



ICAO BANGKOK | UNITING AVIATION

ICAO APAC Webinars – Fundamentals of ANS

Aeronautical Meteorology (MET)

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Objectives

- To improve understanding:
 - Fundamental knowledge of MET (ICAO)
 - ICAO requirements for MET information
 - Regional planning supporting MET
 - Implementation activities supporting MET



Agenda

- Basics of ICAO's MET program
- ICAO's Regional requirements for MET
- What ICAO can offer (to support planning and implementation of MET)
- Q&A session



BASICS OF ICAO'S MET PROGRAM



Does MET matter to civil aviation?



...absolutely YES



Weather impacts on air traffic management

In Europe, “**adverse weather**” is attributed as the 2nd biggest delay category amongst en-route ATFM Delays; just ahead of “ATC Staffing” and behind only “ATC Capacity”.

[Source: EUROCONTROL – Performance Review Report 2018]

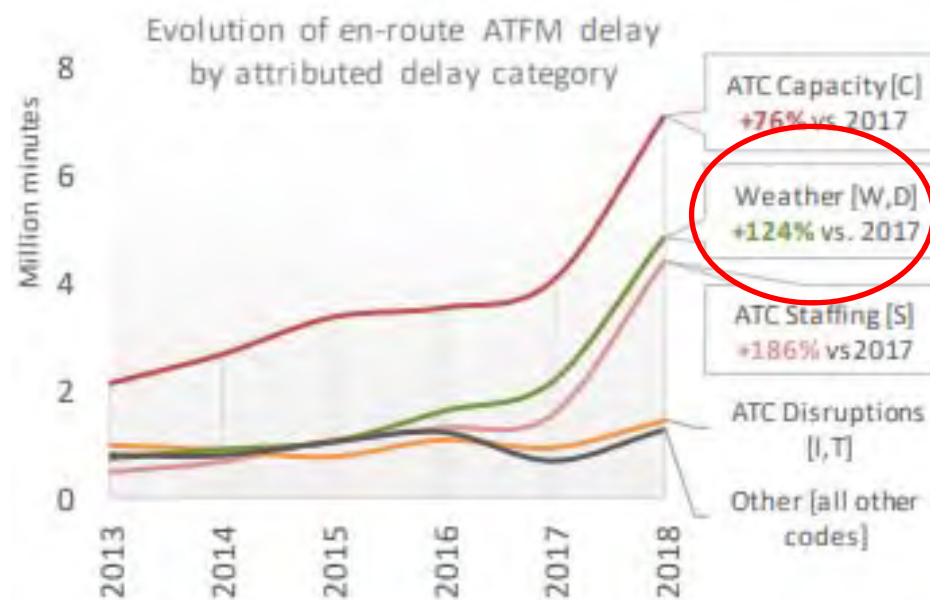


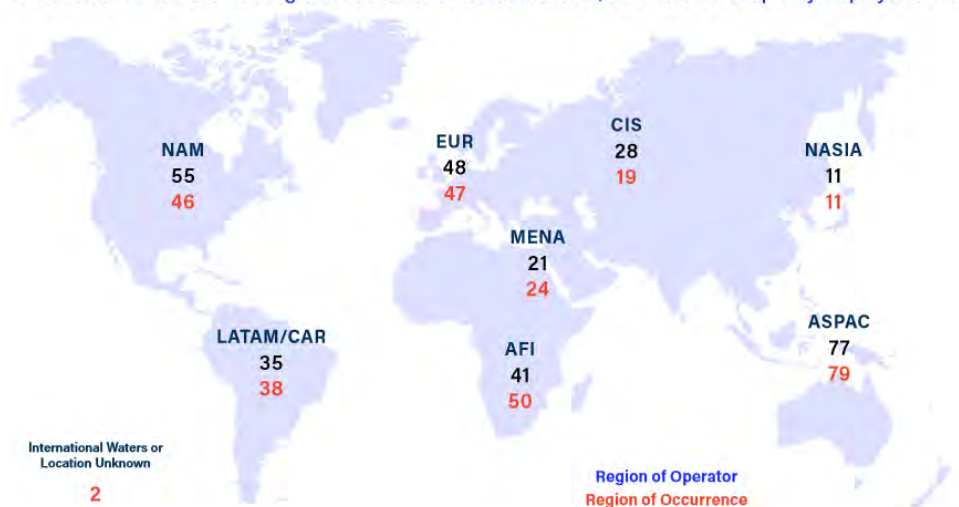
Figure 3-4: En-route ATFM delay by attributed delay category



Weather impacts on aviation safety

Number of Accidents per Region (2014-2018)

The accident rate based on region of occurrence is not available, therefore the map only displays counts



2014-2018 Aircraft Accidents – Accident Count

[Source: IATA SAFETY REPORT 2018, Edition 55]

Top Primary Contributing factors

Latent Conditions

Regulatory Oversight: 31%

Threats

Meteorology: 33%

Flight Crew Errors

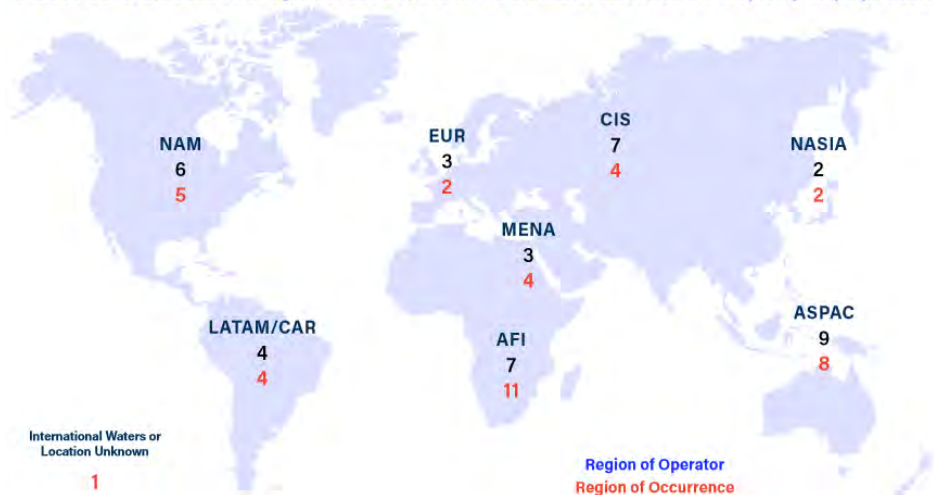
Manual Handling/Flight Controls: 37%



Weather impacts on aviation safety

Number of Accidents per Region (2014-2018)

The accident rate based on region of occurrence is not available, therefore the map only displays counts



2014-2018 Fatal Aircraft Accidents – Accident Count

[Source: IATA SAFETY REPORT 2018, Edition 55]

Top Primary Contributing factors

Latent Conditions

Safety Management:
54%

Threats

Meteorology:
46%

Flight Crew Errors

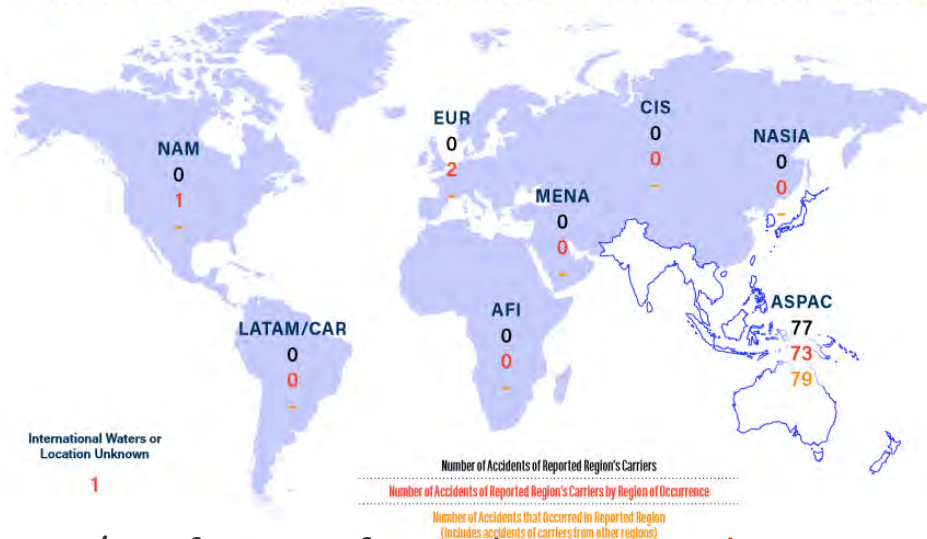
SOP Adherence / SOP Cross-verification:
61%



