Provision of ICAO Space Weather Information

Presented to: NAM/CAR/SAM Workshop on PANS-MET

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Federal Aviation Administration

Designation of Space Weather Centers

- In 2016, the Meteorology Panel developed criteria to identify space weather information providers capable of providing the ICAO space weather information service
- ICAO issued a State Letter (9 June 2017) requesting States to provide a formal expression of interest in providing the space weather information service
- WMO conducted audits of all States and consortia that indicated formal interest
- 13 November 2018, the ICAO Council established the space weather information service and designated States to provide Space Weather Advisories for International Air Navigation

International Civil Aviation Organization | Organisation de l'aviation civile internationale | Organización de Aviación Civil Internacional | Международная организация гражданской авиации | منظمة الطيران المدني الدولي | 国际民用航空组织

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Ref.: AN 10/1-IND/17/11 — 9 June 2017

Subject: Request for interest in providing a space weather information service

Action required: Comments to reach Montréal by 8 September 2017

Sir/Madam,

1. I have the honour to inform you that the Air Navigation Commission, at the tenth meeting of its 204th Session held on 9 March 2017, considered proposals developed by the second meeting of the Meteorology Panel (METP/2) to amend Annex 3 — *Meteorological Service for International Air Navigation*. The Commission authorized their transmission to Member States and appropriate international organizations for comment. The consultation process has already started through SL AN 10/1-17/41, related to proposals for amendment of Annex 3 and consequential amendments to Annex 15 — *Aeronautical Information Services*, *Procedures for Air Navigation Services — ICAO Abbreviations and Codes* (PANS-ABC, Doc 8400) and the *Procedures for Air Navigation Services — Air Traffic Management* (PANS-ATM, Doc 4444).

2. One of the above proposals refers to the introduction of a space weather information service to support international air navigation, which is intended for implementation in November 2018. An essential element of the implementation is the designation of space weather information providers. In this regard, the Air Navigation Commission endorsed METP/2 Recommendation 4/4, which is reproduced below:

Recommendation 4/4 – Guidance on the process for selecting space weather information providers

That to assist in the process of selection of space weather information providers, the guidance on the process for establishing the global space weather information capability, including the schedule to complete the said process (Appendix I) be endorsed by the ANC.

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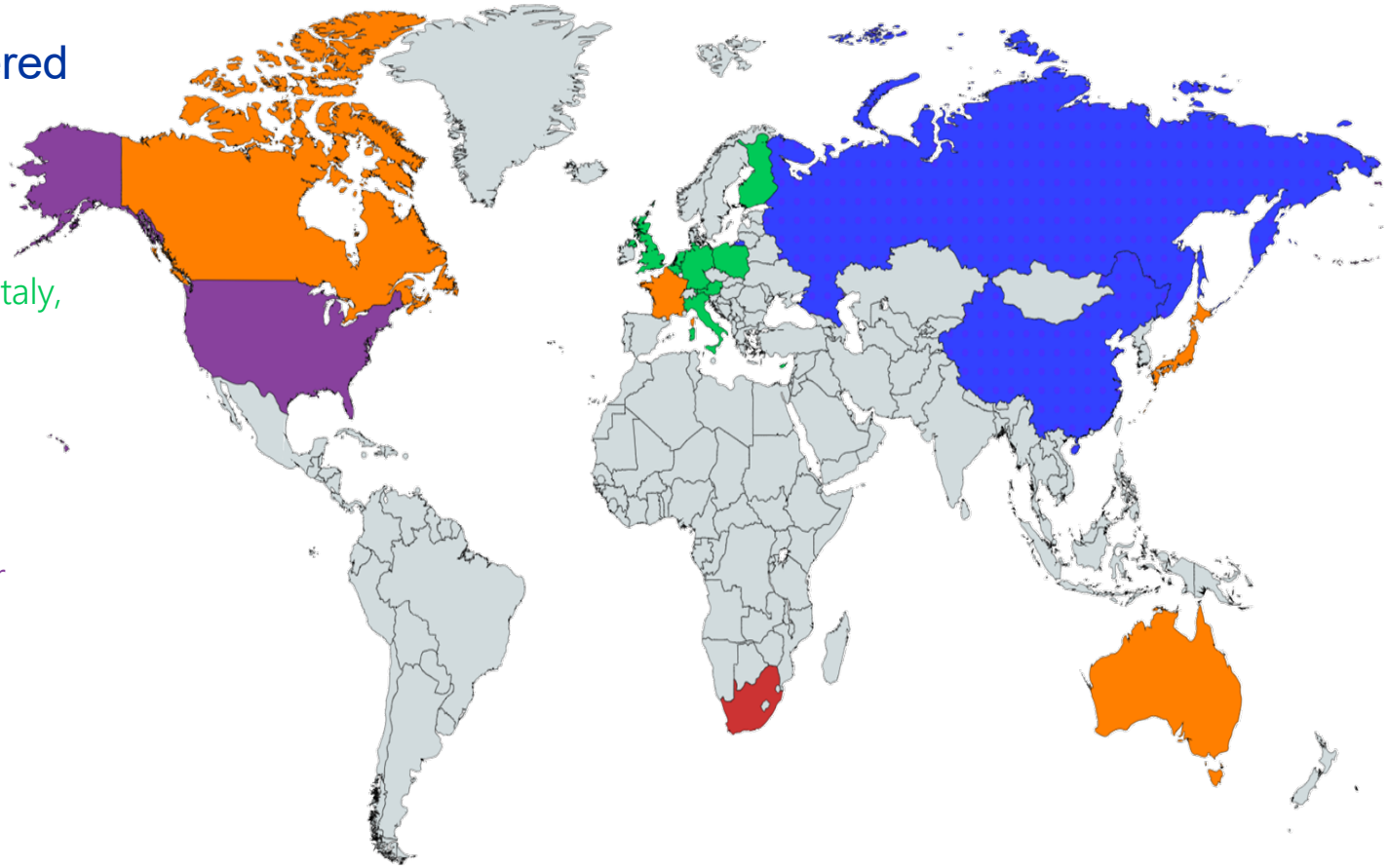
ICAO-Designated Space Weather Centers

