ICAO BANGKOK UNITING AVIATION

ICAO APAC Webinars – Safety and Air Navigation Services

Aeronautical Meteorology

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Japan Meteorological Agency

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]

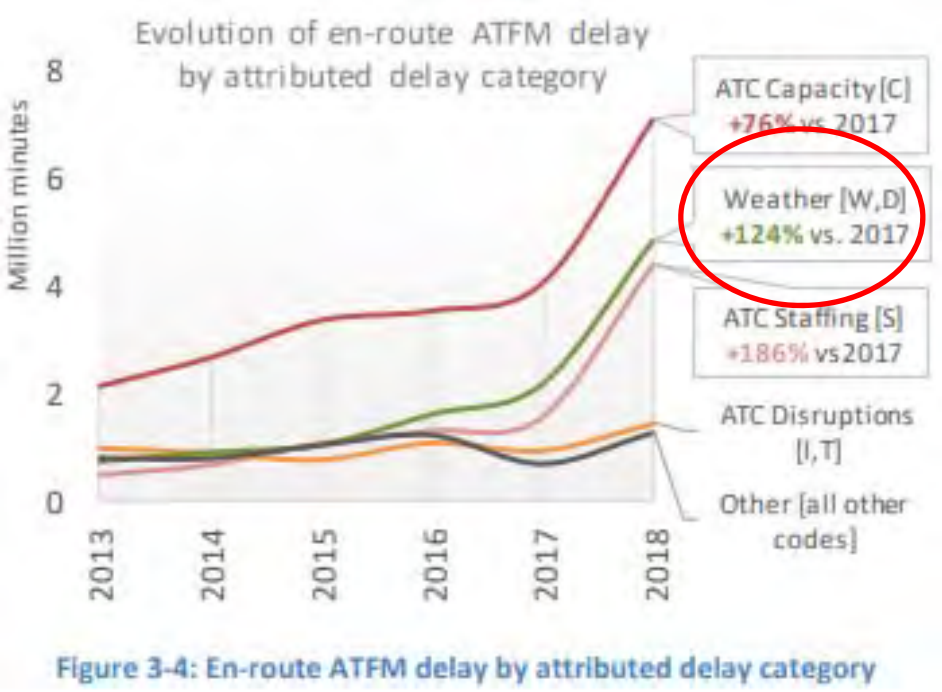
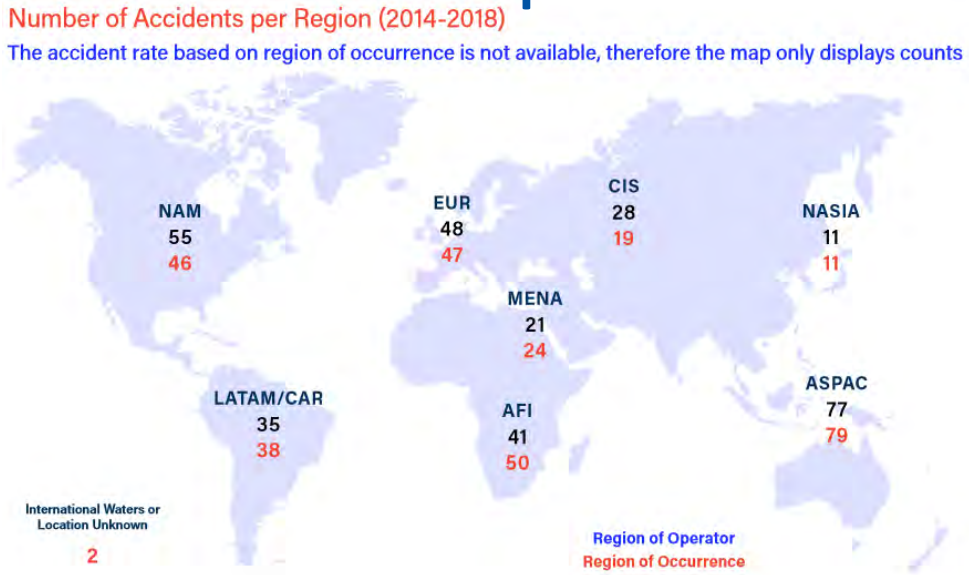


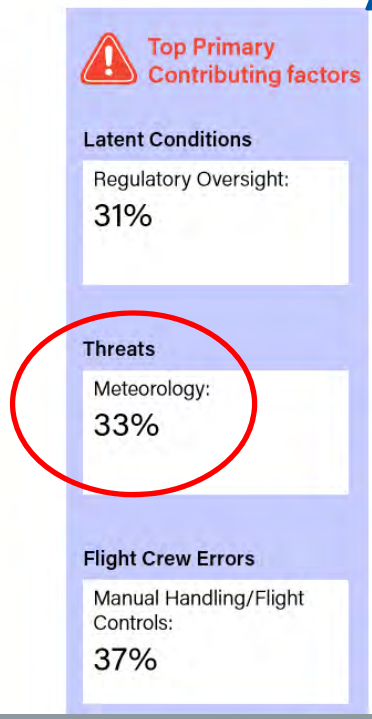
Figure 3-4: En-route ATFM delay by attributed delay category

Weather impacts on aviation safety

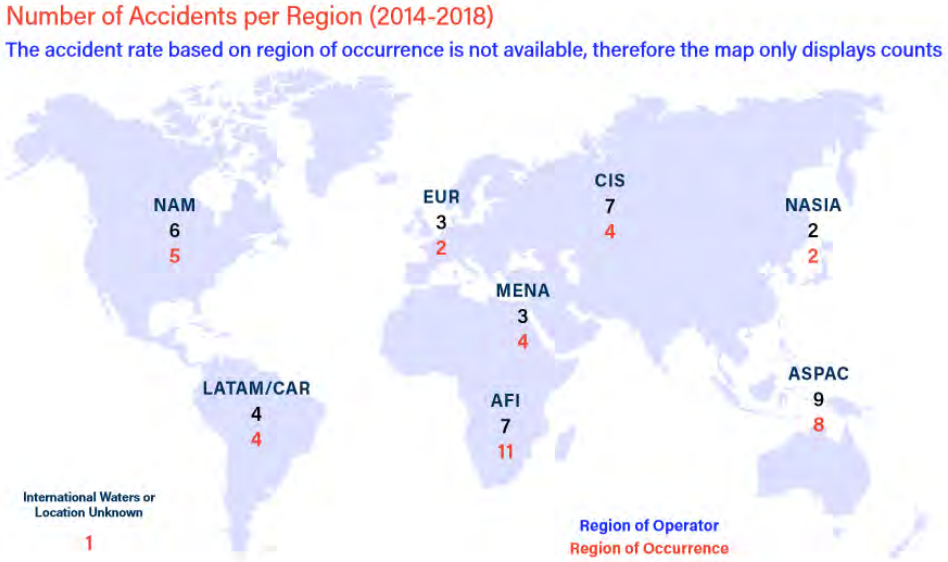


2014-2018 Aircraft Accidents – Accident Count

[Source: IATA SAFETY REPORT 2018, Edition 55]



Weather impacts on aviation safety



2014-2018 Fatal Aircraft Accidents – Accident Count

[Source: IATA SAFETY REPORT 2018, Edition 55]

