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# AFI Workshop on the Guidance on Space Weather requirements

*(Virtual Meeting, 28-29 July 2021)*

## Development of Space Weather Requirements in ICAO Annex 3

*Presented by Ms. Chinga Mazhetese,  
Regional Officer, MET/ENV, ESAF Office*



1. Importance of the provision of space weather information
2. The MET Panel
3. Developments within the METP on Space Weather
4. ICAO Annex 3 SARPs and guidance on Space Weather



- Rational behind ICAO's decision on the provision of SWX information
  - a high priority in support of international air navigation as numerous aviation safety risks arise from solar events
    - these risks affect the reliable operation of satellites, aircraft, electronic communications, and anything else dependent on electromagnetic waves.
  - annually over 10,000 flight operations are conducted at polar latitudes.
    - Aircraft operating at these latitudes are more susceptible to space weather events
    - can affect navigation and communication systems and/or
    - expose flight crewmembers and passengers to medically significant levels of radiation.
  - ICAO recognized the need for operators to acquire information on space weather events
    - as part of their safety risk management program for flight planning for hazardous weather situations
      - that may perhaps jeopardize the safety of flight.
    - similar information required by Air Navigation Service Providers (ANSPs)
      - to manage operations in their airspace for space weather events that can potentially compromise the performance of their communication and surveillance systems.
  - Based on this, ICAO, during A39:
    - proposed a resolution to support its work effort to introduce the provision of space weather information to operators, flight crew members and air traffic management.
- SARPs and guidance development
  - Responsibility of the **Meteorology Panel (METP)**



- established at the 5<sup>th</sup> meeting of the 197<sup>th</sup> session of Air Navigation Commission (ANC 197-5)
  - 30 September 2014;
- primary responsibility
  - to define and elaborate concepts and to develop ICAO provisions for aeronautical meteorological (MET) services
    - consistent with operational improvements
    - envisioned by the *Global Air Navigation Plan (GANP)* (Doc 9750)
  - keeping with the *Working Arrangements between the International Civil Aviation Organization and the World Meteorological Organization*
    - (Doc 7475).
- Members
  - experts from the States tasked to provide the new services,
  - a number of relevant international organizations, and
  - the ICAO Secretariat.





## Working Groups

Meteorological requirements and integration

Meteorological information and service development

Meteorological information exchange

Meteorological operations group

MET cost recovery guidance and governance

## Working Group for MET Information and Service Development (WG-MISD)

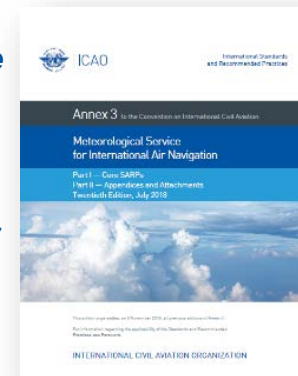
- assesses user needs, develop concepts of operations, and define the functional and performance requirements
  - for new MET information required to support future operational concepts as defined in the GANP (Doc. 9750).
- consists of 5 work streams that are developing requirements for MET information
  - to be included in the Amendments to Annex 3
  - including the guidance material to implement the proposed provisions.

### Space Weather Work (SWx) Stream

- The SWx Work Stream completed the SARPs for the space weather information service that were proposed for inclusion in Amendment 78 to Annex 3.
- After approval of the SARPs for space weather information by MET Panel and the ANC,
  - the SWx Work Stream undertook development of a Manual on Space Weather Information for International Air Navigation to support implementation of the SARPs by describing the provision and intended use of the information.



