case 2: Airborne rerouting

- FPL and SIGMET exchanged in SWIM format
  - integrate flight and MET information in the automatic decision-supporting tool
  - better support the timely tactical decision making by the ATC and FOC

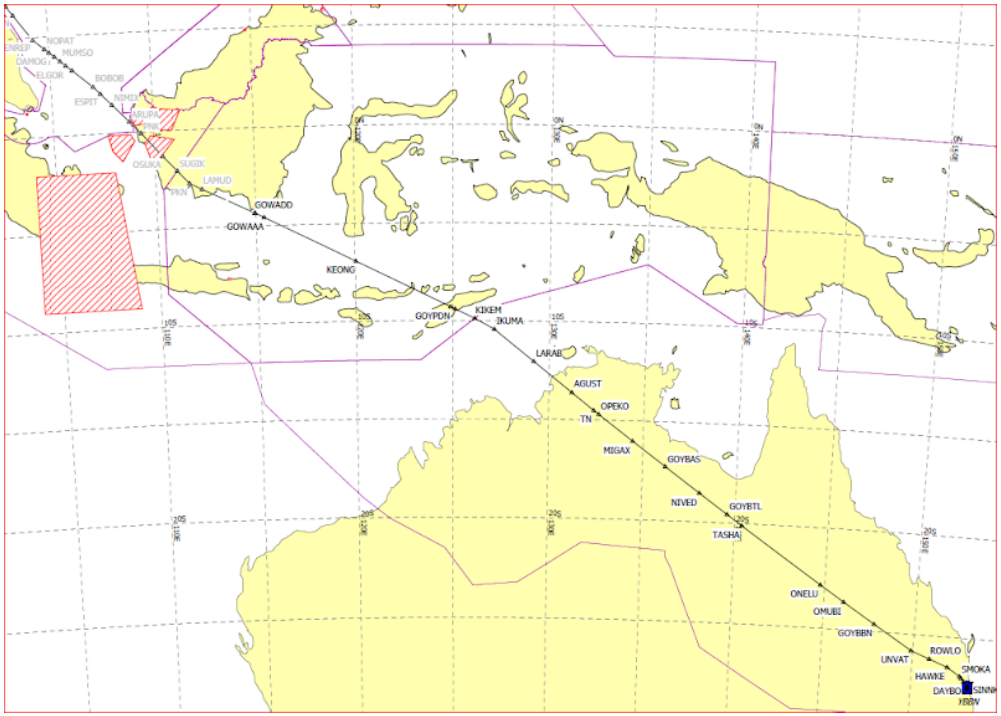


Use case 3: Volcanic ash avoidance based on digital Volcanic Ash Advisory / SIGMET



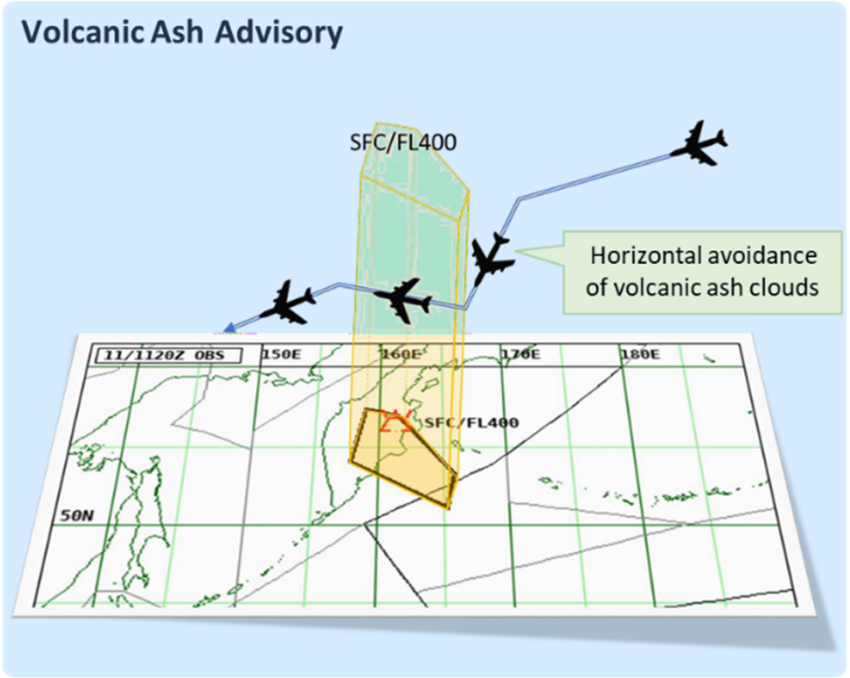
Route diversion for volcanic ash avoidance

