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Development of future aeronautical meteorological services to better meet ATM requirements

Jun Ryuzaki, Technical Officer Meteorology, ICAO

2022-05-30, ICAO Asia Pacific MET/ATM Webinar

Meteorology Panel (METP)

- One of ANC Panel on aeronautical meteorology
  - Non-governmental expert Group to address specific issues and develop global standards
  - Consisting of 31 Member experts from 24 States/7 Organization plus Advisers (as of today)
- Key Areas of Work
  - Annex 3 and PANS-MET - development and implementation
  - Trajectory-based operations support / ASBU support
  - IWXXM and SWIM development and implementation
  - World Area Forecast system (WAFS) - further development
  - Space weather information service - implementation and further development
  - Volcanic ash information service - further development (IAVW)
  - Hazardous Weather information service - concepts and development of HWIS
  - Cost recovery and governance work – SWX cost recovery guidance, etc
  - MET Panel structural enhancement - closer co-operation and collaboration with WMO

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Current METP Working Group Structure (as of May 30, 2022)

ICAO Air Navigation Commission

Meteorology Panel
Bill Maynard, Acting Chair

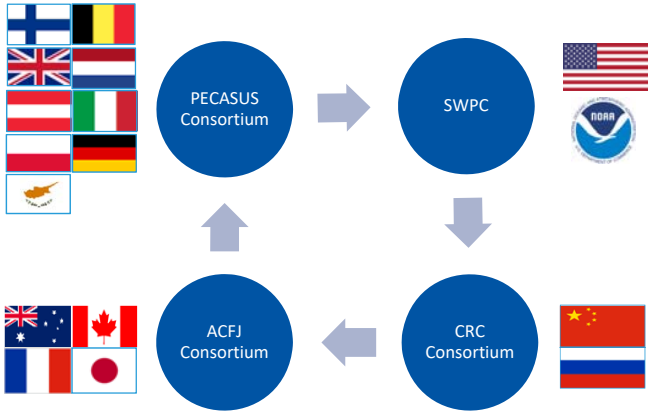
WG-MRAD	WG-MIE	WG-MOG	WG-MCRGG
Rosalind Lapsley	Tim Hailes (co-rapporteur TBD)	Jon Dutton	Jaakko Nuottokari
HWIS Clemens Wilderman	**IWXXM Requirements** Tim Hailes	**IAVW/VASD** Paula Acethorp	**Development of Guidance** TBD
MET Requirements TBD	**MET in SWIM** Rebecca Kotten	**WAFS/WIFS/SADIS** Jon Dutton & Karen Shorey	**Definition of MET Authority** Greg Brock
Ad Hoc Groups	**IWXXM Documentation** Humphrey Elton	**SWX** Angelo Romito	**SWIM Management & Governance** TBD
	Support & Coordination TBD		

Upcoming & Foreseen developments

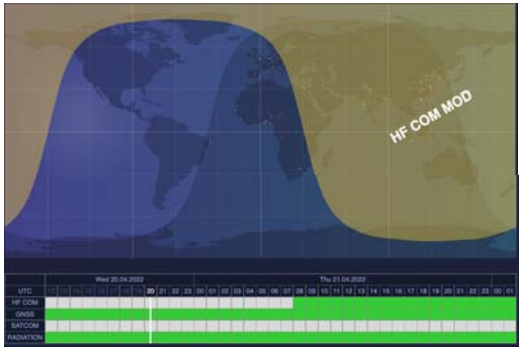
- Space weather information (started Nov. 2019)
- Quantitative volcanic ash information (IOC, 2024)
- Hazardous Weather Information Service (2026 *to be further developed)
- Volcano Observatory Notice to Aviation (VONA) in TAC and/or IWXXM (2024)
- World Area Forecast System (WAFS) upgrades
  - Higher resolution aviation hazards (2020)
  - High resolution data for all parameters (2024)
  - Introduction of probabilistic WAFS information (2026)
- SADIS/WIFS accommodate IWXXM and Higher resolution data (2024)
- API (Application Programming Interface) services to be available under SWIM environment