- **METP/2, Rec 4/3 Amendment 78 to Annex 3/Technical Regulations [C.3.1] concerning the provision of space weather information**
  - Introduction of space weather advisory information services in the [AMD 78 to Annex 3](#) to the Convention.
- **METP/4 Rec. 4/6 — Proposed changes for Amendment 79 to Annex 3 - *Meteorological Service for International Air Navigation* concerning space weather advisory information**
  - To take into account [some minor changes](#) of Amendment 78 of Annex 3
- The requirements for the provision of space weather information in support of international air navigation by the designated SWXC
  - **stated in Chapter 3 and Appendix 2 of Annex 3**
  - **Annex 3 Chap.3: §3.8.1** A Contracting State, having accepted the responsibility for providing a space weather centre (SWXC), **shall arrange for that Centre to monitor and provide advisory information on space weather phenomena in its area of responsibility.**





- **METP/4 Decision 4/3: Manual on Space Weather Information in Support of International Air Navigation**
  - The **Version 1.0** of the *Manual on Space Weather information in Support of International Air Navigation* endorsed by the Panel.
  - The Manual of SWX (Doc 10100) to be **expeditiously published by ICAO** to support the implementation of Amendment 78 to Annex 3 applicable in November 2018
  - (En) : [https://portal.icao.int/icao-net/ICAO%20Documents/10100\\_cons\\_en.pdf](https://portal.icao.int/icao-net/ICAO%20Documents/10100_cons_en.pdf)
  - (Fr) : [https://portal.icao.int/icao-net/ICAO%20Documents/10100\\_cons\\_fr.pdf](https://portal.icao.int/icao-net/ICAO%20Documents/10100_cons_fr.pdf)





- **Annex 3:Chap.3: 3.8.1**
  - SWXC shall monitor and provide advisory information on space weather phenomena in its area of responsibility.
- **Annex 3:Chap.3: 3.8.2**
  - SWXC shall maintain a 24-hour watch.
- **Annex 3 Chap. 4: 3.8.3**
  - In case of interruption of the operation of a SWXC, its functions shall be carried out by another SWXC or another Centre, as designated by the SWXC Provider State concerned.





- **App 2: 6.1.1 Recommendation.**— *Advisory information on space weather should be issued in abbreviated plain language, using approved ICAO abbreviations and numerical values of self explanatory nature, and should be in accordance with the template shown in Table A2-3. When no approved ICAO abbreviations are available, English plain language text, to be kept to a minimum, should be used.*
- **App 2: 6.1.2 Recommendation.**— *As of 7 November 2019 and until 4 November 2020, space weather advisory information should be disseminated in IWXXM GML form, in addition to the dissemination of space weather advisory information in abbreviated plain language in accordance with 6.1.1.*
- **App 2: 6.1.2 As of 5 November 2020,** space weather advisory information shall be disseminated in IWXXM GML form, in addition to the dissemination of this advisory information in abbreviated plain language in accordance with 6.1.1



## Space weather advisory information as required in the flight documentation

**Annex 3, Chap.9:9.1.3 refers** : Meteorological information supplied to operators and flight crew members shall be up to date and include the following information, as agreed between the meteorological authority and the operators concerned:

- a) forecasts of:
  - 1) upper wind and upper-air temperature;
  - 2) upper-air humidity;
  - .....
- b) METAR or SPECI (including trend forecasts as issued in accordance with regional air navigation agreement) for the aerodromes of departure and intended landing, and for take-off, en-route and destination alternate aerodromes;  
.....
- i) meteorological satellite images;
- j) ground-based weather radar information; and
- k) space weather advisory information relevant to the whole route.**



- **The space weather advisories conveyed to:**
  - air transport network area control centres,
  - flight information centres,
  - aerodrome meteorological offices,
  - international OPMET (operational meteorological information) databanks,
  - international NOTAM offices, and
  - aeronautical fixed service Internet-based services.
- **The space weather service relies upon coordination and assistance from:**
  - National OPMET centres (NOCs), Regional OPMET Centres (ROCs), Regional OPMET Data Banks (RODBs) and Inter-regional OPMET Gateways (IROG) which will be responsible to receive and disseminate space weather advisories.
- **Guidance on the provision of space weather advisory information, including the ICAO-designated provider(s) of space weather advisory information,**
  - provided in the Manual on Space Weather Information in Support of International Air Navigation ([Doc 10100](#)).
- **the provision of space weather information**
  - is consistent with the AFI Regional priorities related to resolving the air navigation deficiencies
    - as part of ICAO's Global Air Navigation Plan (GANP) and the associated Aviation Safety Block Upgrades (ASBU).



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