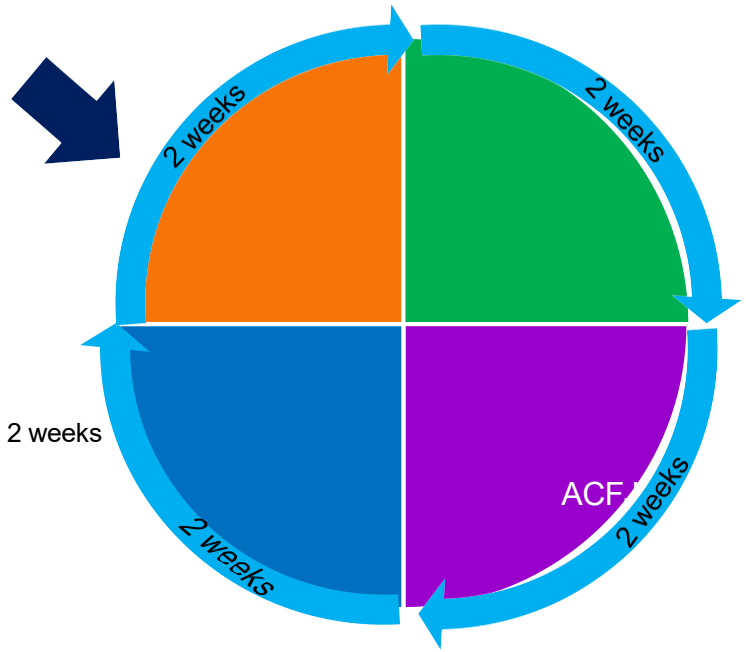
- Designated ICAO Centers
  - Four Global – Consortiums are considered one center
    - PECASUS (European consortium lead by Finland)
      - Austria, Belgium, Cyprus, Finland, Germany, Italy, Netherlands, Poland, South Africa, United Kingdom
    - ACFJ (Australia, Canada, France, Japan)
    - United States
      - NOAA Space Weather Prediction Center
    - China/Russian Federation Consortium

  One Regional Center
    - South Africa



ICAO-Designated Space Weather Centers, Cont.

- Global Centers became operational **7 November 2019**
- One ‘On Duty’ Center at any given time
  - Two-week rotation
  - “On Duty” Center issues all advisories
  - Centers continually coordinate and collaborate
  - China-Russian Federation Consortium became operational in 2021