Weather impacts on aviation safety

Number of Accidents per Region (2014-2018)

The accident rate based on region of occurrence is not available, therefore the map only displays counts



Asia/Pacific Aircraft Accidents – Accident Count

[Source: IATA SAFETY REPORT 2018, Edition 55]

Top Primary Contributing factors

Latent Conditions

Regulatory Oversight:
49%

Threats

Meteorology:
30%

Flight Crew Errors

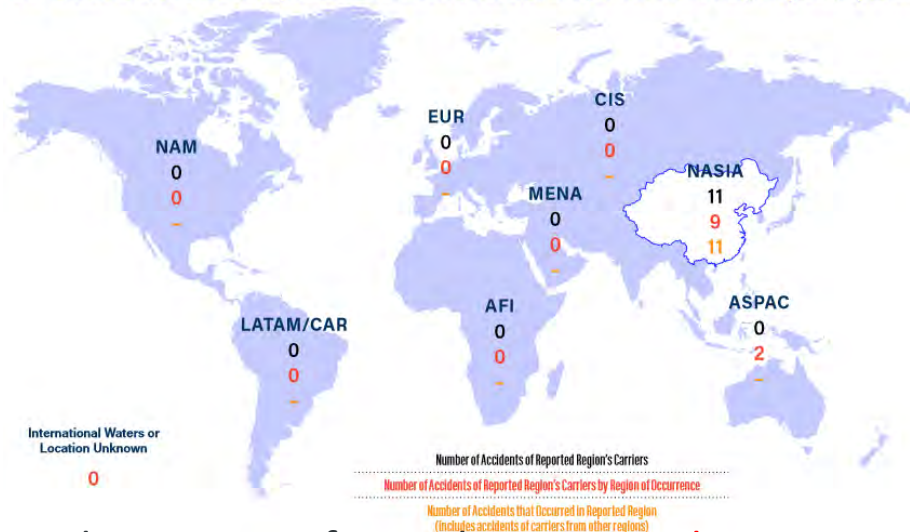
Manual Handling/Flight Controls:
46%



Weather impacts on aviation safety

Number of Accidents per Region (2014-2018)

The accident rate based on region of occurrence is not available, therefore the map only displays counts



North Asia Aircraft Accidents – Accident Count

[Source: IATA SAFETY REPORT 2018, Edition 55]

Top Primary Contributing factors

Latent Conditions

Flight Operations:
50%

Threats

Meteorology:
70%

Flight Crew Errors

Manual Handling/Flight Controls:
70%



Weather impacts on aviation safety

2. THREATS

Definition: An event or error that occurs outside the influence of the flight crew, but which requires crew attention and management if safety margins are to be maintained.

Mismanaged threat: A threat that is linked to or induces a flight crew error.

Environmental Threats	Examples
Meteorology	See the following breakdown
	↗ Thunderstorms
	↗ Poor visibility/Instrument Meteorological Conditions
	↗ Wind/wind shear/gusty wind
	↗ Icing conditions
	↗ Hail

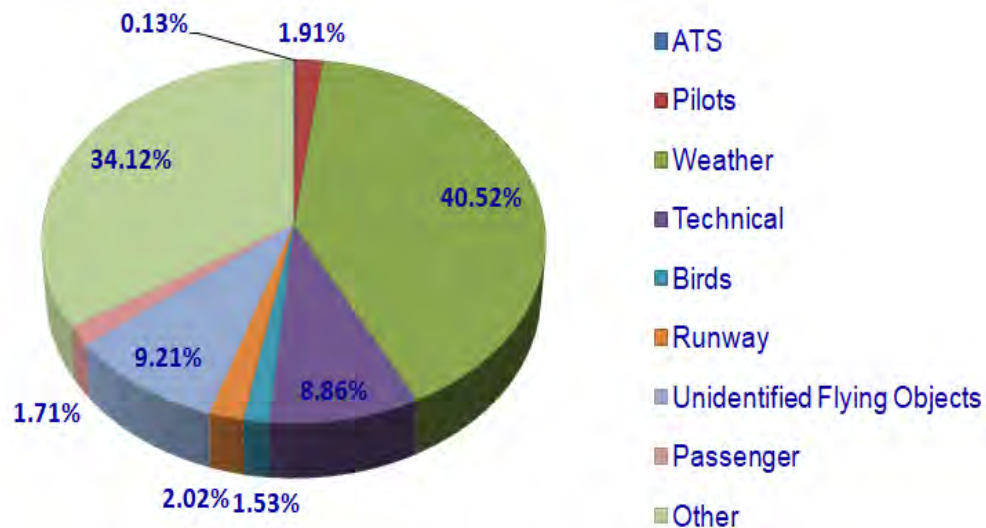
[Source: IATA SAFETY REPORT 2018, Edition 55]



Weather impacts on aviation safety

[Source: Civil Aviation Authority Vietnam]