Space Weather Information Services

- Implemented since the AMD 78 to ICAO Annex 3
  - ICAO Council designated 4 global SWXCs, PECASUS, US and ACFJ (Nov 2018) and CRC (April 2020), and 1 Regional SWXC, South Africa
  - Operational services started in November 2019
    - Nov 2021: CRC started operational services
- Targeted aviation impact by space weather phenomena (e.g. Solar radiation storms, Solar flares, Geomagnetic storms and Ionospheric disturbances)
  - HF Communications (HF COM)
  - GNSS-based navigation and surveillance (GNSS)
  - Radiation impacts on avionics and human health (RAD)
  - Space Weather Advisory issued when MOD and SEV occurred/expected to occur
- Further details are described in ICAO Manual on Space Weather Information in Support of International Air Navigation (Doc 10100)



CRC has started at Nov 2021



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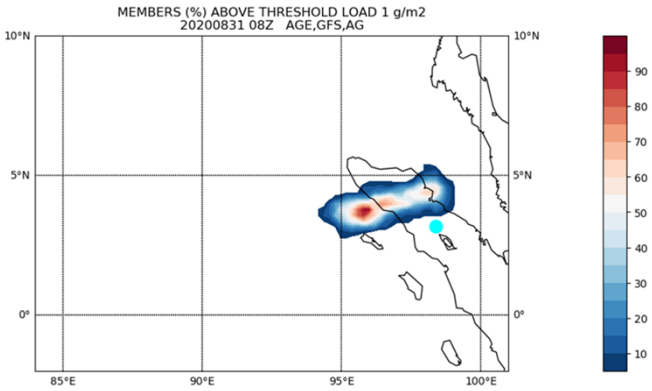
Quantitative Volcanic Ash (QVA) information

- IAVW—9 Volcanic Ash Advisory Centres (VAACs) provides 24/7 monitoring/forecasting, issuing VAAs
  - in coordination with State Volcano Observatories (SVOs)
- Aviation requirements for further development of QVA
  - Timely detections of eruptions/ash cloud
  - 4-d characteristics (x, y, z, t) of VA cloud
  - Amount of ash in cloud (quantitative)
  - Uncertainty information
- QVA initial operational capability expected to be provided in 2024 (some VAACs)
  - To be extended to all VAACs in 2026
- Challenges still exists
  - Further needs for more in-situ observations of ash amounts
  - Reduce uncertainties and variance of forecast results

Proposed Concentration Thresholds for Ash

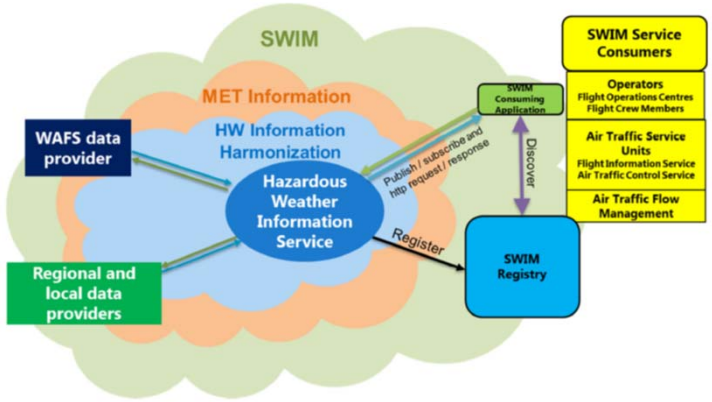
Threshold	Ash Concentration range (mg / m3)
Very Low	< 0.2
Low	0.2-2.0
Medium	2.0-5.0
High	5.0-10.0
Very High	> 10.0

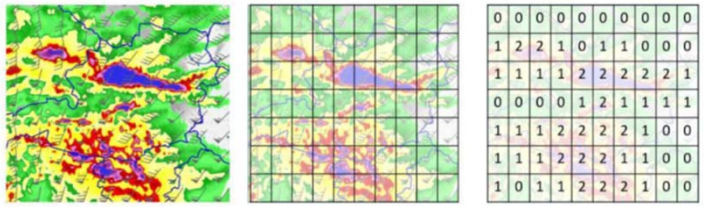


Hazardous Weather Information Services (HWIS)