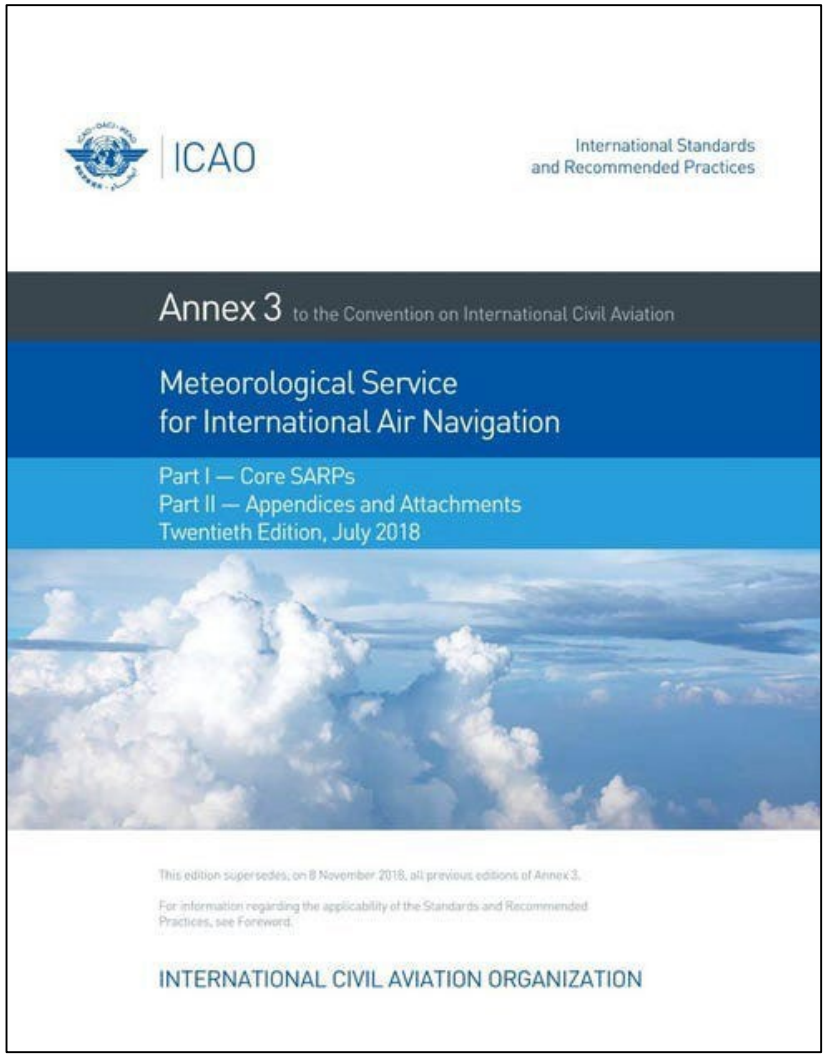


Use of the Space Weather Advisory

- Primarily intended for pre-flight planning decisions (e.g., route selection, altitude selection, fuel loading)
- Provides real-time warnings for some SWX events
- May be used for in-flight route or altitude deviations
- Promotes common situational awareness among aviation decision-makers

