



ICAO

# INTERNATIONAL CIVIL AVIATION ORGANIZATION

A UN SPECIALIZED AGENCY

*ASECNA Seminar on the Implementation of  
requirements for the provision of Space  
Weather Information to Aviation: From  
Awareness to Operational Readiness*

*Dakar, 8-12 December 2025, Dakar, Senegal*

# Session 4 : Advisory Interpretation – Hands-on Exercises

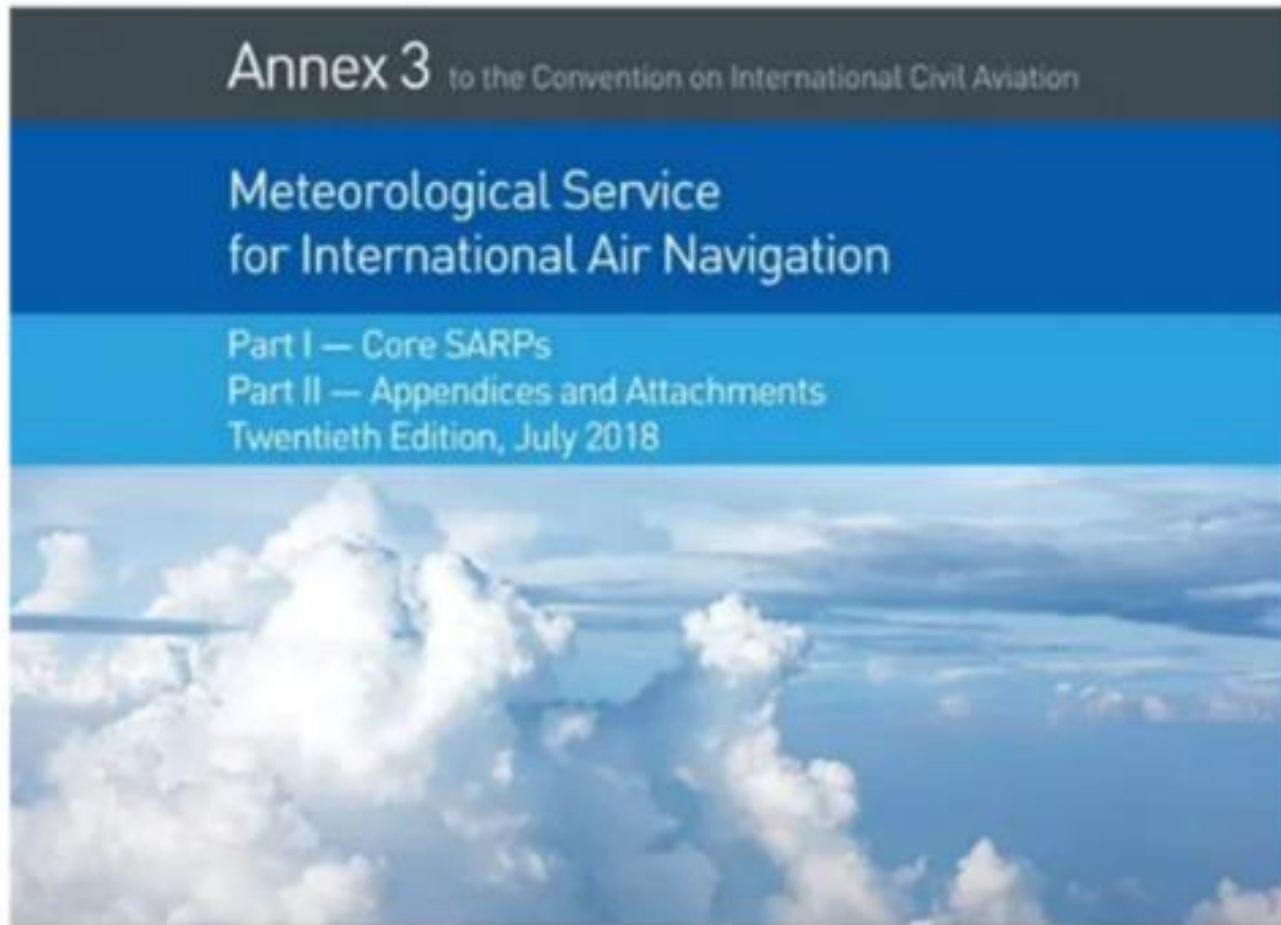
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The Secrétariat

*Bureau WACAF*

## 2.1

# Overview of ICAO Annex 3 provisions



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## The 3 fundamentals of aeronautical meteorology

- ☑ “Meteorology” is one of the very first key factors for aviation safety.
- ☑ No flight may be commenced without obtaining appropriate meteorological information.
- ☑ In every phase, single authoritative meteorological information is shared among aviation users.