- In Vietnam, adverse weather is a main safety concern

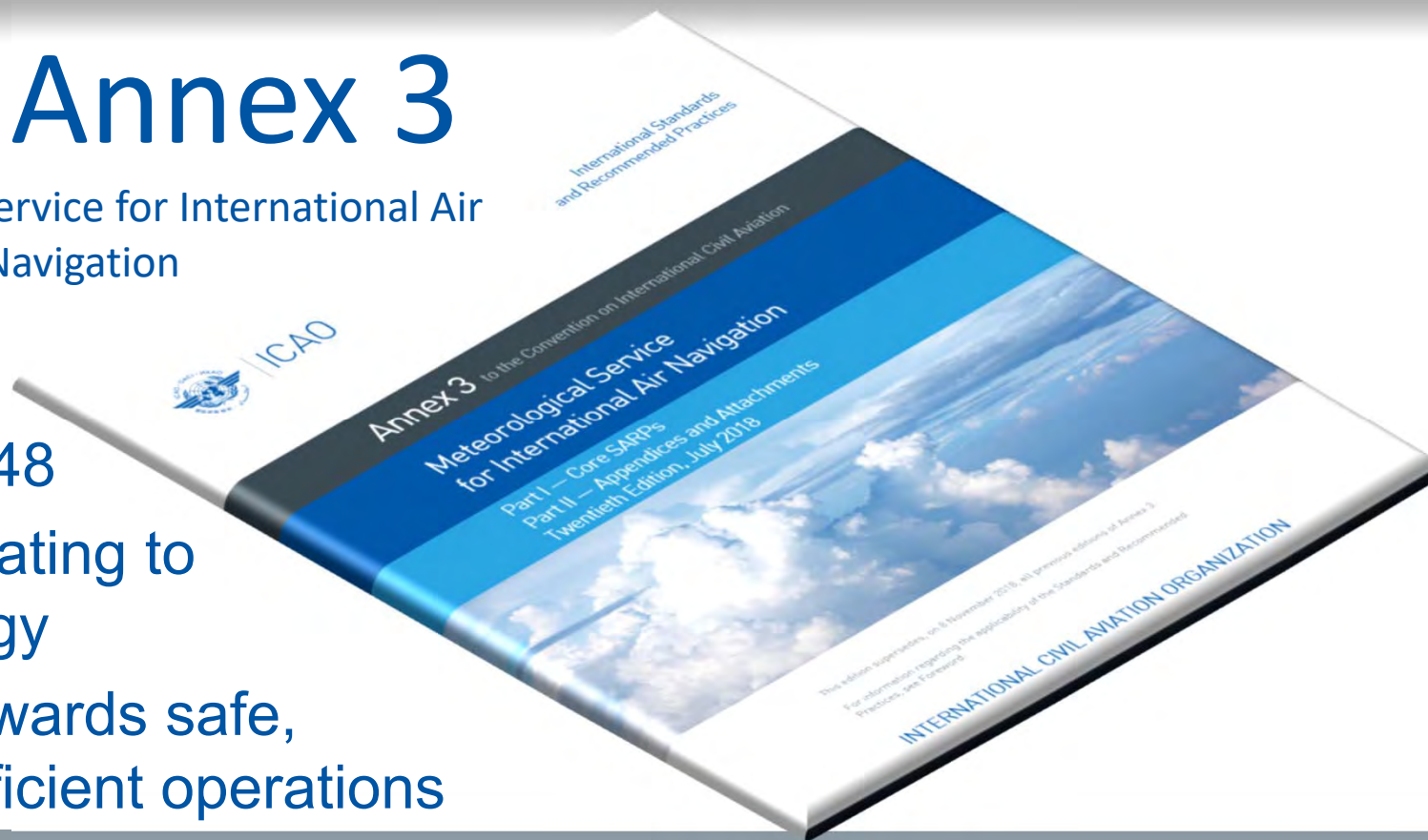




ICAO Annex 3

Meteorological Service for International Air Navigation

- 1st Ed. 1948
- SARPs relating to meteorology
- Geared towards safe, regular, efficient operations





ICAO Annex 3

- Part I (Core SARPs)
 - Definitions and General Provisions
 - Requirements for MET services
- Part II (Appendices and attachments)
 - Technical specifications for MET services



- Objective of MET service: contribute towards safety, regularity and efficiency
 - Supply users necessary MET information
 - Determine MET service to meet the needs
 - Designate MET authority to provide/arrange MET
 - Qualifications/competencies/education/training
 - Maintain close liaison between suppliers/users
 - Ensure the quality management of MET

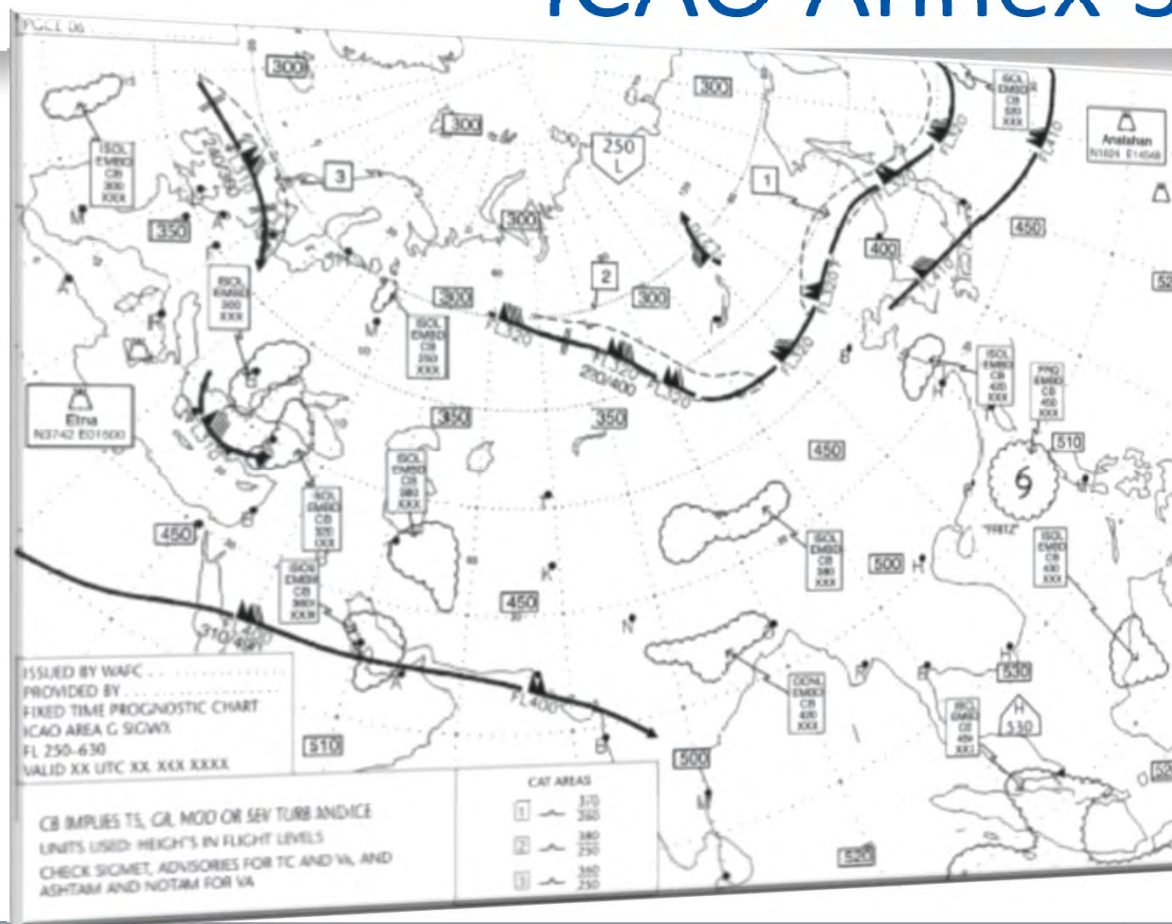


Annex 3 – MET provision today

- WAFS/WAFCs
- VAACs
- State Volcano Observatories
- TCACs
- Space Weather
- Aeronautical MET stations
- Automatic observing systems
- Aerodrome MET Offices
- Meteorological Watch Offices
- Aircraft observations
- ATIS, D-ATIS, VOLMET, D-VOLMET
- Climatological information
- Quality management
- Etc.



SIGWX forecast





Volcanic ash advisory information

FVFE01 RJTD 230130
 VA ADVISORY

DTG: 20080923/0130Z
 VAAC: TOKYO
 VOLCANO: KARYMSKY 1000-13
 PSN: N5403 E15927
 AREA: RUSSIA
 SUMMIT ELEV: 1536M
 ADVISORY NR: 2008/4
 INFO SOURCE: MTSAT-1R KVERT KEMSD
 AVIATION COLOUR CODE: RED
 ERUPTION DETAILS: ERUPTION AT 20080923/0000Z FL300 REPORTED
 OBS VA DTG: 23/0100Z
 OBS VA CLD: FL250/300 N5400 E15930 – N5400 E16100 – N5300 E15945 MOV SE 20KT
 SFC/FL200 N5130 E16130 – N5130 E16230 – N5230 E16230 – N5230 E16130
 MOV SE 15KT

FCST VA CLD +6 HR: 23/0700Z FL250/350 N5130 E16030 – N5130 E16230 – N5330 E16230 – N5330
 E16030 SFC/FL180 N4830 E16330 – N4830 E16630 – N5130 E16630 – N5130
 E16330

FCST VA CLD +12 HR: 23/1300Z SFC/FL270 N4830 E16130 – N4830 E16600 – N5300 E16600 – N5300
 E16130

FCST VA CLD +18 HR: 23/1900Z NO VA EXP
 RMK: LATEST REP FM KVERT (0120Z) INDICATES ERUPTION HAS CEASED.
 TWO DISPERSING VA CLD ARE EVIDENT ON SATELLITE IMAGERY