Top Primary Contributing factors

Latent Conditions

Safety Management: 54%

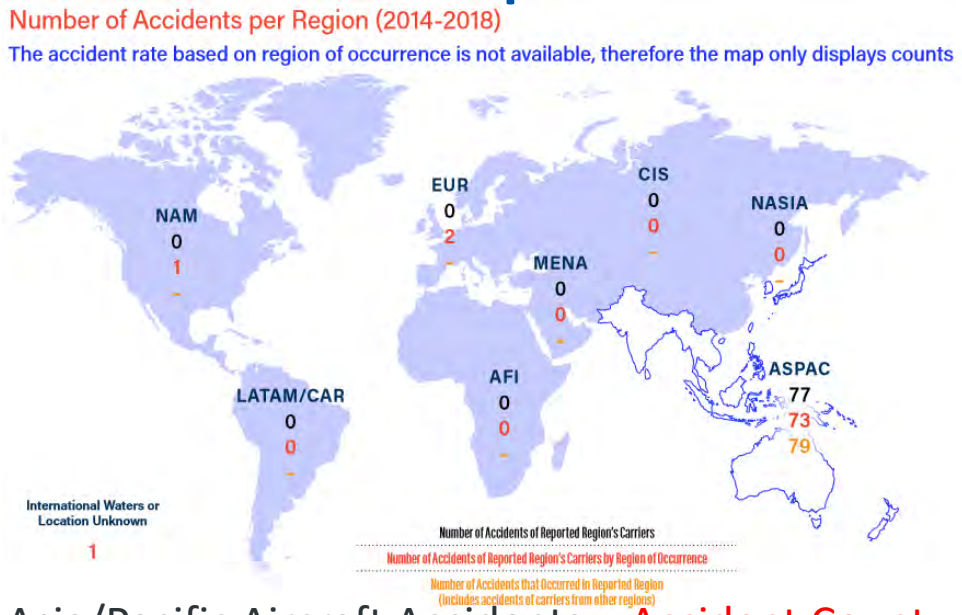
Threats

Meteorology: 46%

Flight Crew Errors

SOP Adherence / SOP Cross-verification: 61%

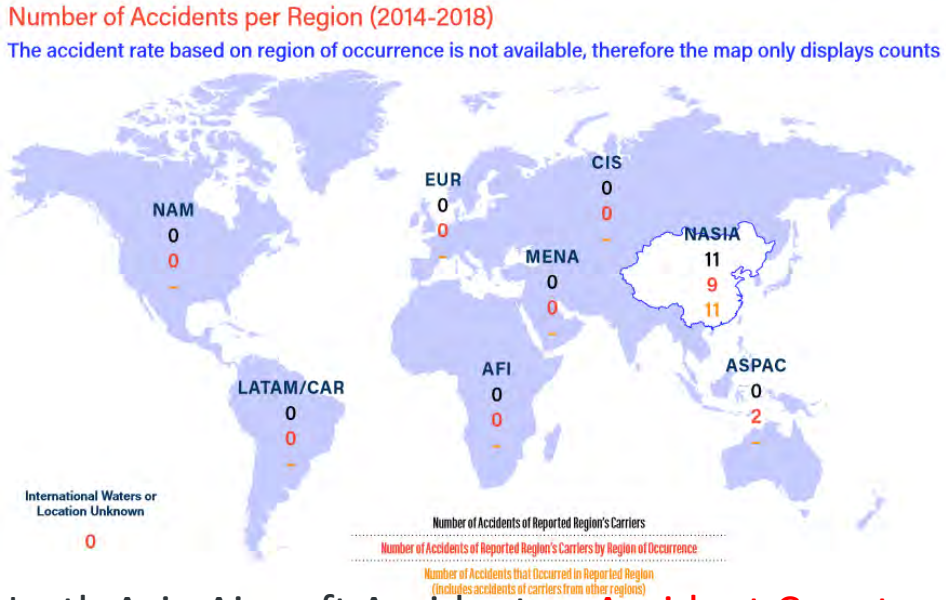
Weather impacts on aviation safety



Asia/Pacific Aircraft Accidents – Accident Count

[Source: IATA SAFETY REPORT 2018, Edition 55]

Weather impacts on aviation safety



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.

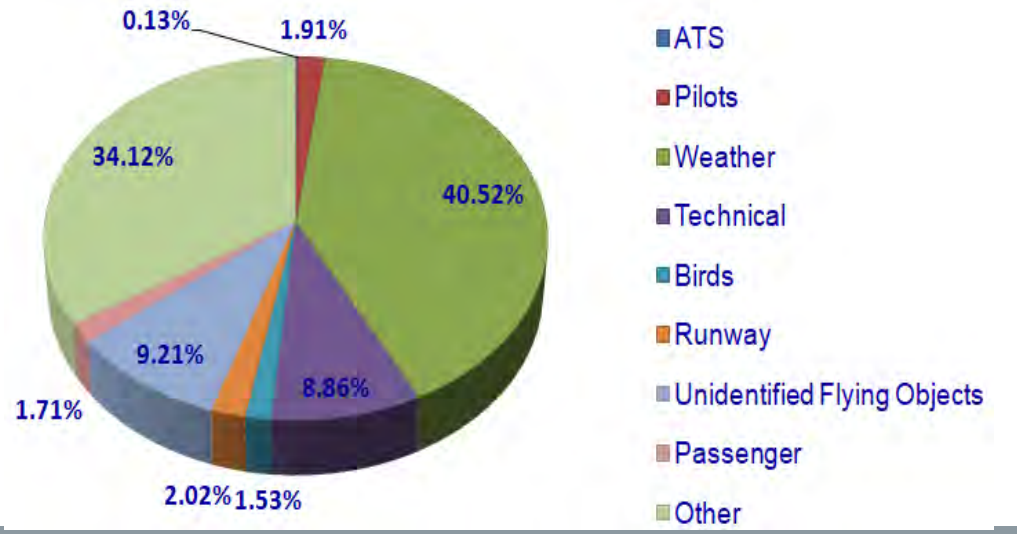
Environmental Threats	Examples
Meteorology	See the following breakdown
	↗ Thunderstorms
	↗ Poor visibility/Instrument Meteorological Conditions
	↗ Wind/wind shear/gusty wind
	↗ Icing conditions
	↗ Hail

[Source: IATA SAFETY REPORT 2018, Edition 55]

Weather impacts on aviation safety

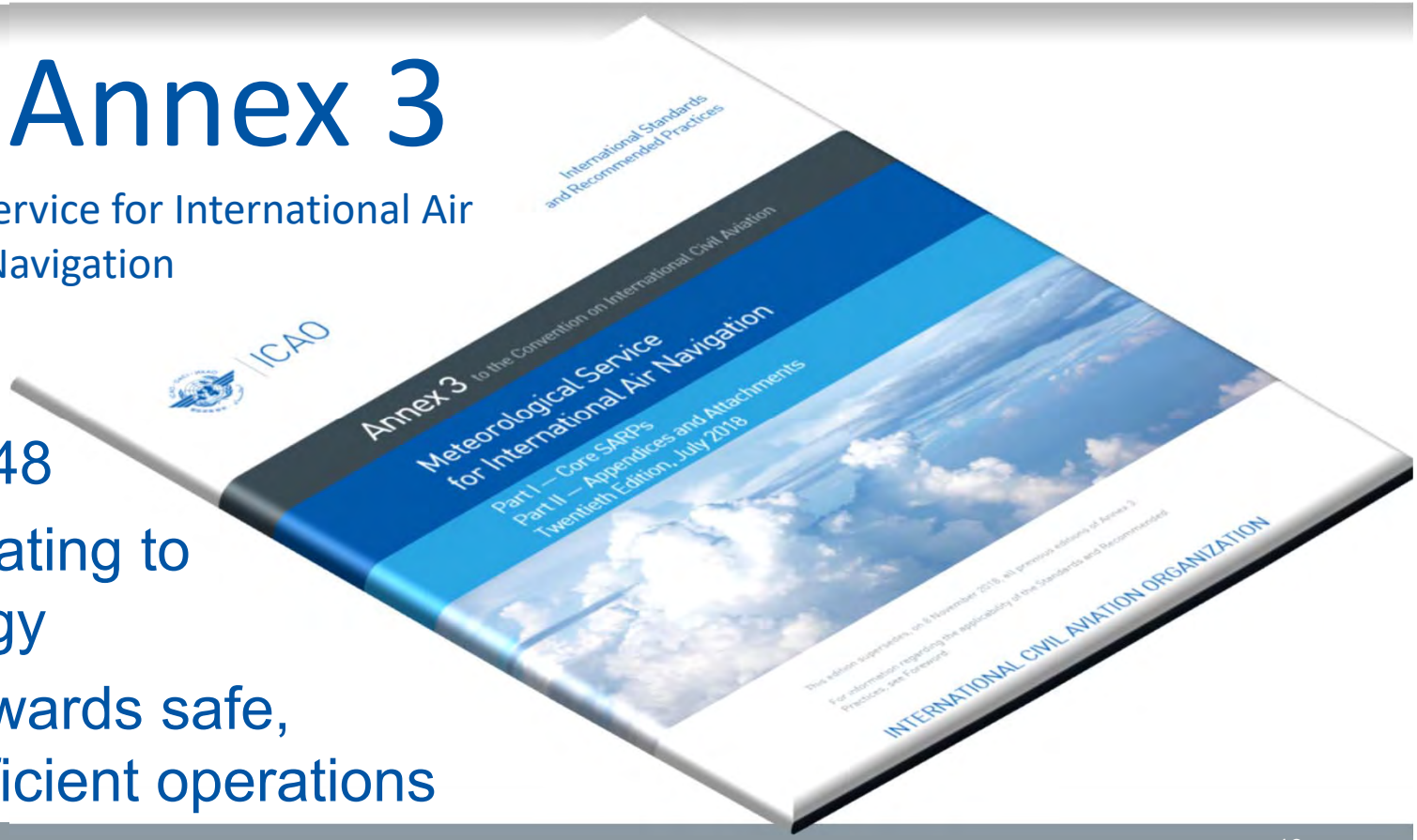
[Source: Civil Aviation Authority Vietnam]

- 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

ICAO Annex 3

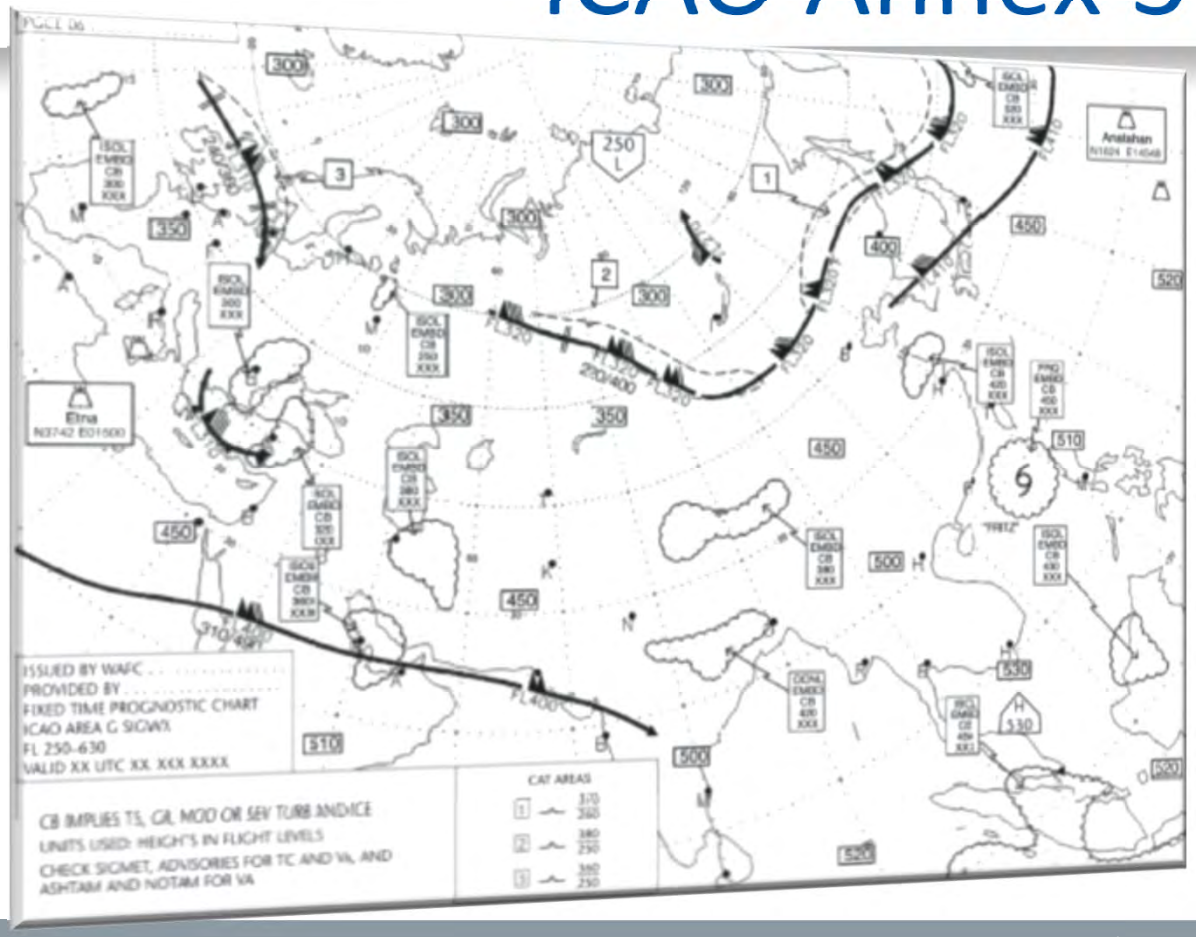
- Objective of MET service: contribute towards safety, regularity and efficiency
  - Supply users necessary MET information
  - Determine MET service to meet the needs
  - Designate MET authority to provide/arrange MET
  - Qualifications/competencies/education/training
  - Maintain close liaison between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