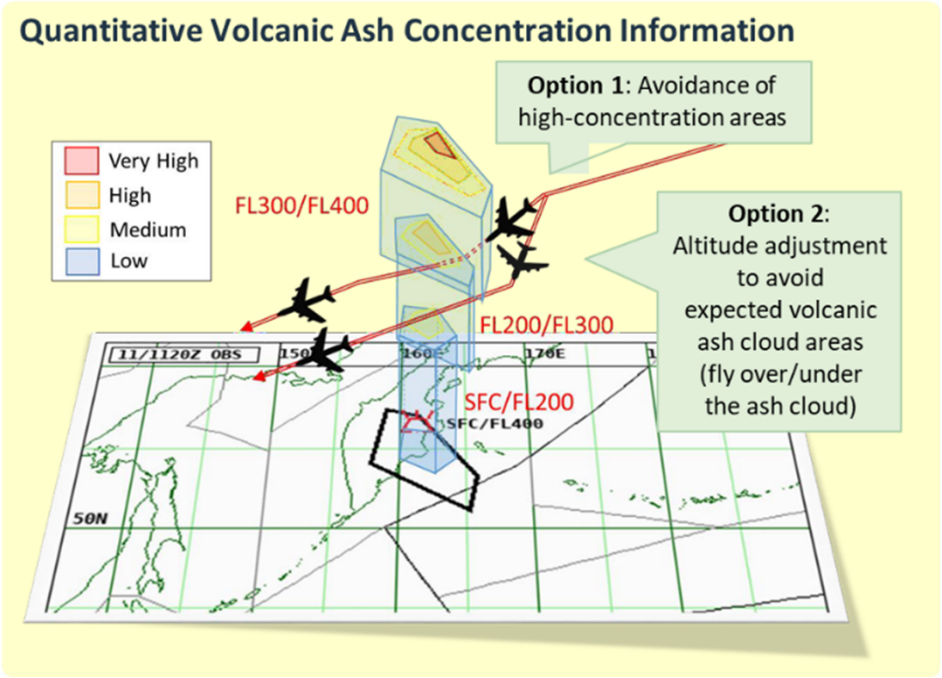
Use case 4: Diversion due to fog



Early flight diversion from Sydney to Brisbane due to fog

Use case 5: Use of Quantitative Volcanic Ash Concentration Information in Trajectory-based Operation





How 4-D QVA quantitative / probabilistic forecast could support TBO

Use case 6: Weather impact assessment based on actual air traffic volume over Standard Terminal Arrival Routes

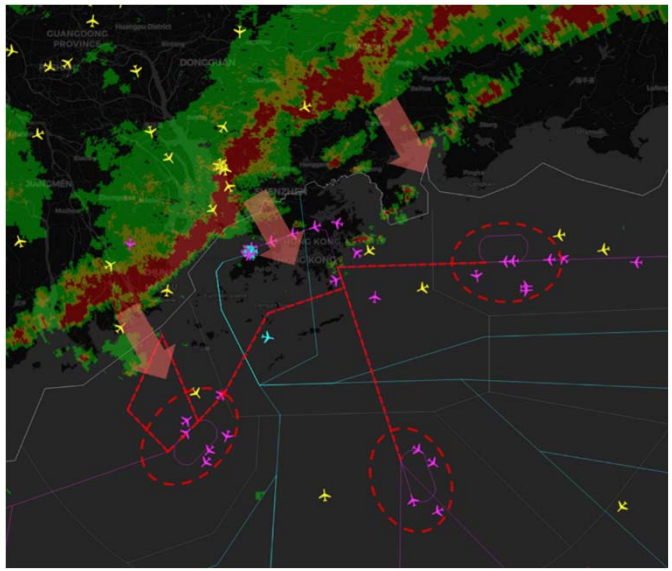


Illustration of severe thunderstorms approaching and posing potential impact on Standard Terminal Arrival Routes (dotted lines) and associated critical airspace (dotted ellipses) with high air traffic volume