NXT ADVISORY: 20080923/0730Z



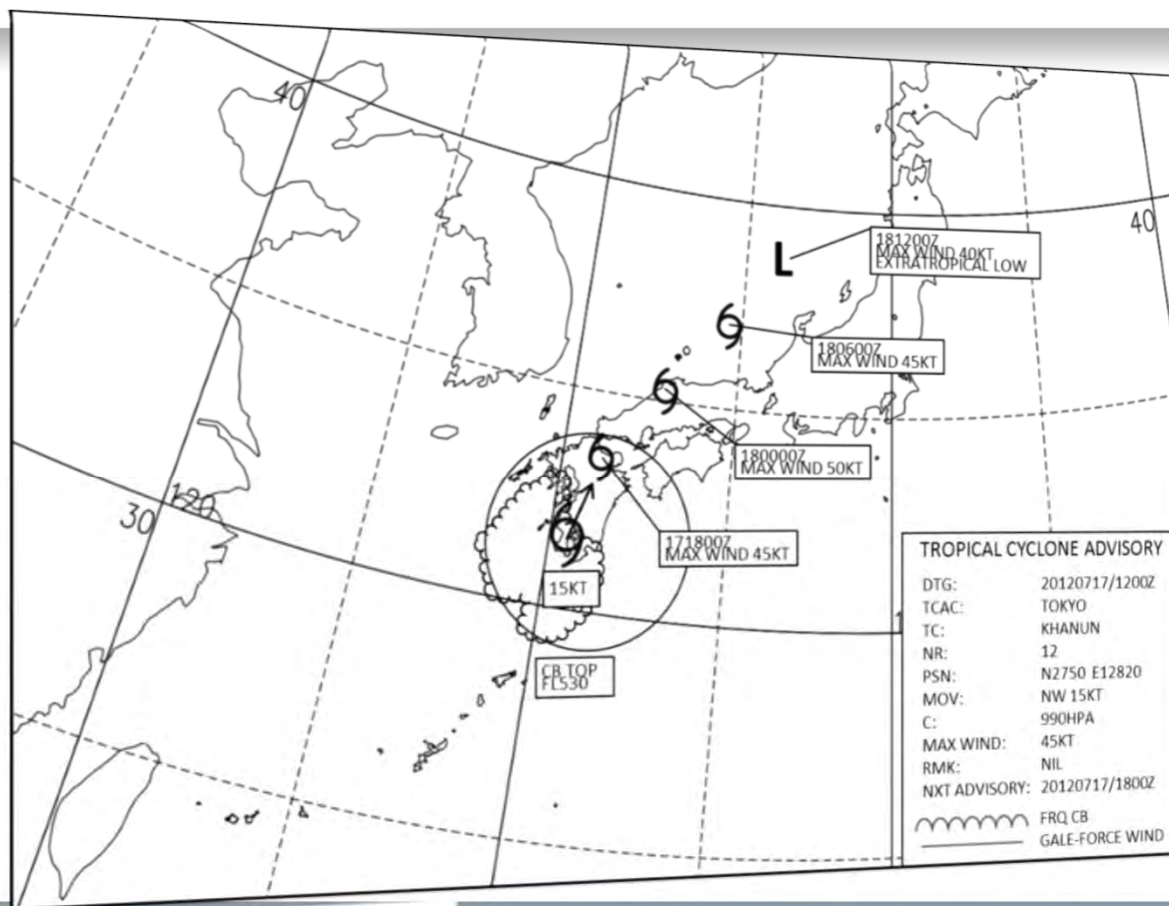
Volcano Observatory Notice for Aviation VONA

VOLCANO OBSERVATORY NOTICE FOR AVIATION (VONA) FORMAT

- | | |
|---|--|
| (1) VOLCANO OBSERVATORY NOTICE FOR AVIATION — VONA | |
| (2) Issued: | Universal (Z) date and time (YYYYMMDDHHMMZ). |
| (3) Volcano: | Name and number (per Smithsonian database at http://www.volcano.si.edu/) |
| (4) Current aviation colour code: | GREEN, YELLOW, ORANGE OR RED in upper-case bold font |
| (5) Previous aviation colour code: | Lower-case font, not bold |
| (6) Source: | Name of volcano observatory (volcanological agency) |
| (7) Notice number: | Create unique number for each VONA that includes year |
| (8) Volcano location: | Latitude, longitude in NOTAM format (N or S deg min W or E deg min) |
| (9) Area: | Regional descriptor |
| (10) Summit elevation: | nnnnn FT (nnnn M) |
| (11) Volcanic activity summary: | Concise statement that describes activity at the volcano. If known, specify time of onset and duration (local and UTC) of eruptive activity. If the eruption is ongoing at the time of VONA release, indicate "eruption and ash emission is continuing". |
| (12) Volcanic cloud height: | Best estimate of ash-cloud top in nnnnn FT (nnnn M) above summit or AMSL (specify which). Give source of height data (ground observer, pilot report, radar, etc.). "UNKNOWN" if no data available or "NO ASH CLOUD PRODUCED" if applicable. |
| (13) Other volcanic cloud information: | Brief summary of relevant cloud characteristics (colour of cloud, shape of cloud, direction of movement, etc.) Specify if cloud height is obscured or suspected to be higher than what can be observed clearly. "UNKNOWN" if no data available or "NO ASH CLOUD PRODUCED" if applicable. |
| (14) Remarks: | Optional. Brief comments on related topics (monitoring data, observatory actions, volcano's previous activity, etc.) |
| (15) Contacts: | Names, telephone and fax numbers, e-mail addresses. |
| (16) Next notice: | "A new VONA will be issued if conditions change significantly or the colour code is changed." Include URL of website where latest volcanic information is posted. |

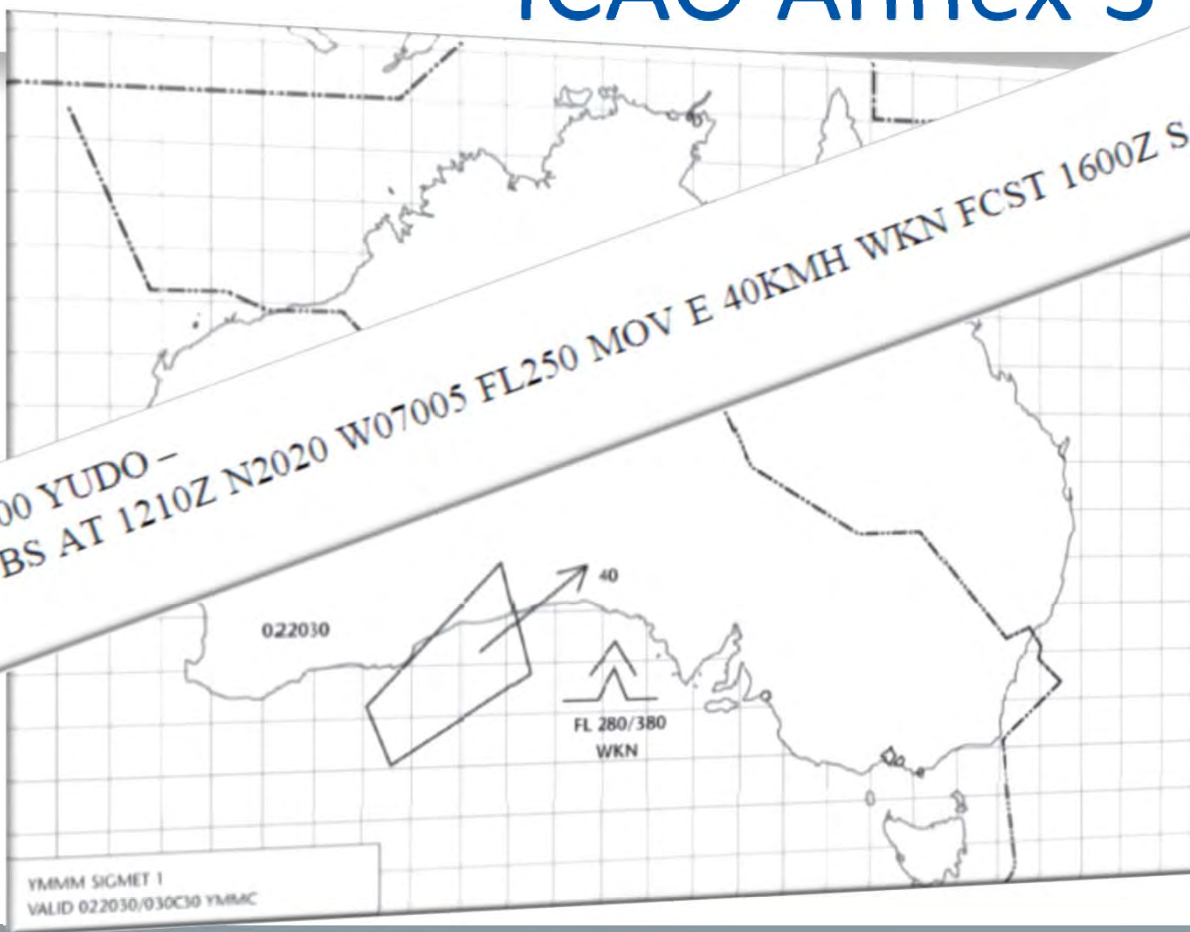


Tropical cyclone advisory information Graphical format





SIGMET graphical and Text format





Routine
report

MET REPORT YUDO 221630Z WIND 240/4MPS VIS 600M RVR RWY 12 TDZ 1000M MOD DZ FC CLD
SCT 300M OVC 600M T17 DP16 QNH 1018HPA TREND BECMG TL1700 VIS 800M FG BECMG AT1800
VIS 10KM NSW