ICAO Annex 3

SIGWX forecast



ICAO Annex 3

Volcanic ash advisory information

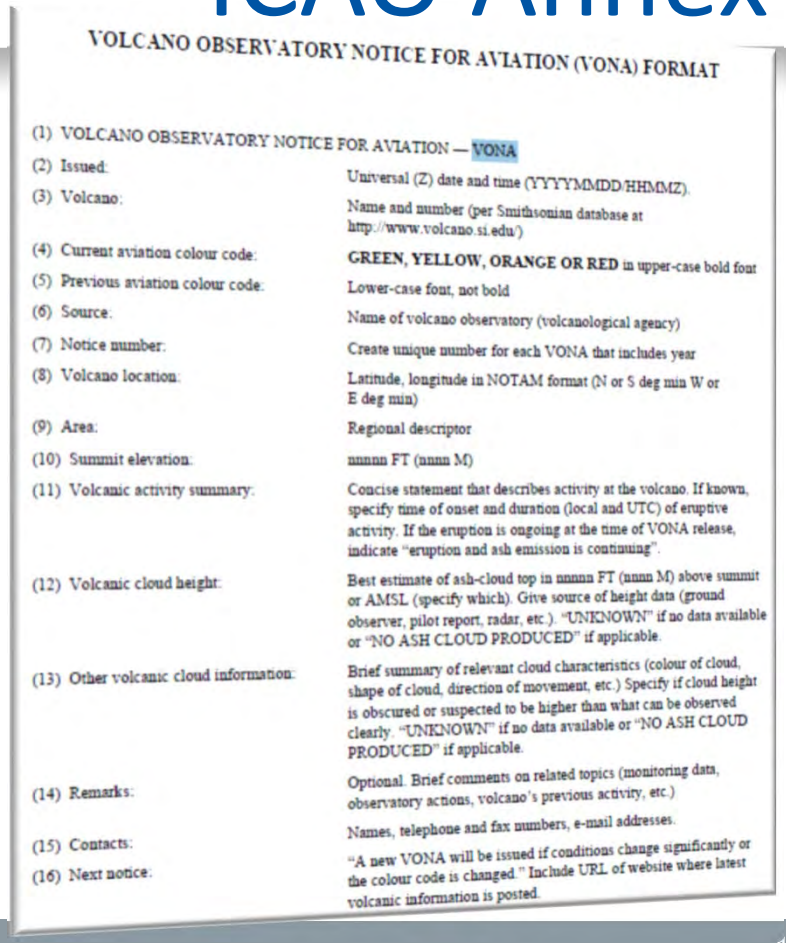
FVFE01 RJTD 230130
VA ADVISORY

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

ICAO Annex 3

Volcano Observatory Notice for Aviation

VONA



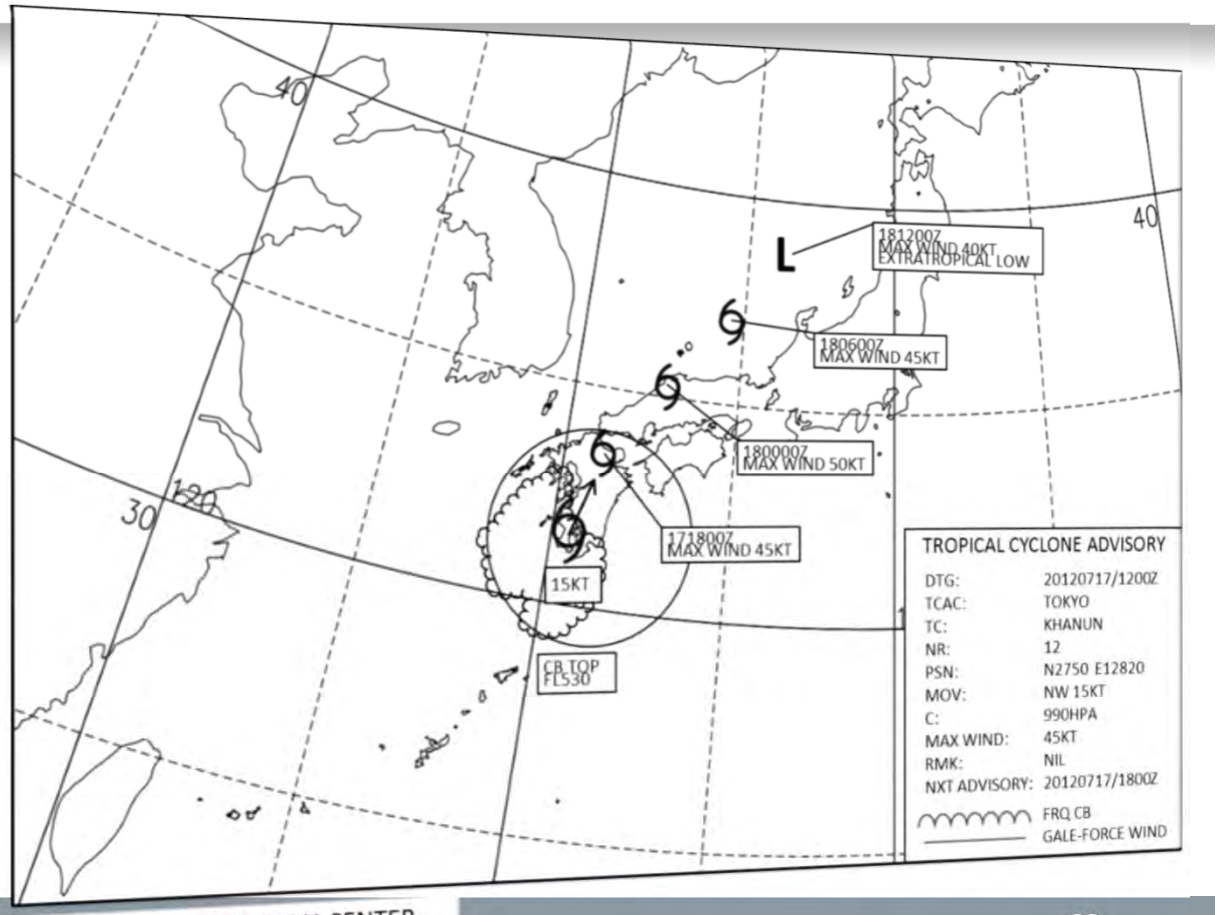
VOLCANO OBSERVATORY NOTICE FOR AVIATION (VONA) FORMAT

(1) VOLCANO OBSERVATORY NOTICE FOR AVIATION — VONA	
(2) Issued:	Universal (Z) date and time (YYYYMMDD/HHMMZ).
(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.