# Establishment of ICAO

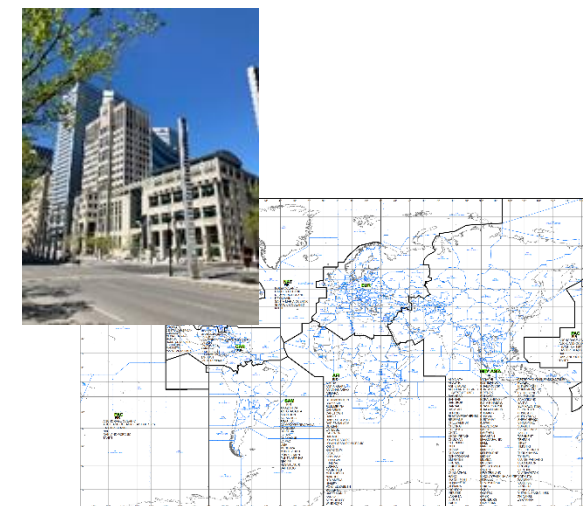
## The Convention on International Civil Aviation (Chicago Convention, 7 Dec 1944)

- To develop international civil aviation in a safe and orderly manner and establish international air transport on the basis of equality and operated soundly and economically.
- Originally signed by 56 States >> As of today, 193 States has joined.

## Establishment of International Civil Aviation Organization (ICAO)

- Established as United Nation's specialized agency (1947)
- Headquarter: Montreal, Canada
- 7 Regional Offices / 1 Regional sub-office

EUR/NAT Region - Paris	NACC Region - Mexico City
MID Region - Cairo	SAM Region - Lima
WACAF Region - Dakar	APAC Region - Bangkok
AFI Region - Nairobi	APAC Regional sub-office - Beijing



# ICAO SARPs for Meteorological Service

## The Beginning of aeronautical meteorological service

- 1944 – Exchange of the Chicago Convention
- 1947 – Establishment of ICAO Council, Special Session for Meteorology
- 1948 – Council adopted the first Annex 3 to the Convention
- Title of the Annex 3 was “*Standards and Recommended Practices — Meteorological Codes*”

## Annex 3 - “Meteorological Service for International Air Navigation”

- Defines ICAO SARPs (Standards and Recommended Practices) for meteorological services to support international air navigation
- Contracting States are encouraged to use the same provisions in domestic regulations

2.1.1 The objective of meteorological service for international air navigation shall be to contribute towards the safety, regularity and efficiency of international air navigation.



# Aeronautical meteorological service in current ICAO Annex 3

Supporting every phase of aircraft operations



## Information for air space

- Low-level Area Forecast
- SIGMET, AIRMET
- Special Air Reports

## Information provided by designated Centres

- WAFS SIGWX forecast, upper temp/wind data
- Volcanic Ash Advisory (VAA)
- Tropical Cyclone Advisory (TCA)
- Space Weather Advisory (SWXA)



## Information at aerodrome

- METAR/SPECI, Local reports
- TAF, TREND
- Aerodrome warnings
- Windshear warnings/alert

## Annex 3 Amendment Process

Proposed amendment is subject to the official reviewing process

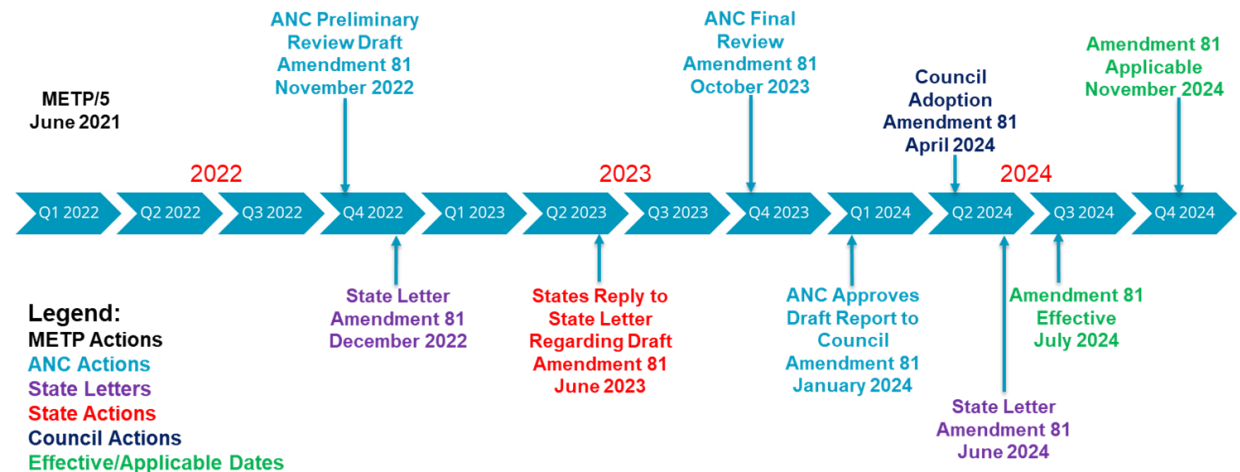
- Preliminary review (PR) by the Air Navigation Commission (ANC)
- Consultation with Contracting States and International Organizations
- Final review (FR) by the Air Navigation Commission (ANC)
- Approval by Council