METAR

METAR YUDO 221630Z 24004MPS 0600 R12/1000U DZ FG SCT010 OVC020 17/16 Q1018 BECMG TL1700
0800 FG BECMG AT1800 9999 NSW

TAF

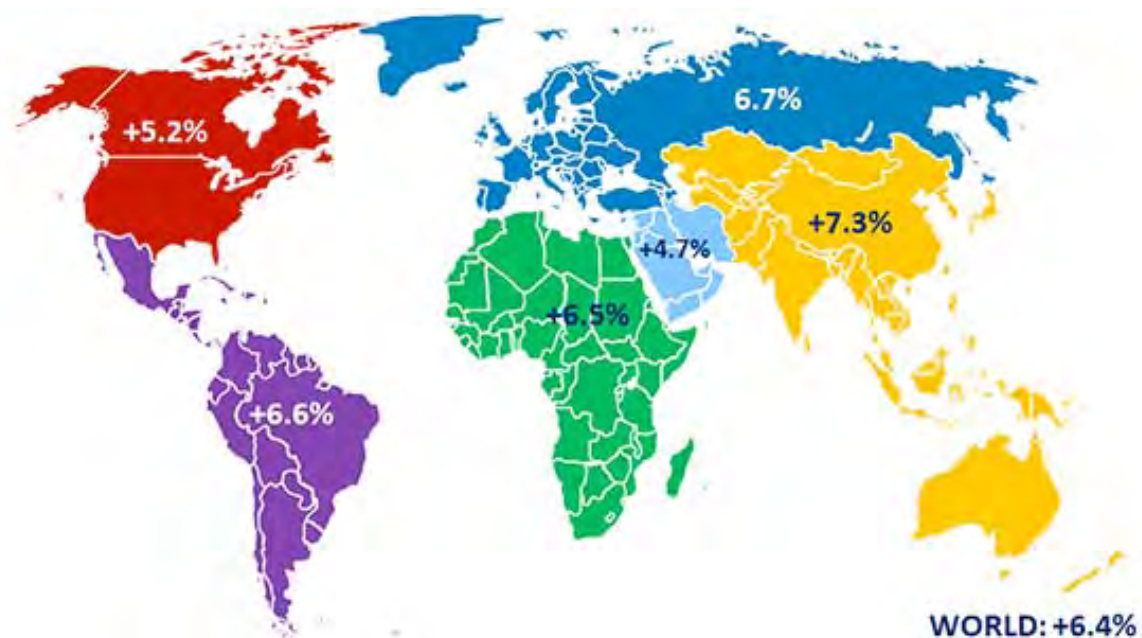
TAF YUDO 160000Z 1606/1624 13005MPS 9000 BKN020 BECMG 1606/1608 SCT015CB BKN020 TEMPO
1608/1612 17006G12MPS 1000 TSRA SCT010CB BKN020 FM161230 15004MPS 9999 BKN020



ICAO'S REGIONAL REQUIREMENTS FOR MET



Regional revenue passenger-kilometres (RPK) Growth



International scheduled revenue passenger-kilometres (RPK) growth in 2018

Source: <https://www.icao.int/Newsroom/Pages/Solid-passenger-traffic-growth-and-moderate-air-cargo-demand-in-2018.aspx>



IATA 20 Year Passenger Forecast





Air traffic demands better MET support

- Weather hazards— “a threat for sustainable aviation developments”
 - APAC has world’s largest air traffic volume
 - Continuous air traffic growth forecasted by IATA and ICAO
 - Safety, efficiency and regularity become more important

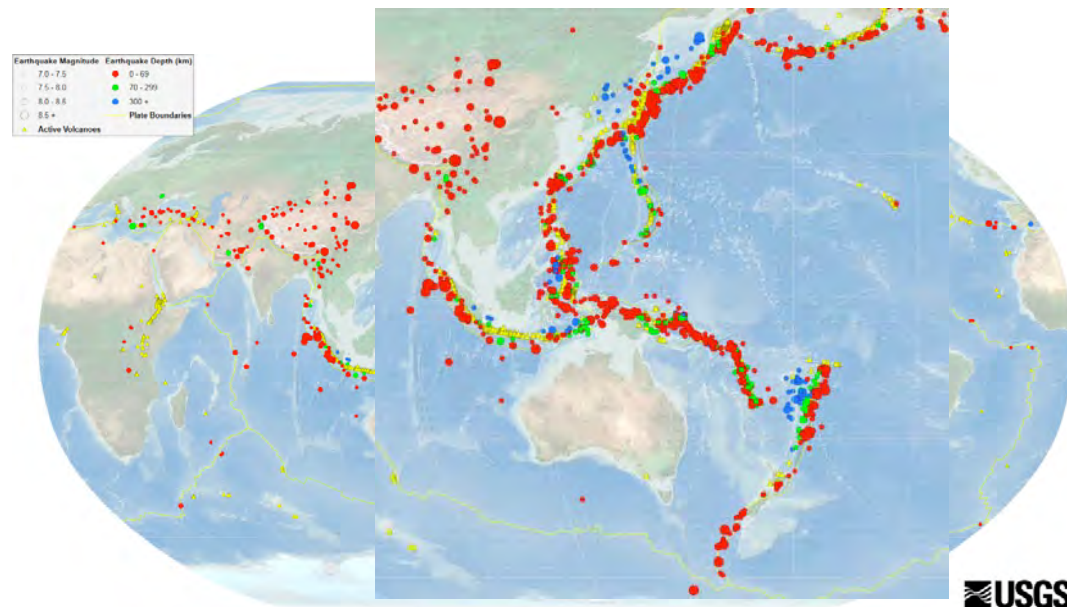


Increasing air traffic demands MET support

- Frequent hazardous weather requires improved MET information and services
 - Variety of phenomena from Tropical Cyclone to Volcanic Ash
 - Quality, timeliness and consistency of MET information required
 - Continuous capacity development is fundamental