ICAO Annex 3

Tropical cyclone advisory information

Graphical format



RSMC TOKYO – TYPHOON CENTER

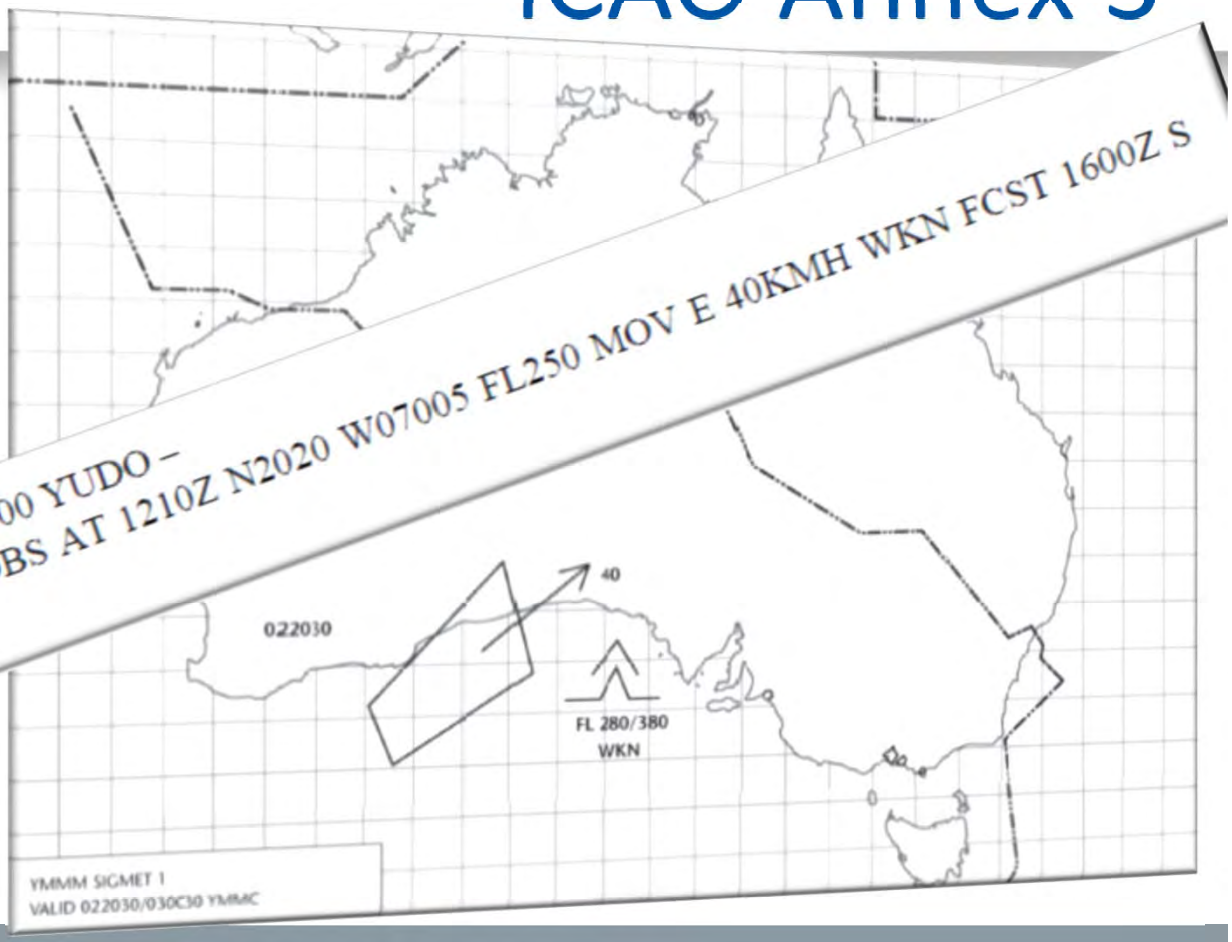
ICAO Annex 3

SIGMET

graphical and

Text format

YUCC SIGMET 5 VALID 221215/221600 YUDO –
YUCC AMSWELL FIR SEV TURB OBS AT 1210Z N2020 W07005 FL250 MOV E 40KMH WKN FCST 1600Z S
OF N2020 E OF W06950

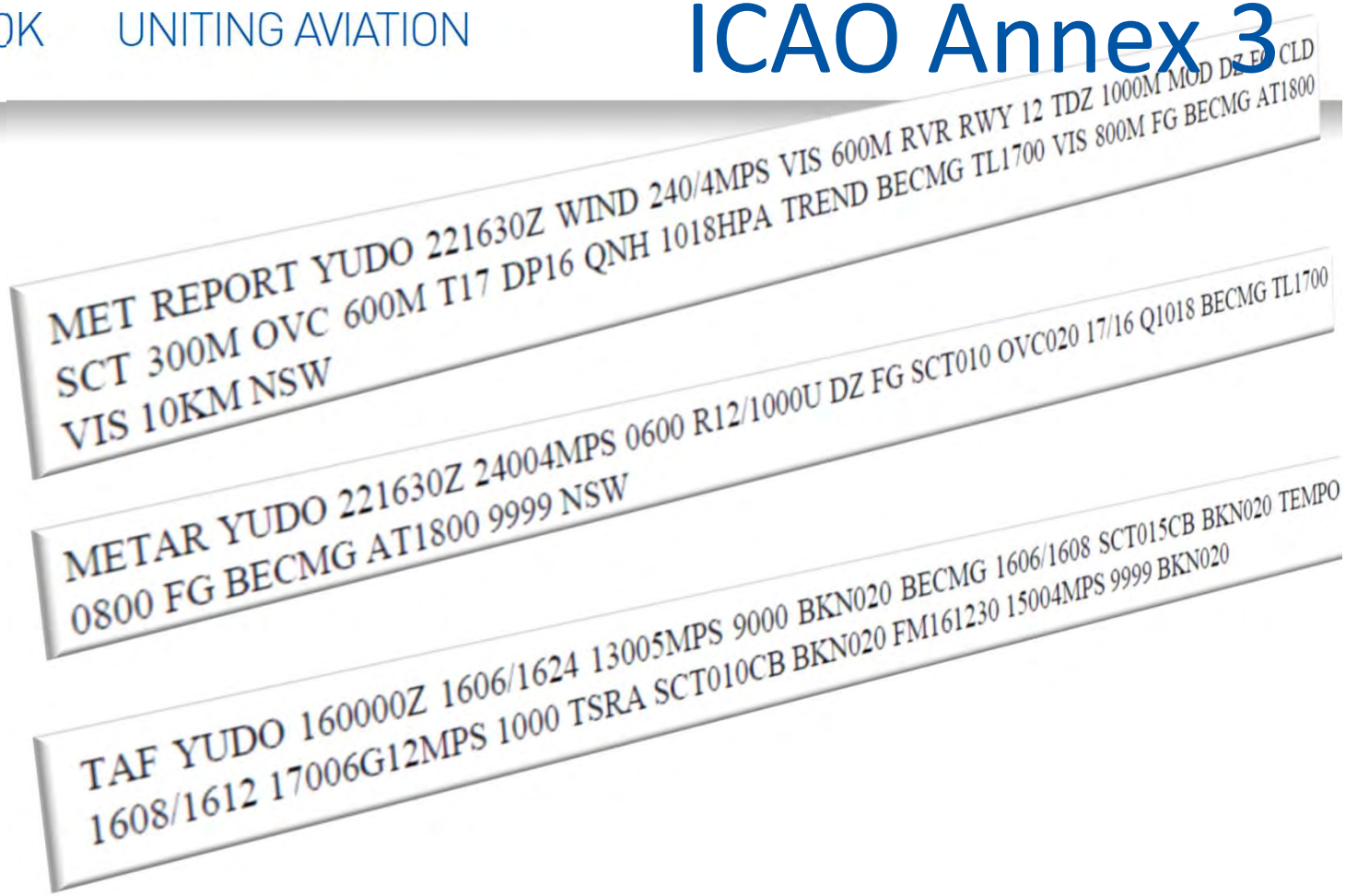


ICAO Annex 3

Routine report

METAR

TAF



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

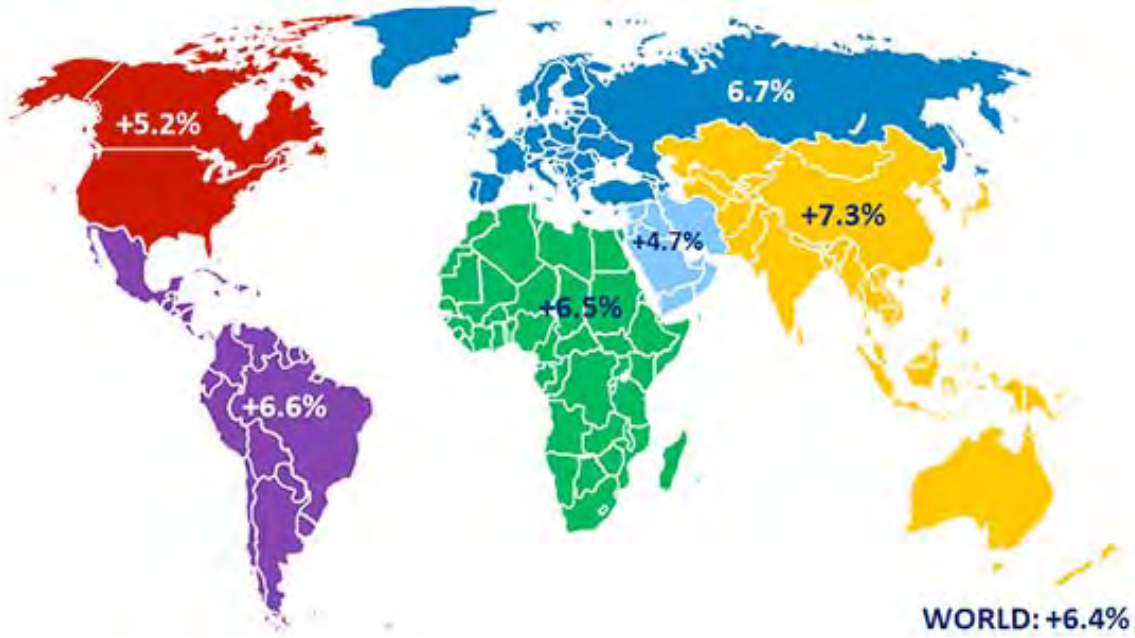
Annex 3 (Amd. 79)