After Council's approval

- Publication
- Effective
- Applicable (November AIRAC)

### Amendment 81 (November 2024 Applicability Date)

Updated: 6 October 2022




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# Meteorology Panel (METP)

## METP is one of the Panels of Air Navigation Commission (ANC)

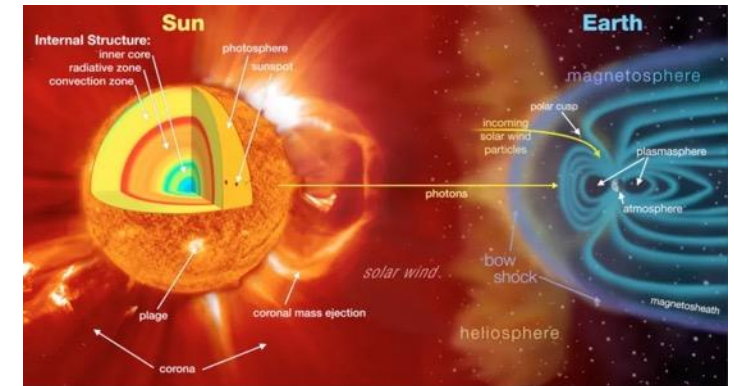
- Discuss further development of SARPs, addressing global issues and enhancement of global standards

### Key Areas of Work

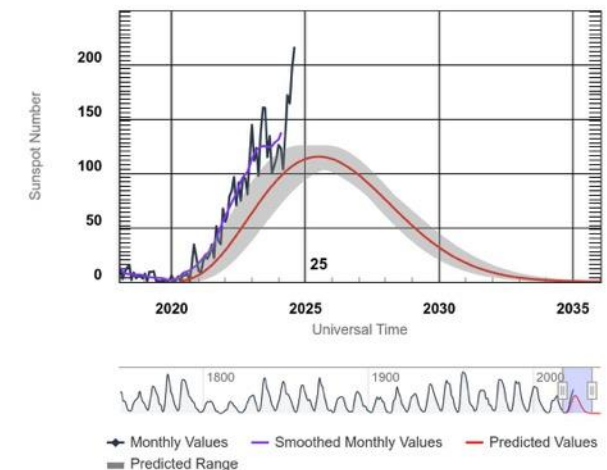
- Extended use of IWXXM and SWIM-enabled meteorological service development
  - Further developments of:
    - World Area Forecast system (WAFS)
    - Space weather information service (SWIS)
    - International Airways Volcano Watch (IAVW)
  - Development of future MET-SWIM information services:
    - Aerodrome Observation/Forecast Information Services
    - Quantitative Volcanic Ash Concentration Information Service (QVA) information services
    - Hazardous Weather Information Service (HWIS)
  - Guidance on cost recovery framework and governance
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# What causes space weather?

- The main driver is the “Sun”
  - Solar activities deliver space weather phenomena
  - Severe space weather brings significant impact on various technologies
    - Satellites, GPS, Communications, power-grids...etc
- 11-year Solar Cycle
  - Historic space weather events caused huge impact  
e.g., The Carrington event (1859, Cycle 10), Hydro-Quebec blackout (1989, Cycle 22)
  - Now at the peak of the “Cycle 25” since 2024
    - The Gannon storm (May 2024) was a G5 geomagnetic storm
    - Extreme events still may occur during the peak period