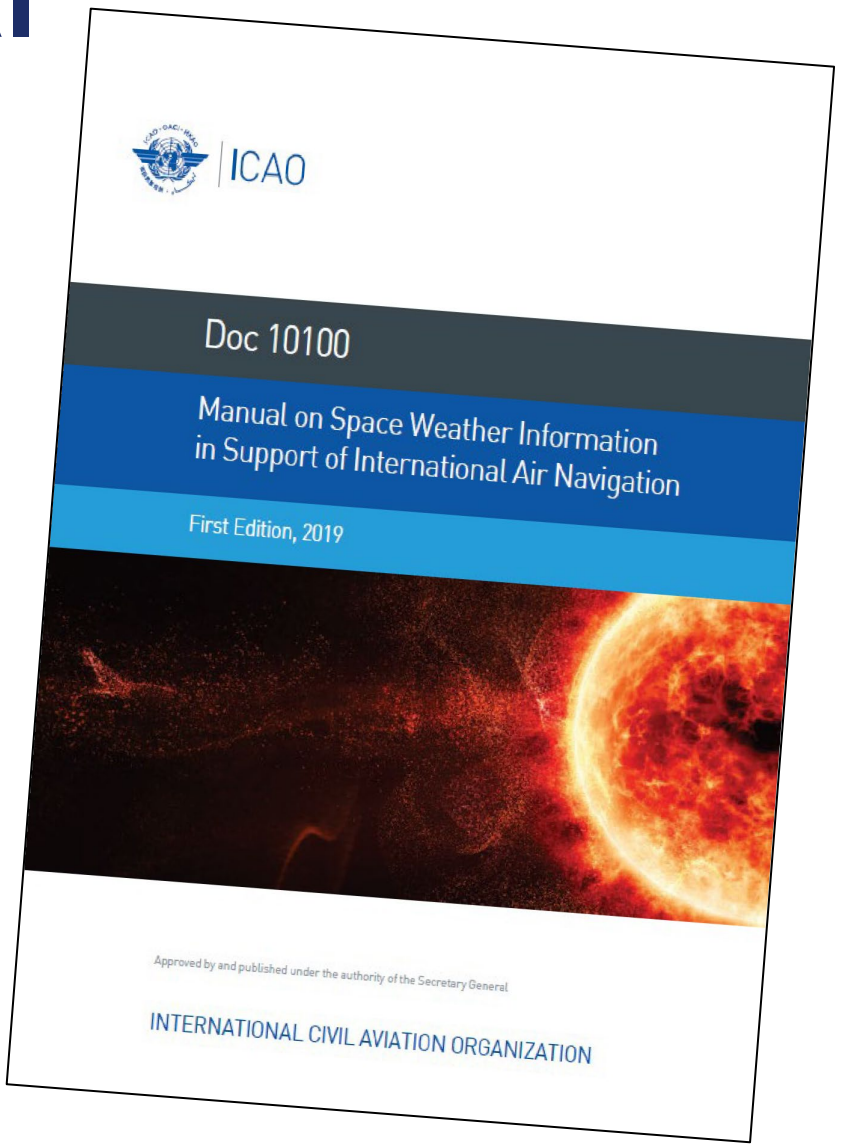
ICAO Provisions for SWX Information

- ICAO Annex 3 – *Meteorological Service for International Air Navigation*
- Provisions for space weather information introduced in Amendment 78 (2018)
  - Advisories issued for
    - HF Voice/Data & Satellite Communications
    - Radiation Exposure to Crew & Passengers
    - GNSS Based Navigation & Surveillance
- Minor changes made to the content of the SWX Advisory in Amendment 79 (2020)
- Additional changes to the format and content planned for Amendment 81 and PANS-MET (2024)



ICAO Space Weather Manual

- Manual on Space Weather Information in Support of International Air Navigation (Doc 10100)
- First edition published October 2019
- Second edition will be available in late 2024 and will incorporate changes with Amendment 81 and PANS-MET



ICAO Space Weather Advisory

- **Issued for moderate (MOD) and severe (SEV) events**
  - For radiation events,
    - MOD is issued for radiation between FL 250 and FL 460
    - SEV is issued above FL 250.
- **The advisory depicts the affected region in one of three ways:**
  - one or more pre-defined latitude bands of width 30° shown in the table, followed by a longitude range in 15° increments;
  - the term DAYLIGHT SIDE, meaning the extent of the planet that is in daylight; or
  - a polygon using latitude and longitude coordinates

Title of the latitude bands	Ranges of the latitude bands
High latitudes northern hemisphere (HNH)	N90 to N60
Middle latitudes northern hemisphere (MNH)	N60 to N30
Equatorial latitudes northern hemisphere (EQN)	N30 to equator
Equatorial latitudes southern hemisphere (EQS)	Equator to S30
Middle latitudes southern hemisphere (MSH)	S30 to S60
High latitudes southern hemisphere (HSH)	S60 to S90

Sample ICAO SWX Advisory

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FNXX01 YMMC 020100
SWX ADVISORY
DTG:                 20190202/0100Z
SWXC:                ACFJ
ADVISORY NR:         2019/10
SWX EFFECT:          HF COM MOD
OBS SWX:             02/0100Z DAYLIGHT SIDE
FCST SWX + 6 HR:     02/0700Z DAYLIGHT SIDE
FCST SWX + 12 HR:    02/1300Z DAYLIGHT SIDE
FCST SWX + 18 HR:    02/1900Z NO SWX EXP
FCST SWX + 24 HR:    03/0100Z NO SWX EXP
RMK:                 LOW END OF BAND HF COM DEGRADED
                     ON SUNLIT ROUTES. NEXT 12 HOURS
                     MOST POSSIBLE, DECLINING THEREAFTER.
NXT ADVISORY:      20190202/0700Z=
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Space Weather Advisory Headers

	WMO Headers	
	TAC Advisory	**IWXXM Advisory**
ACFJ – Australia	FNXX01 YMMC	LNXX01 YMMC
ACFJ – France	FNXX01 LFPW	LNXX01 LFPW
PECASUS – Finland	FNXX01 EFKL	LNXX01 EFKL
PECASUS – UK	FNXX01 EGRR	LNXX01 EGRR
CRC – China	FNXX01 ZBBB	LNXX01 ZBBB
CRC – Russia	FNXX01 UUAG	LNXX01 UUAG
SPWC – USA	FNXX01 KWNP	LNXX01 KWNP

01 = GNSS

02 = HF COM

03 = RADIATION

04 = SATCOM

Questions?