Twentieth Edition, July 2018

- 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

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

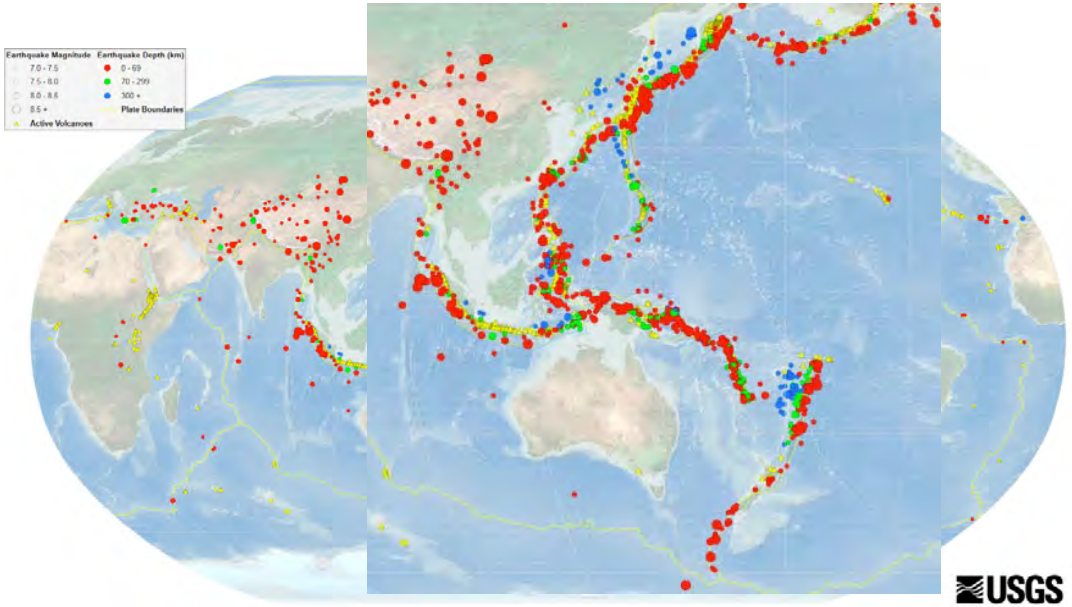
Air traffic demands better MET support

- 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

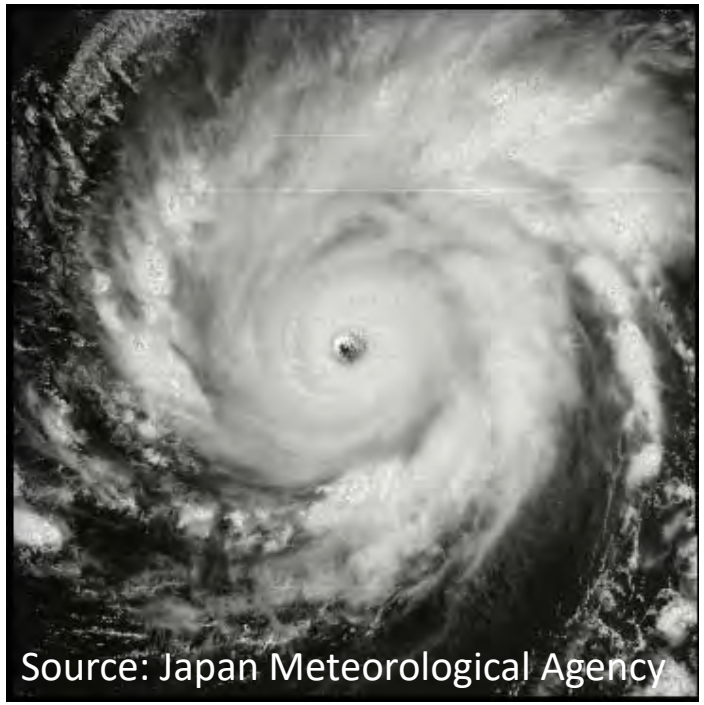
Increasing air traffic demands MET support

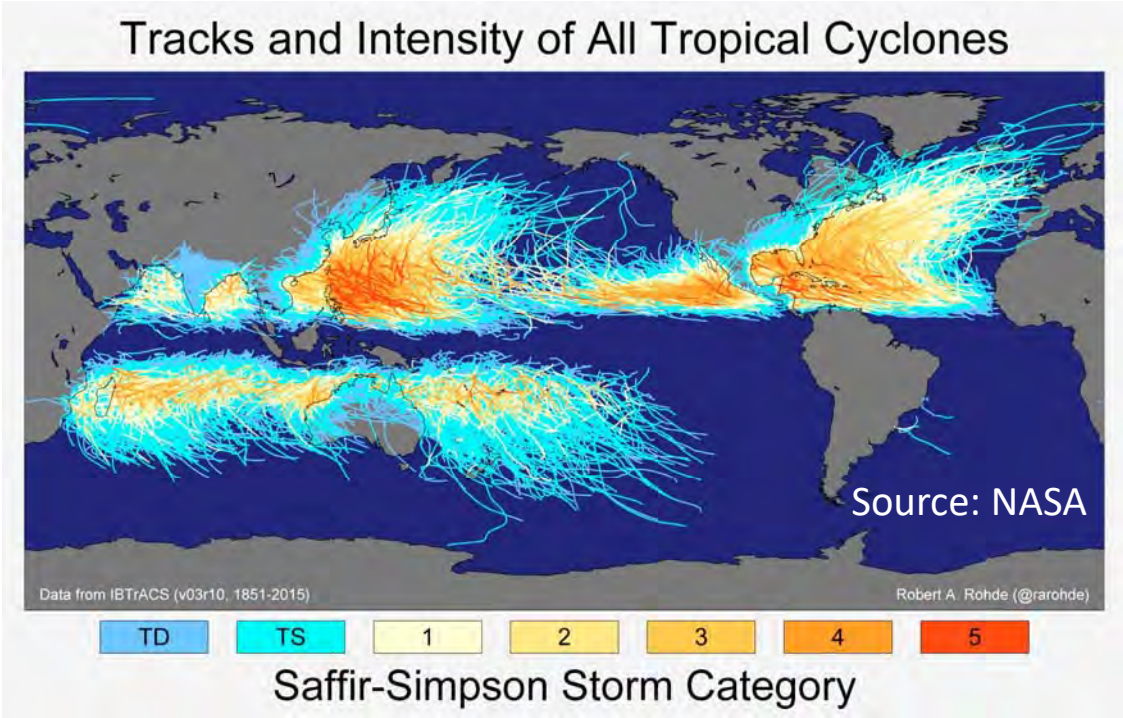
- Frequent hazardous weather requires improved MET information and services
  - Variety of phenomena from Tropical Cyclone to Volcanic Ash
  - Quality, timeliness and consistency of MET information required
  - Continuous capacity development is fundamental