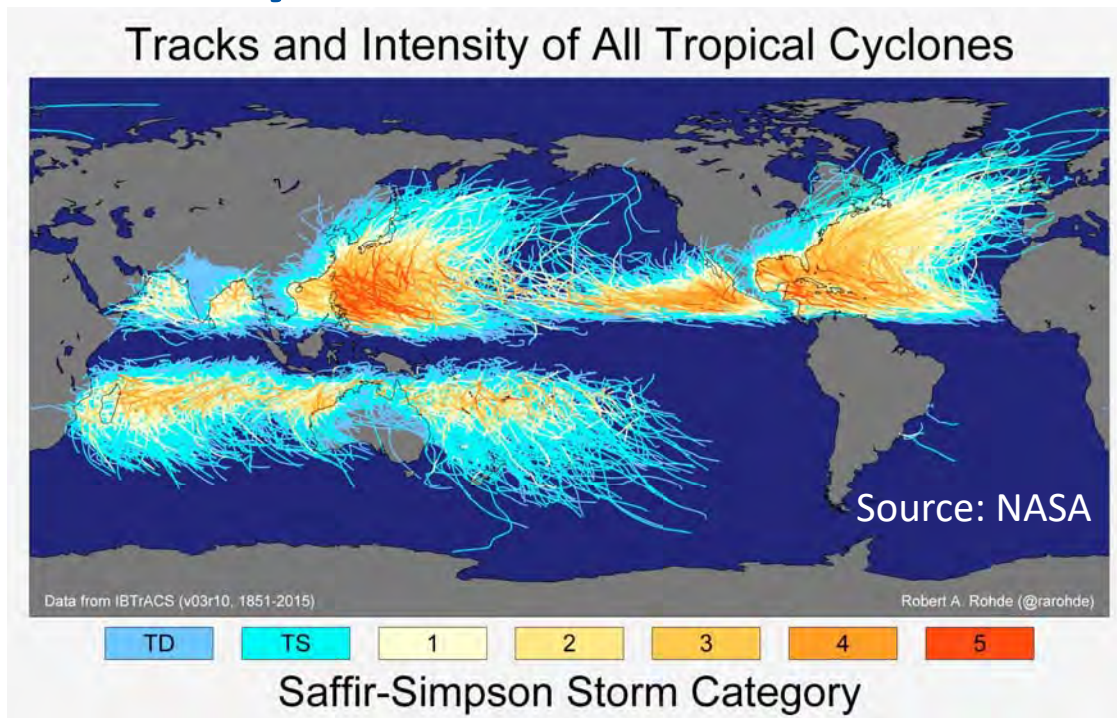
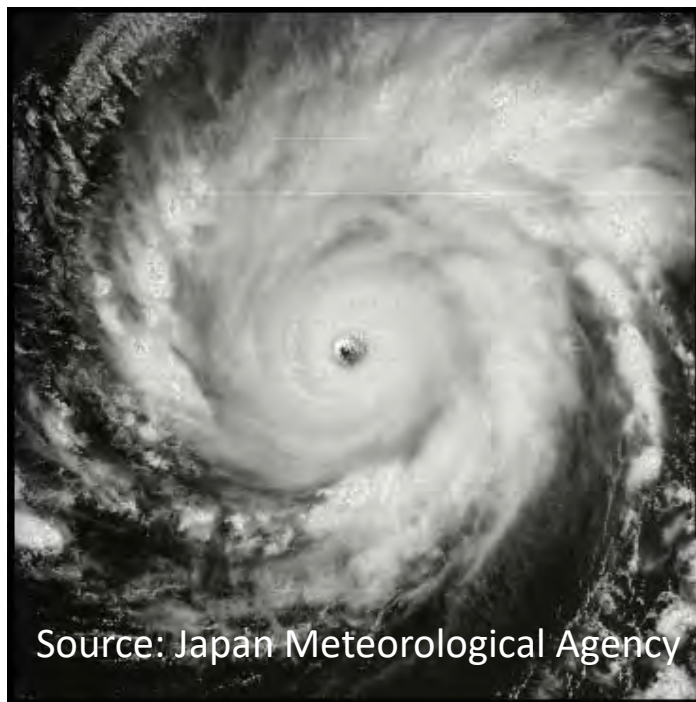


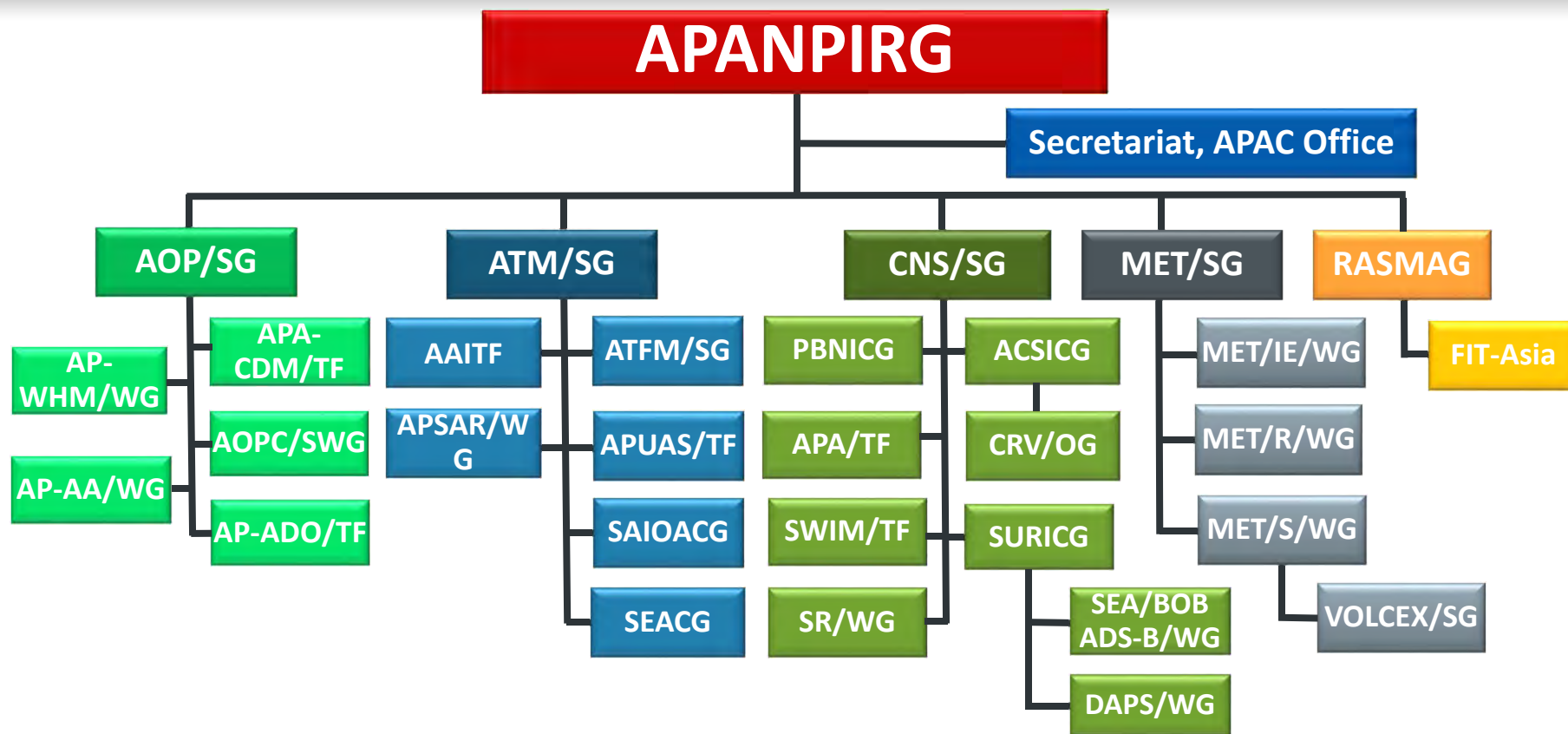
Volcanic Ash





Tropical cyclone







ICAO

The Seventeenth Meeting of the Asia/Pacific Meteorological Information Exchange Working Group
(MET/IE WG/17)