- Transition from former RHWAC concept
  - To better provide globally consistent information
  - FIR-basis to Phenomenon-basis
- HWIS — provision of globally-harmonized information on select hazardous weather phenomena
  - Gridded information via information services under SWIM
  - Enable users to extract HWIS data for their fit-for-purpose use
- Concept of Operations has been developed, and now service architecture and functional/performance requirements are under discussion
- HWIS initial capability is now expected to be implemented in November 2026 (Annex 3 AMD 82)
  - IOC target : Convective Could Hazards
  - Further demonstration and evaluation to be conducted

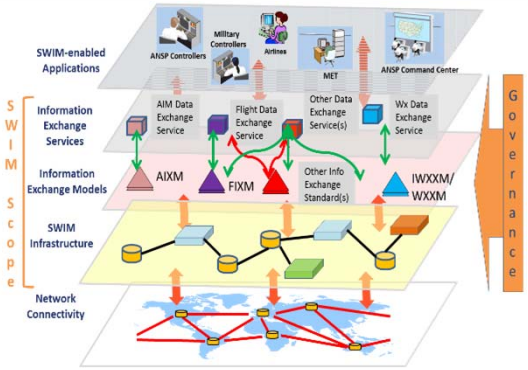
Hazardous Information SWIM high-level diagram





Digitalization of Meteorological information

- IWXXM implementation has been promoted
  - Standard Practice implemented in November 2020
  - Regional Workshop/Webinar has been conducted
- SWIM-based information services are expected to be implemented more widely
  - MET service provision transition from Product-Centric service to Information Service
- MET information services via SWIM….
  - Remove of limitations from legacy TAC format by using IWXXM and grids
  - Allow further MET information exchange in IWXXM
  - Enable “fit-for-purpose” use/visualization of MET info



Evolution of global air navigation system and "MET"

- Migration from "product-centric" to "information-based" environment
  - Support global ATM as envisaged in ICAO GANP/ASBUs
- Future MET integration into ATM decision making to be developed
- Close coordination with ATM-related Panels (ATMRPP, ATMOPSP)

AMET Block 0:
Global, regional and local meteorological information to support flexible airspace management, improved situational awareness, collaborative decision-making and dynamically optimized flight trajectory planning.

AMET Block 1:
Meteorological information supporting automated decision process or aids, involving meteorological information, meteorological information translation, ATM impact conversion and ATM decision support.

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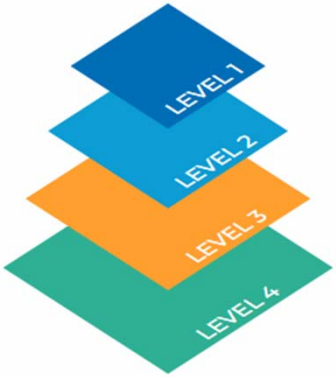
AMET Block 4:
Integrated meteorological information supporting both air and ground decision making for all phases of flight and ATM operation, especially for implementing immediate weather mitigation strategies.

GLOBAL STRATEGIC

GLOBAL TECHNICAL

REGIONAL

NATIONAL



The sixth edition of Global Air Navigation Plan (GANP) can be found at: Home - ICAO GANP Portal

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Future considerations

- Migration from product centric to information services
  - IWXXM/SWIM compatible services
- Integration of MET information into ATM decision making system
  - In coordination with other ATM-related Panels (ATMRPP, ATMOPSP)
- Addressing additional requirements for MET
  - Integrated MET information for aerodrome domain
  - Ultra long-haul/High altitude flight support
  - High altitude Ice Crystal information, Aircraft De-icing support
- Other foreseen requirements
  - Environmental affect may require further advanced meteorological information and services (to reduce significant phenomena impact on aviation)
  - RPAS (Remote Piloted Aircraft Systems) support to be considered

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Thank you!! Merci!!

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