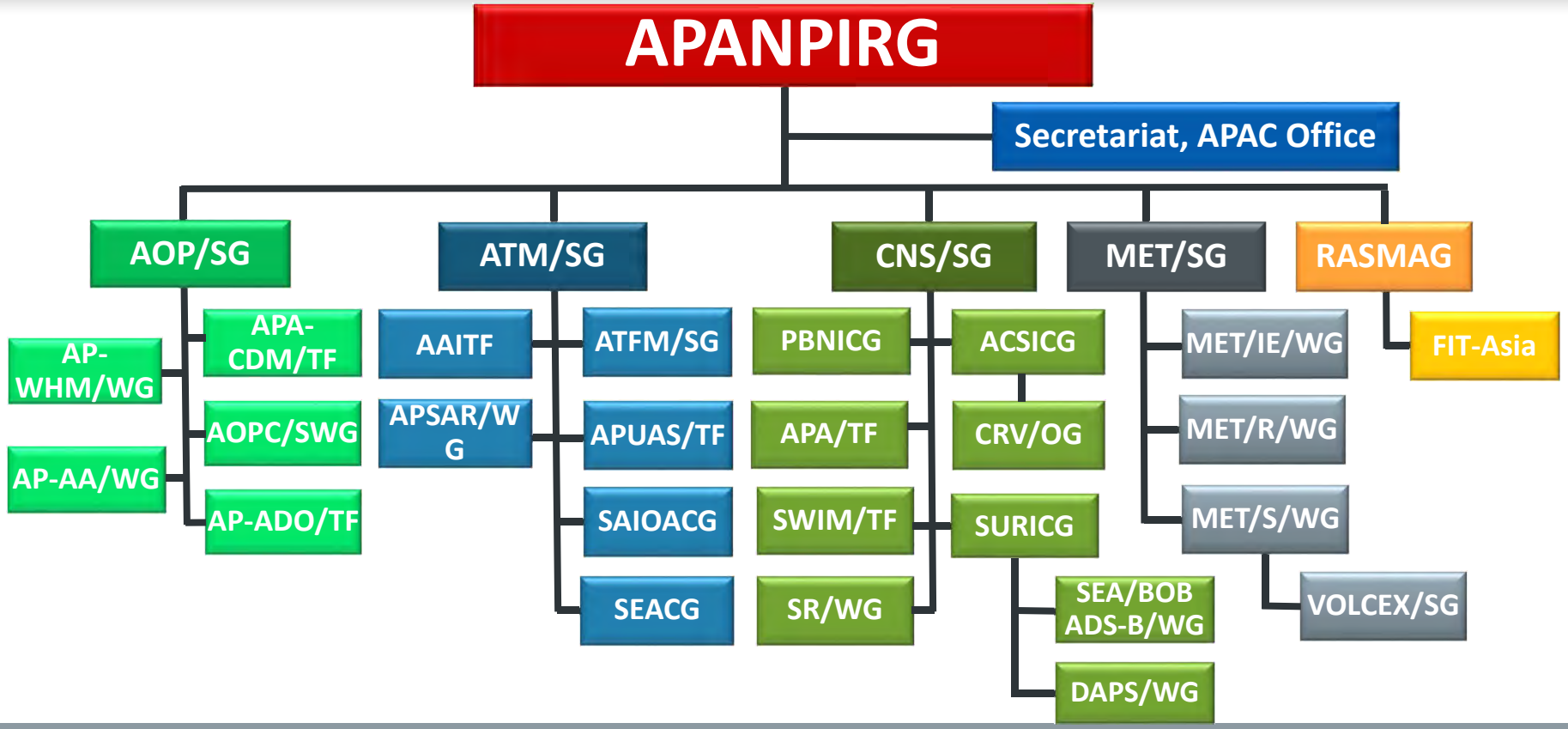
Volcanic Ash



Tropical cyclone






APANPIRG
Secretariat, APAC Office
AOP/SG
ATM/SG
CNS/SG
MET/SG
RASMAG
AP-WHM/WG
APA-CDM/TF
AOPC/SWG
AP-AA/WG
AP-ADO/TF
AAITF
APSAR/WG
ATFM/SG
APUAS/TF
SAIOACG
SEACG
PBNICG
APA/TF
SWIM/TF
SR/WG
ACSICG
CRV/OG
SURICG
SEA/BOB ADS-B/WG
DAPS/WG
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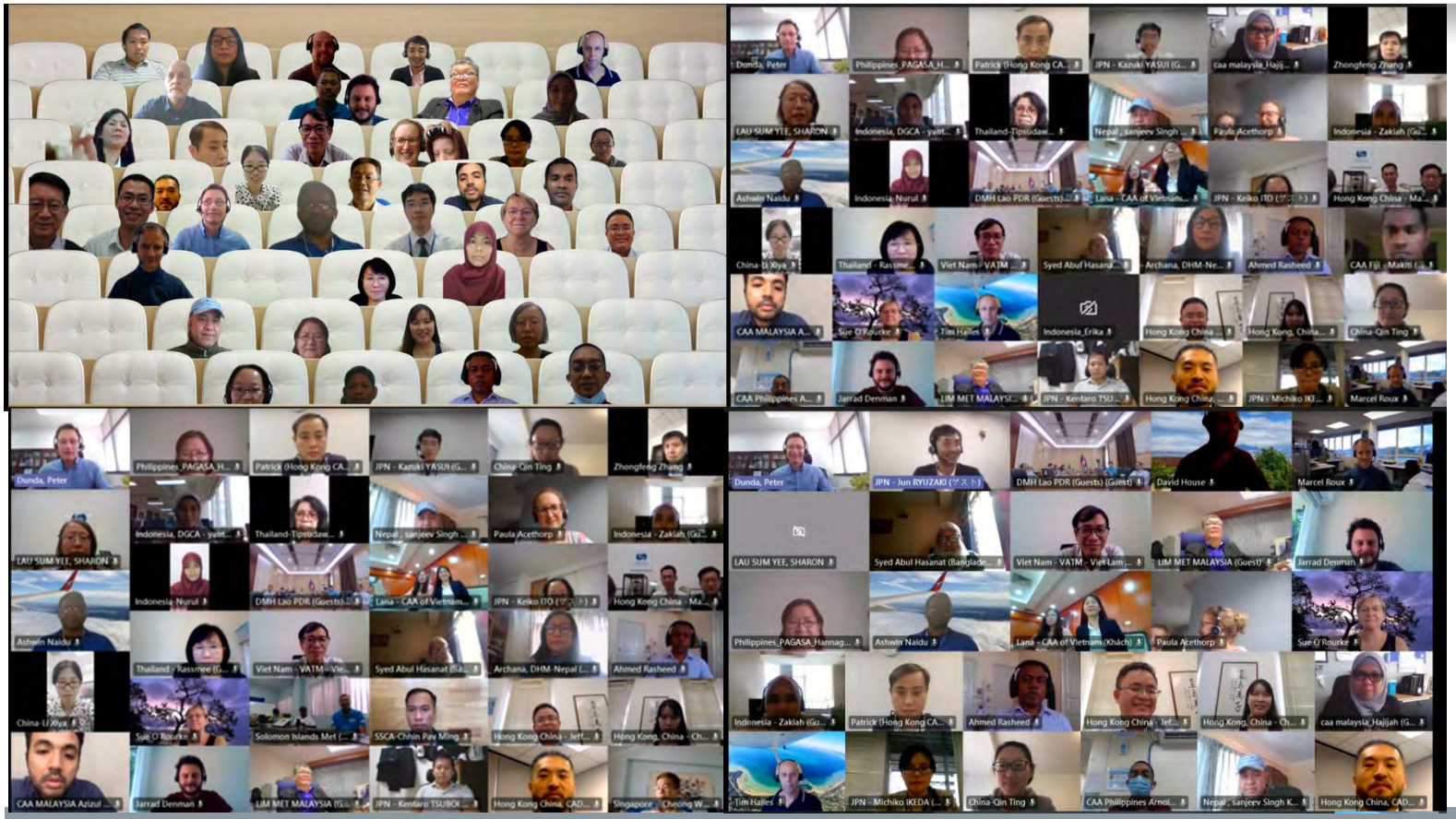
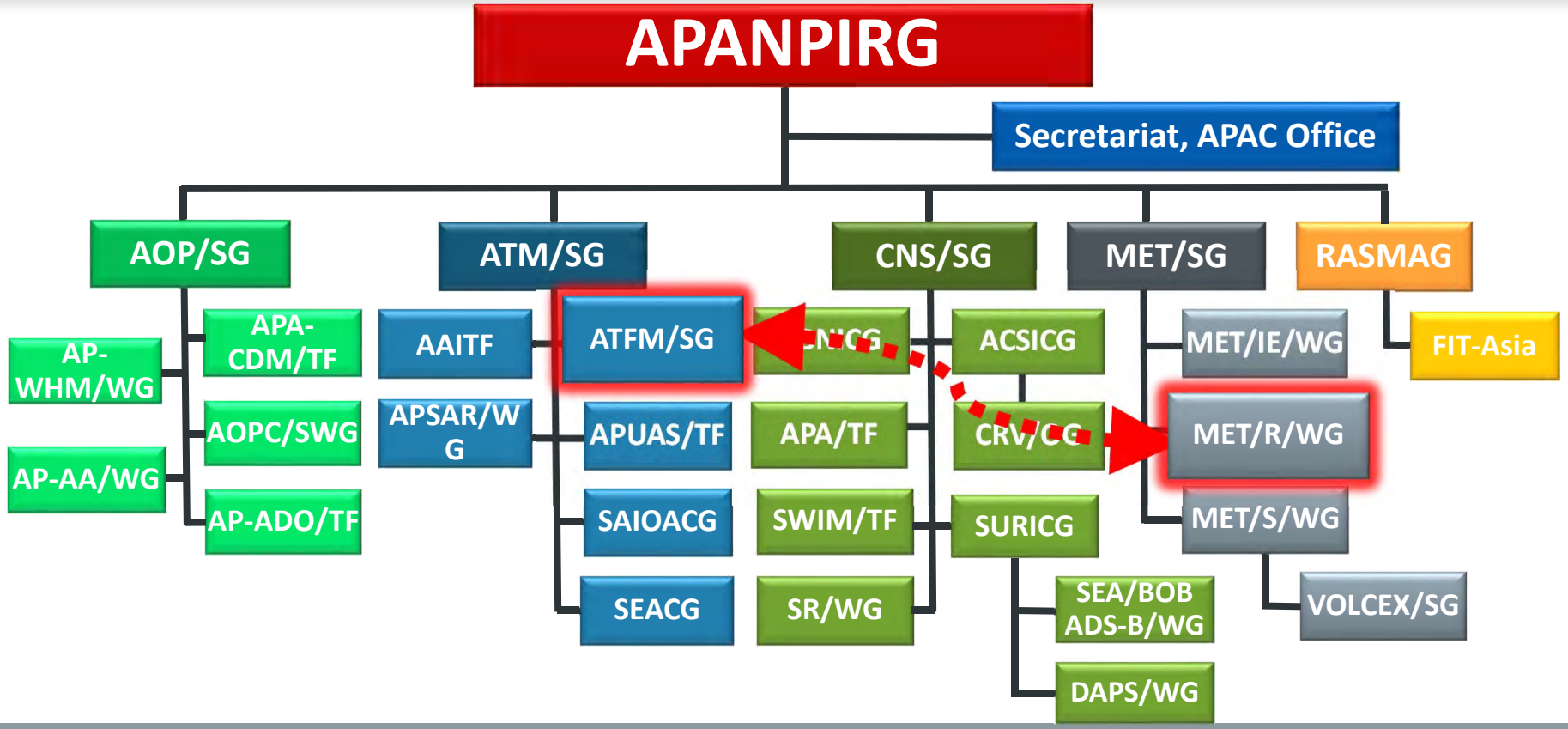
MET/R/WG
MET/S/WG
VOLCEX/SG
FIT-Asia