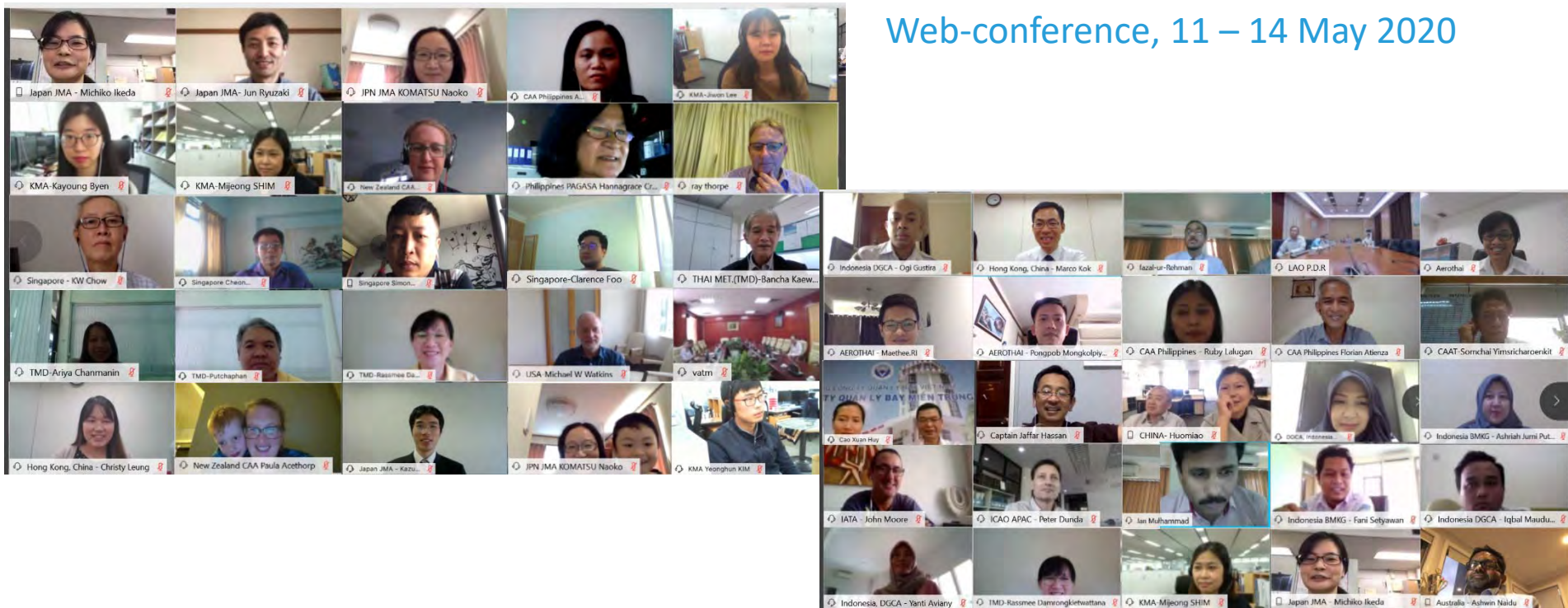
ICAO Asia and Pacific Regional Office, Bangkok, Thailand, 11-13 March 2019





Ninth Meeting of the Meteorological Requirements Working Group (MET/R WG/9)

Web-conference, 11 – 14 May 2020

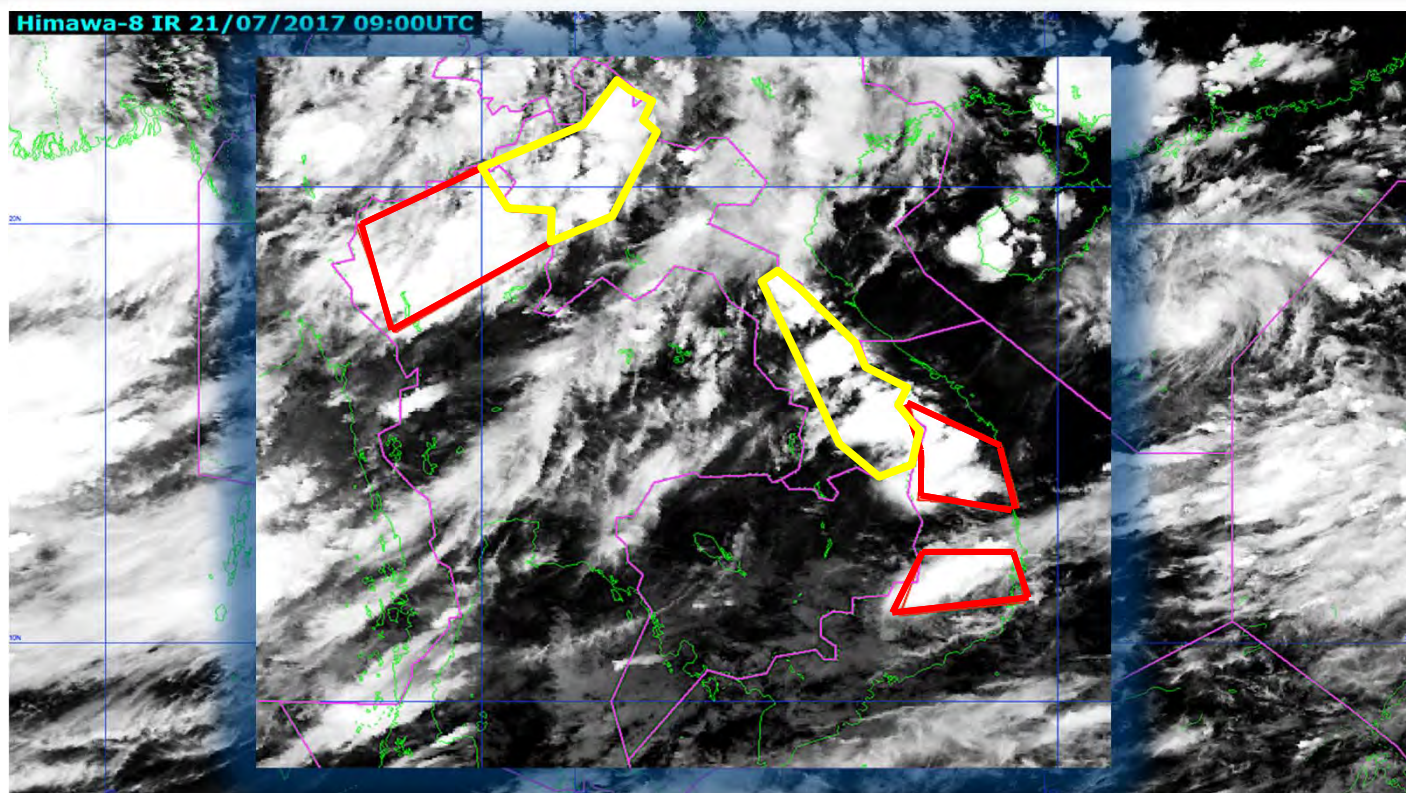




Regional coordination of SIGMET

- Multi-lateral cooperation scheme has been spreading in APAC
 - Harmonize en-route weather information (SIGMET) across FIR boundaries
 - Capacity development through training opportunities
 - Regional guidance on SIGMET coordination has been developed







WHAT ICAO CAN OFFER (TO SUPPORT PLANNING AND IMPLEMENTATION OF MET)



Meteorology in 2019 GANP/ASBU

- GANP/ASBUs module AMET envisage migration towards integration into ATM decision making under TBO environment

AMET Block 0:

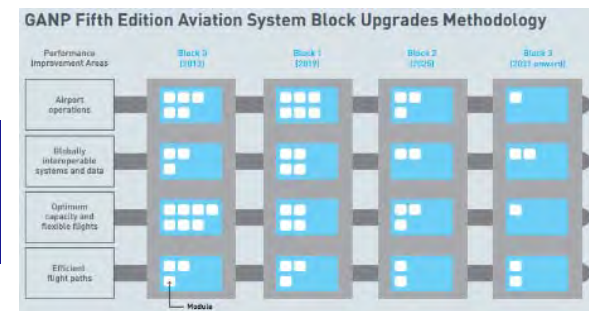
Global, regional and local meteorological information to support flexible airspace management, improved situational awareness, collaborative decision-making and dynamically optimized flight trajectory planning.

AMET Block 1:

Meteorological information supporting automated decision process or aids, involving meteorological information, **meteorological information translation**, **ATM impact conversion** and ATM decision support.

AMET Block 4:

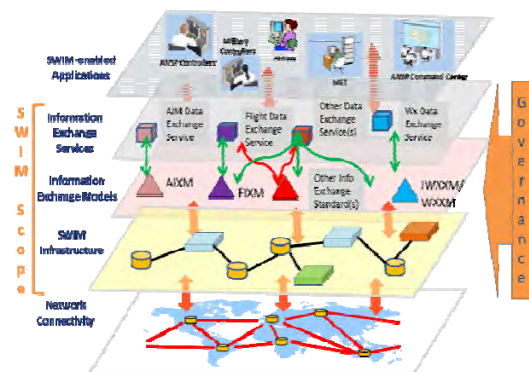
Integrated meteorological information supporting both air and ground decision making for all phases of flight and ATM operation, especially **for implementing immediate weather mitigation strategies**.