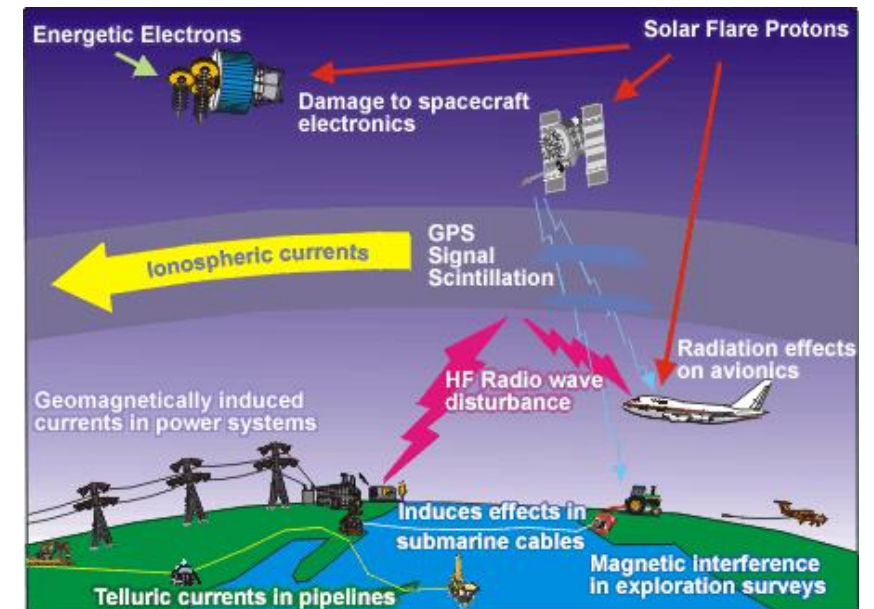
ISES Solar Cycle Sunspot Number Progression



Space Weather Prediction Center

## Why space weather matters for aviation?

- Space weather phenomena pose flight safety risks
  - Loss of HF/Satellite communications
  - Disturbance/degradation on GNSS navigation and surveillance
  - Adverse effects on avionics
  - Radiation exposure impact on air occupants' health
- Identified adverse space weather phenomena
  - Geomagnetic storms
  - Solar flares
  - Ionospheric disturbances
  - Solar radiation storms



## Development of ICAO space weather information service – 1/2



1970

Interest in space weather information — originated from supersonic operations

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2002

**ICAO MET Divisional Meeting 2002 (September 2002) - Recommendation 1/20**

- impacts of space weather phenomena were broadly acknowledged

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2011

IATA's request to ICAO — implementation of operational space weather information service

2014 Jul

**ICAO MET Divisional Meeting 2014 (July 2014) - Recommendation 2/7**

- ICAO is asked to develop SARPs for operational space weather information service

2015 -

Development of Annex 3 SARPS for SWIX led by the ICAO Meteorology Panel

2017

ICAO State letter – Contracting States were invited to show their interest in providing SWIS

- 8 States and 1 consortium (PECASUS) expressed their willingness

WMO technical audits were conducted to assess technical/operational feasibility

# Development of ICAO space weather information service – 2/2

2018

**Adoption of the first SWX SARPs (Amendment 78 to Annex 3) (C-DEC 213/5, 7 March 2018)**

Designation of 3 global & 2 regional space weather centres (SWXCs) (C-DEC 215/7, 13 November 2018)

- Global SWXCs: ACFJ, PECASUS, and US
- Regional: SWXCs: CRC and South Africa

2019

**Operational space weather information service provision started (November 2019)**

Designation of China Rusia Consotium (CRC) as a new global SWXC (C-DEC 219/7, 27 April 2020)

- Global SWXCs: ACFJ, CRC, PECASUS, and US
- Regional: SWXCs: South Africa

2020

2021

**CRC was integrated in operational SWIS (November 2021)**

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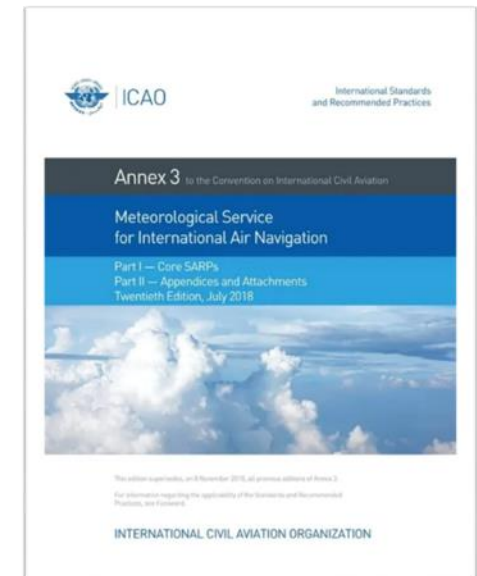
2025

**Adoption of refined SWX SARPs in ICAO Annex 3 (Amendment 82) (C-DEC 234/14, 2 April 2025)**

**South Africa is to be integrated in operational SWIS, supporting global SWXCs (November 2025)**

# Provisions of ICAO space weather information service (SWIS)

- Annex 3 to the Convention on International Civil Aviation
  - defines Standards and Recommended Practices of meteorological service to support safety, efficiency and timeliness of international air navigation
  - Amendment 82 has become effective in August 2025 and will be come applicable on 26 November 2025
- PANS-MET (Doc 10157)
  - defines procedures and technical specifications for meteorological service to fulfil requirements specified in Annex 3
  - 1<sup>st</sup> Edition was approved in April 2025
- ANC established the Meteorology Panel (METP) in 2014
  - for further development of meteorological services to support GANP





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Thank You!