Twenty-fourth Meeting of the Meteorology Sub-Group **MET SG/24** virtual meeting 16 – 20 November 2020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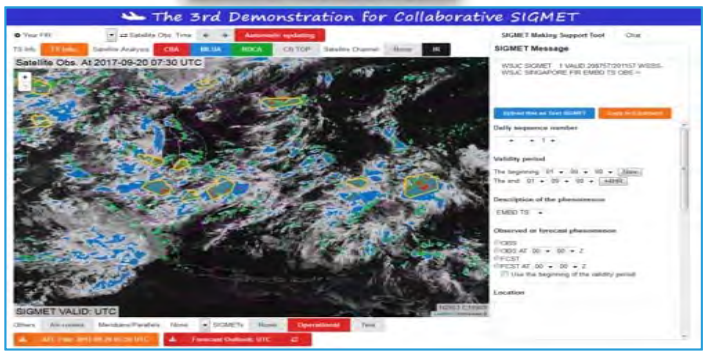
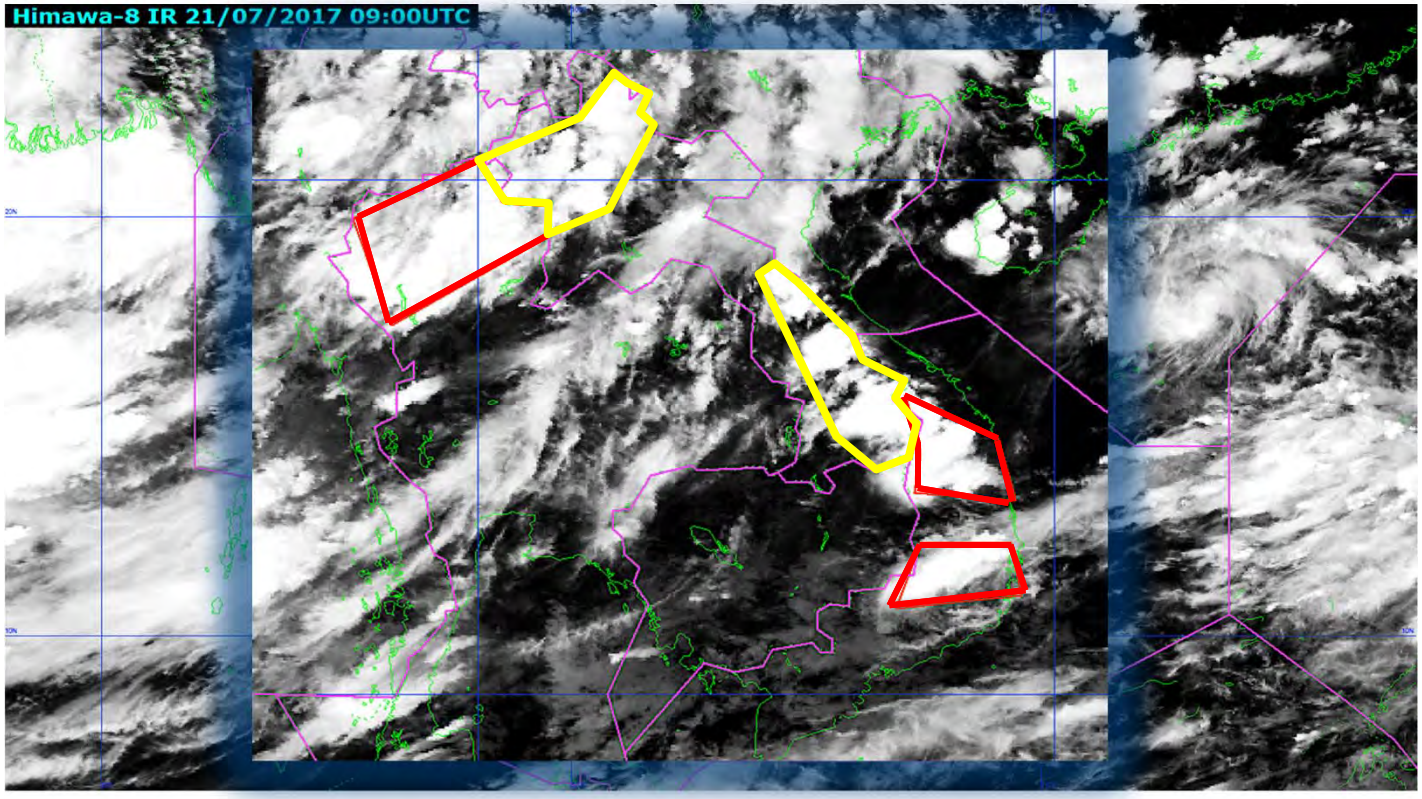
Secretariat, APAC Office
AOP/SG
ATM/SG
CNS/SG
MET/SG
RASMAG
AP-WHM/WG
APA-CDM/TF
AOPC/SWG
AP-AA/WG
AP-ADO/TF
AAITF
APSAR/WG
ATFM/SG
APUAS/TF
SAIOACG
SEACG
ACSICG
APA/TF
SWIM/TF
SR/WG
SURICG
SEA/BOB ADS-B/WG
DAPS/WG
MET/IE/WG
MET/R/WG
MET/S/WG
VOLCEX/SG
FIT-Asia

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

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

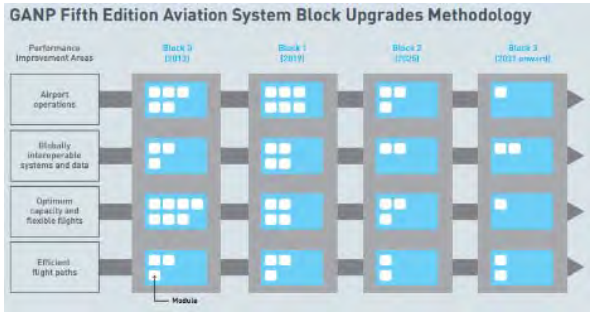
Meteorology in 2019 GANP/ASBU

- 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.

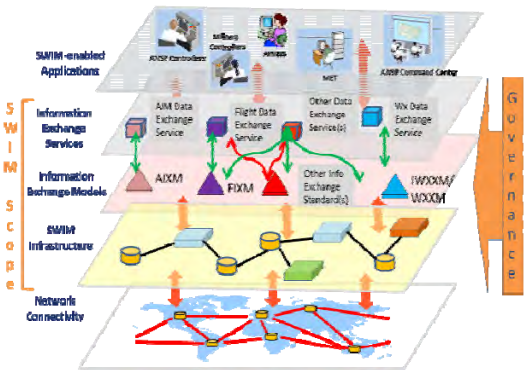
AMET Block 1:
Meteorological information supporting automated decision process or aids, involving meteorological information, meteorological information translation, ATM impact conversion and ATM decision support.

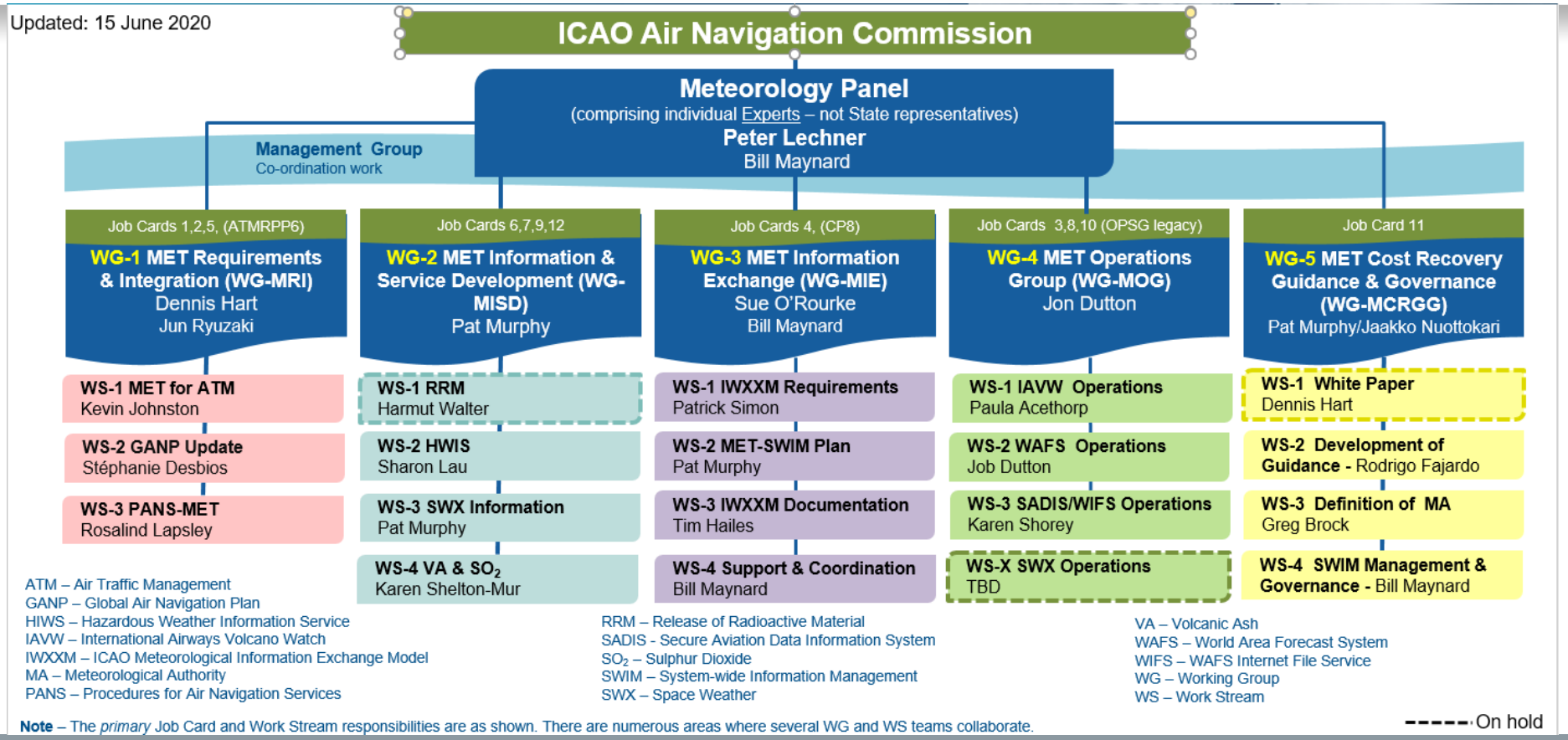
AMET Block 4:
Integrated meteorological information supporting both air and ground decision making for all phases of flight and ATM operation, especially for implementing immediate weather mitigation strategies.