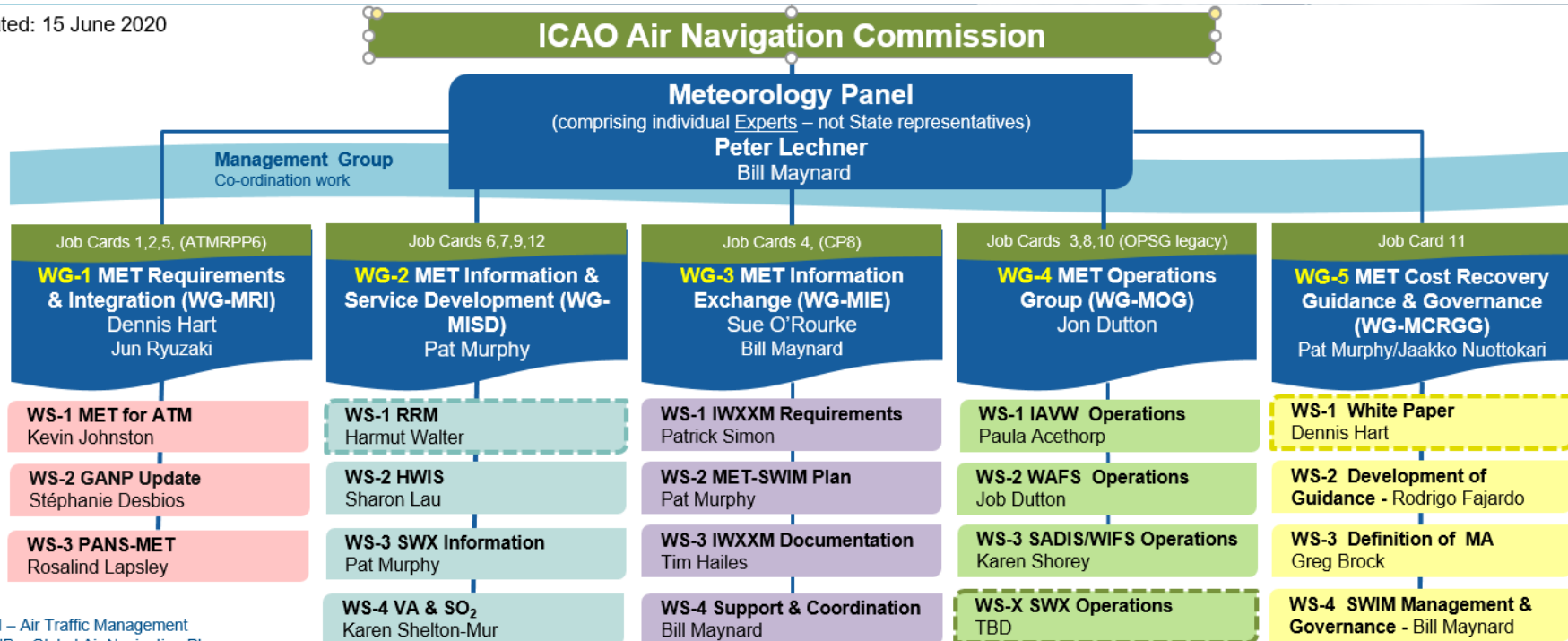
Digitalization of MET—SWIM

- MET information exchanged through SWIM
 - Fit-for-purpose use of MET information enabled
 - MET data migration to IWXXM from TAC codes





Updated: 15 June 2020



ATM – Air Traffic Management
GANP – Global Air Navigation Plan
HIWS – Hazardous Weather Information Service
IAVW – International Airways Volcano Watch
IWXXM – ICAO Meteorological Information Exchange Model
MA – Meteorological Authority
PANS – Procedures for Air Navigation Services

RRM – Release of Radioactive Material
SADIS - Secure Aviation Data Information System
SO₂ – Sulphur Dioxide
SWIM – System-wide Information Management
SWX – Space Weather

VA – Volcanic Ash
WAFS – World Area Forecast System
WIFS – WAFS Internet File Service
WG – Working Group
WS – Work Stream

Note – The primary Job Card and Work Stream responsibilities are as shown. There are numerous areas where several WG and WS teams collaborate.

----- On hold



Annex 3 (Amd. 78)

Twentieth Edition, July 2018

- IWXXM as a Standard
- 5 November 2020
- VA and TC advisory
- Space weather advisory
- METAR/SPECI
- TAF
- SIGMET/AIRMET



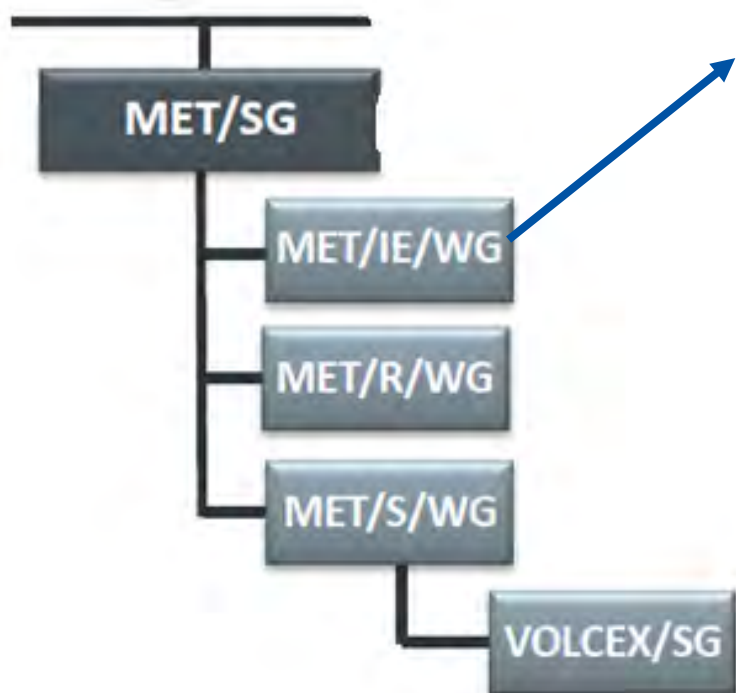


Annex 3 (Amd. 79)

Twenty-first Edition, July 2020

- 5 November 2020
- IWXXM as a Recommended Practice for SIGWX (4 November 2021)
- Template METAR and SPECI support IWXXM to handle missing/incorrect parameters when translating from TAC





Increase OPMET availability and reliability

- Facilitate and monitor the migration to IWXXM in support of SWIM
- Report to MET SG on IWXXM exchange/testing
 - Monitor migration to IWXXM
 - Undertake IWXXM testing
 - Increase awareness of IWXXM requirement
 - Arrange IWXXM workshop



Facilitating the implementation of IWXXM

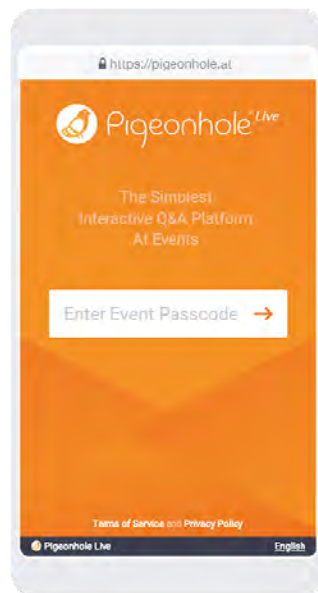
- WMO/ICAO Workshop on Implementation of IWXXM
 - Hong Kong, China, 10 – 12 October 2017
- Workshop on the Implementation of IWXXM
 - Bangkok, Thailand, 12 – 14 June 2019
- Workshop on the Implementation IWXXM
 - Nuku'alofa, Tonga, 4 – 6 December 2019
- **Webinar on the Implementation IWXXM**
 - **Dates/program to be confirmed (2020)**



Q&A SESSION



Q&A session



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[www.pigeonhole.at](https://pigeonhole.at)

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