From shared surveillance data

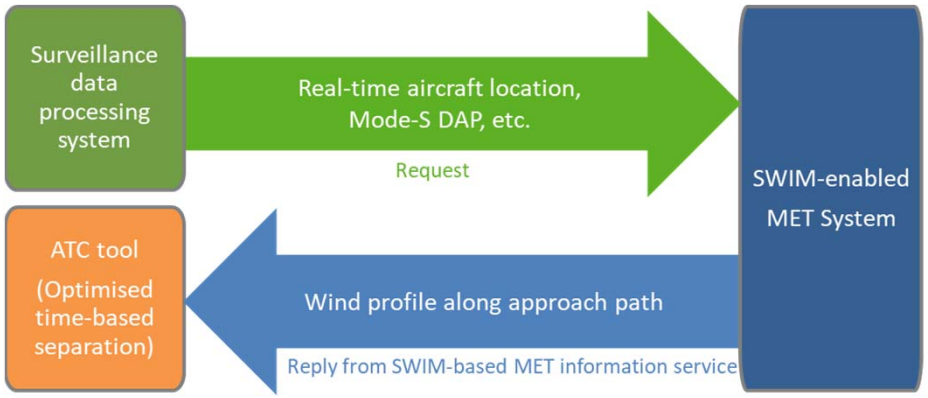
From MET information

Forecast timing of Severe Thunderstorms	Air traffic volume over STARs and associated airspace			
	0-25%	25-50%	50-75%	75-100%
In 10 mins				
In 10-20 mins				
In 20-30 mins			✓	

Weather impact: Normal; Immediate risk; High risk

Risk matrix for accessing the tactical 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 7: (potential future use case): Aircraft spacing management based on real-time surveillance information shared in SWIM



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

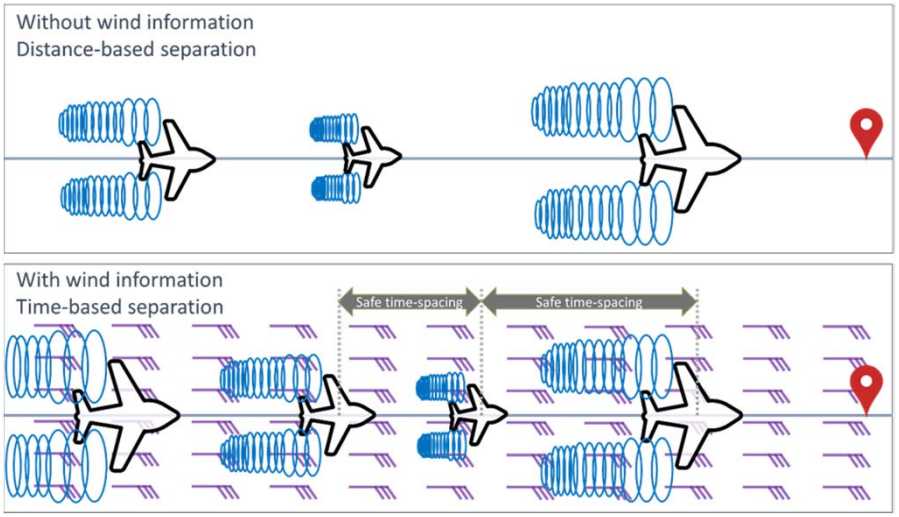


Illustration of the benefits of optimised time-based separation - if the provision of high-resolution wind profile along the approach path is made available through SWIM information service

Discussion

- The ad-hoc group also presented the updates on the work and draft reference document in SWIM TF/7 meeting held on 8-12 May 2023 to seek feedback and comments from the SWIM experts.
- The SWIM TF/7 meeting appreciated the paper presented and shared that some use cases could potentially be included in the APAC regional SWIM implementation guidance material being developed by SWIM TF

Discussion

- MET SG/27 meeting held in September 2023 reviewed recent updates on the work and draft reference document. The meeting provided comments 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.
- The draft reference document has been revised based on the comments received at MET SG/27 and presented at the ATM SG/11 held in October 2023 to seek feedback from ATM experts and no further comment was received.

Discussion

- In view of the successful demonstration of the use of Quantitative Volcanic Ash (QVA) concentration information in Trajectory-based Operation (TBO) in SWIM environment conducted in 2023, the ad hoc group further proposed adding the associated use case in the draft document as "*USE CASE 5: Use of Quantitative Volcanic Ash Concentration Information in Trajectory-based Operation*" contributed by Japan for reference by the stakeholders.
- The proposed addition was incorporated in the draft along with some editorial changes as provided in Attachment A of this paper for review by the MET/R WG/13 and ATFM/SG/14.

Action by the meeting

- Review the updated draft reference document in Attachment A and provide comments, in particular suggestions on use cases, if any, for further analysis;
- Discuss any relevant matters (and actions) as appropriate.

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THANK YOU