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
ICAO Air Navigation Commission
Meteorology Panel
(comprising individual Experts – not State representatives)
Peter Lechner
Bill Maynard
Management Group
Co-ordination work
Job Cards 1,2,5, (ATMRPP6)
WG-1 MET Requirements & Integration (WG-MRI)
Dennis Hart
Jun Ryuzaki
WS-1 MET for ATM
Kevin Johnston
WS-2 GANP Update
Stéphanie Desbios
WS-3 PANS-MET
Rosalind Lapsley
Job Cards 6,7,9,12
WG-2 MET Information & Service Development (WG-MISD)
Pat Murphy
WS-1 RRM
Harmut Walter
WS-2 HWIS
Sharon Lau
WS-3 SWX Information
Pat Murphy
WS-4 VA & SO2
Karen Shelton-Mur
Job Cards 4, (CP8)
WG-3 MET Information Exchange (WG-MIE)
Sue O'Rourke
Bill Maynard
WS-1 IWXXM Requirements
Patrick Simon
WS-2 MET-SWIM Plan
Pat Murphy
WS-3 IWXXM Documentation
Tim Hailes
WS-4 Support & Coordination
Bill Maynard
Job Cards 3,8,10 (OPSG legacy)
WG-4 MET Operations Group (WG-MOG)
Jon Dutton
WS-1 IAVW Operations
Paula Acethorp
WS-2 WAFS Operations
Job Dutton
WS-3 SADIS/WIFS Operations
Karen Shorey
WS-X SWX Operations
TBD
Job Card 11
WG-5 MET Cost Recovery Guidance & Governance (WG-MCRGG)
Pat Murphy/Jaakko Nuottokari
WS-1 White Paper
Dennis Hart
WS-2 Development of Guidance - Rodrigo Fajardo
WS-3 Definition of MA
Greg Brock
WS-4 SWIM Management & Governance - Bill Maynard
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

What is IWXXM?

- The ICAO Meteorological Information Exchange Model (IWXXM) describes aeronautical meteorological information in support of international air navigation.

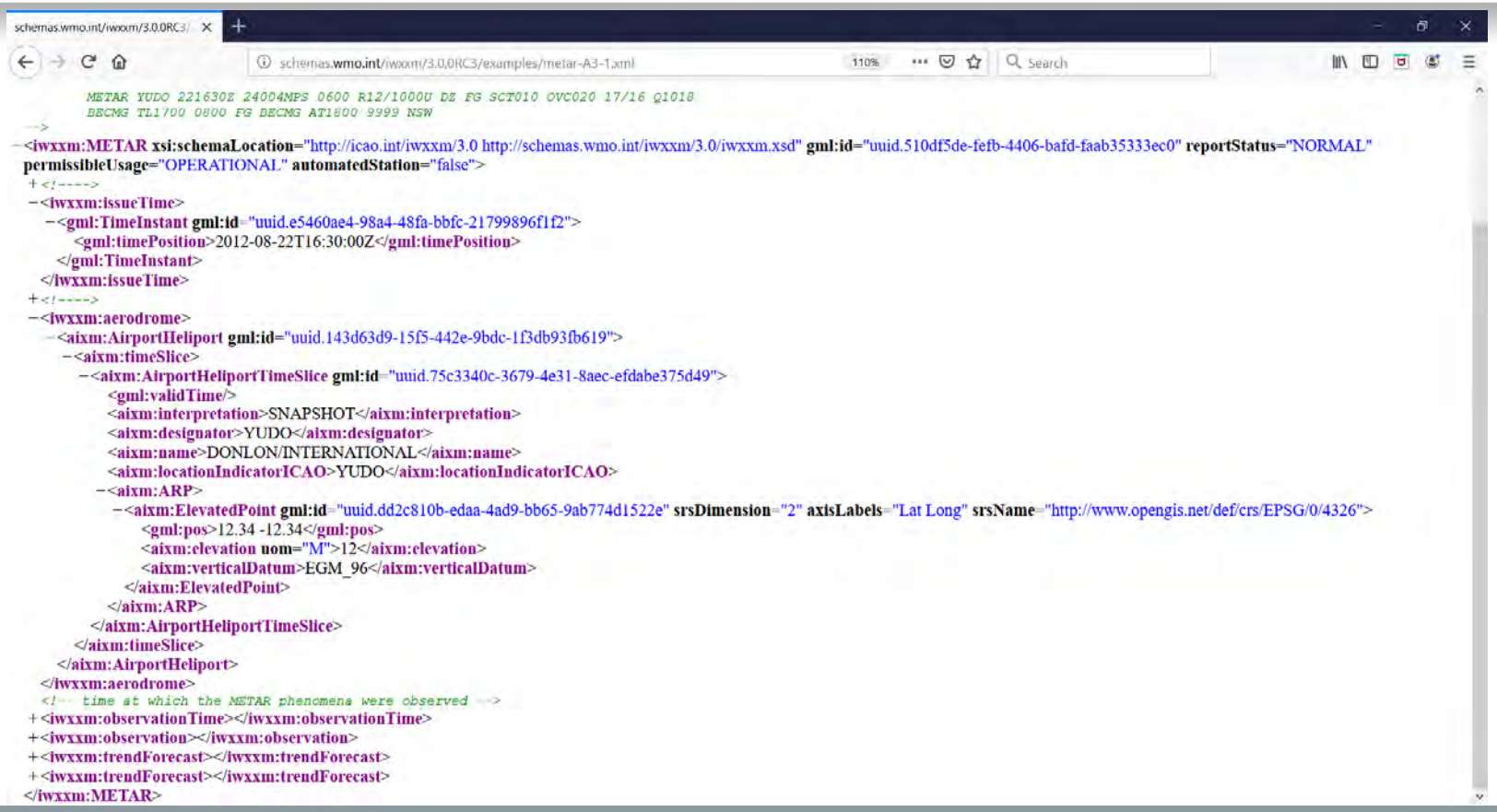
IWXXM Logical Model describes the relationships between meteorological entities

IWXXM Schema + Schematron rules are XML/GML-based implementation of the IWXXM Logical Model

IWXXM in short

- A data format for reporting aviation weather information in machine readable XML/GML form
- Currently covers 7 TAC products including:

  METAR/SPECI, TAF, AIRMET, SIGMET, Tropical Cyclone Advisory, Volcanic Ash Advisory, Space Weather Advisory
- Original TAC contents are enriched in their IWXXM counterparts with metadata (e.g. projection) and extension
- XML Schema and Schematron enforces report integrity and reporting requirements in ICAO Annex 3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BECMG TL1700 0800 FG BECMG AT1800 9999 NSW
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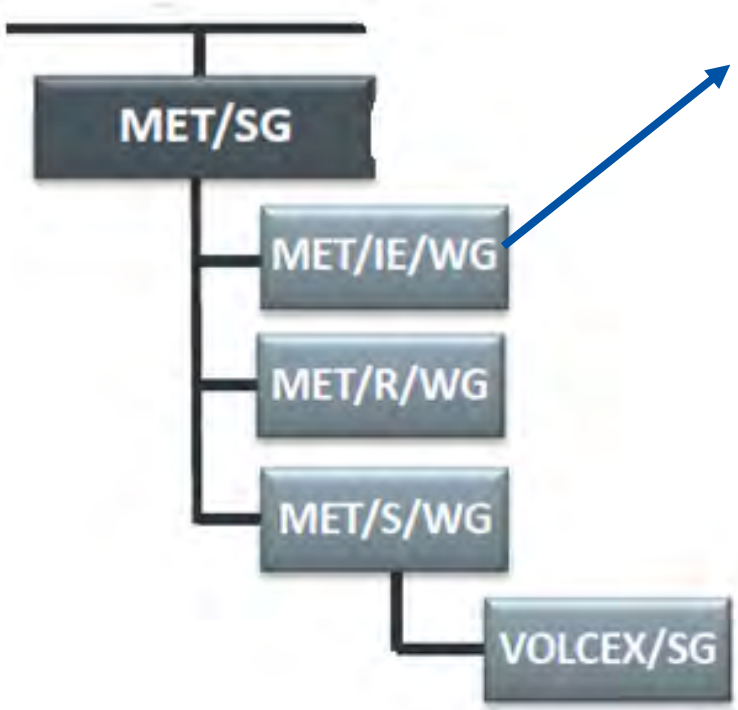


Increase OPMET availability and reliability

- 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

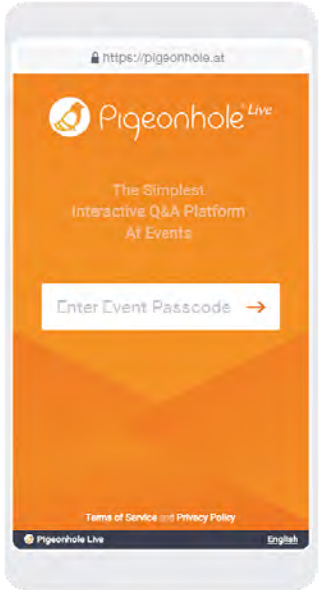
- WMO/ICAO Workshop on Implementation of IWXXM
  - Hong Kong, China, 10 – 12 October 2017
- Workshop on the Implementation of IWXXM
  - Bangkok, Thailand, 12 – 14 June 2019
- Workshop on the Implementation IWXXM
  - Nuku‘alofa, Tonga, 4 – 6 December 2019
- Webinar on the Implementation IWXXM
  - Online, 27 – 29 October 2020
- **Seminar/Workshop on the Implementation IWXXM ?**
  - **Dates/program to be confirmed (2021)**

Safety Management

- Safety management system obligations (Annex 19)
  - Operators
  - ATS
  - Maintenance/design/manufacturers
  - Training
- The service provider's interfaces with other organizations can make a significant contribution to the safety of its products or services
  - E.g., MET Authority, MET service provider

Q&A SESSION

Q&A session



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