Establishment of Space Weather Information Service

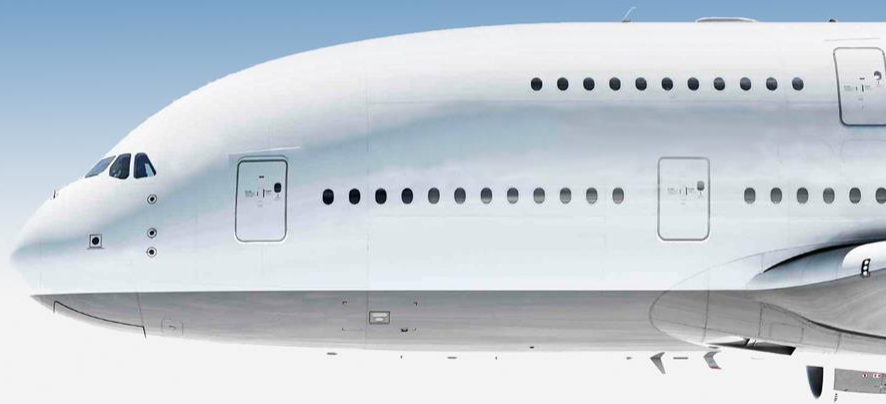
For International Air Navigation

Raul Romero
Technical Officer MET
ICAO Headquarters, Montreal

CGMS Space Weather Coordination Group
(CGMS SWx CG)

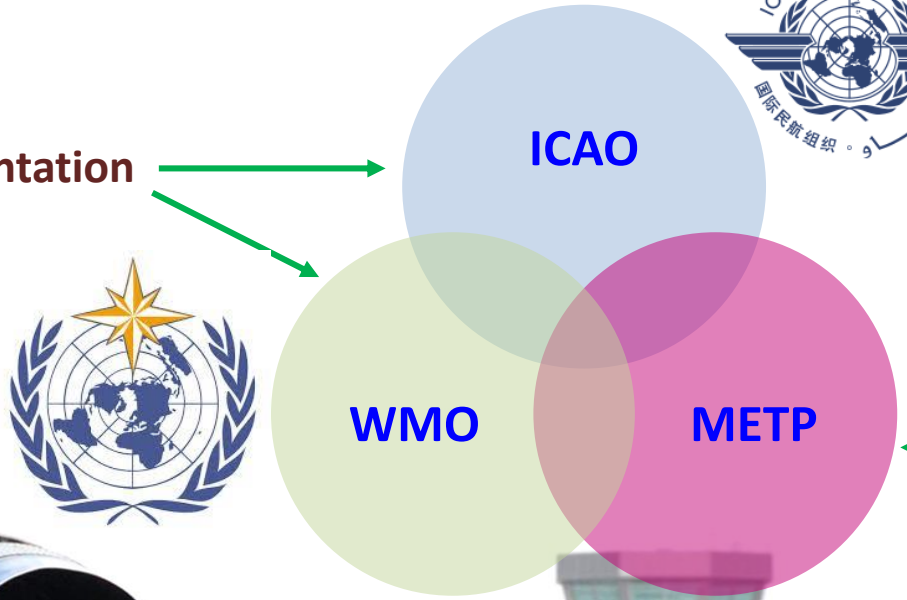
Presentation Outline

- Introduction and background
- Requirements
- Guidance on Criteria for SW Providers
- Schedule for the implementation
- METP/3 Meeting
- Council Decision (C-DEC 215/7)
- Next steps



Background

State Representation



METEOROLOGY PANEL

Expert Members

Background-Overall Mandates

- Annex 3 – *Meteorological Service for International Air Navigation*
- *WMO Technical Regulations* Pub 49
- *Working Arrangements between the International Civil Aviation Organization and the World Meteorological Organization*
  - Doc 7475
- Meteorology Panel
  - Terms of Reference

Background Requirements

- IAVWOPSG
- 2014 Meteorology (MET) Divisional Meeting
- Meteorology Panel (METP/2) Meeting
- Air Navigation Commission (ANC)

Background- ANC Job Card

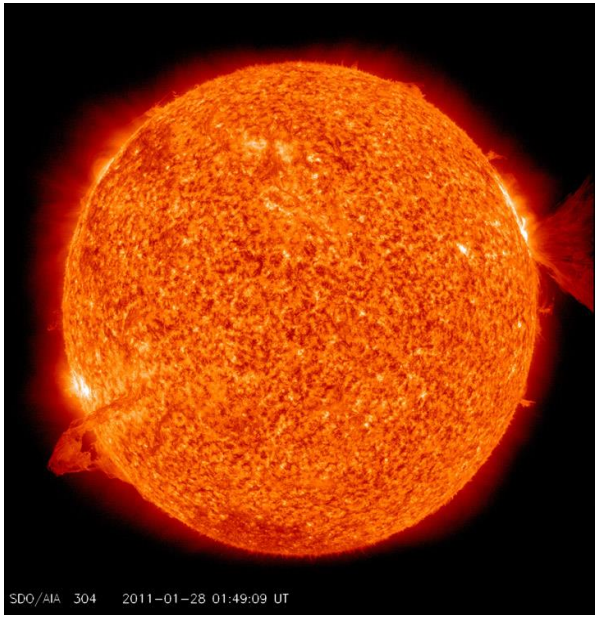
METP.009.03 – Development of provisions for information on space weather to international air navigation

Problem Statement – Space weather events such as solar radiation storms, solar flares, geomagnetic storms and ionospheric disturbances that impact earth pose a risk to flight safety, impacting communication, navigation systems, on board avionics and also posing a risk to the health of aircraft occupants.

Expected Benefits – To provide information on space weather and to avoid the risks posed to flight safety regarding communications, Satellite-base navigation surveillance, and avionics, as well the risk to the health of aircraft occupants (i.e. flight crew and passengers) due to radiation exposure. Integrate the information produced into the SWIM environment in line with the GANP.

Guidance on Criteria for SW Providers

To ensure quality, reliability, and integrity of the space weather information service for international air navigation, a space weather information provider should demonstrate and/or provide evidence that it meets the following criteria:



Guidance on Criteria for SW Providers

1-Institutional Criteria

a) Experience as a designated national space weather information provider

b) A Quality Management System (Annex 3 - Meteorological Service for International Air Navigation, Chapter 2, Paragraph 2.2.2)

c) Appropriate qualifications of personnel and an ongoing competency and training program (WMO-No 49, WMO-No 258)

d) Adherence to all applicable data rights

e) Procedures to liaise with aviation decision-makers and gather feedback on the space weather information service

f) Procedures to coordinate with other space weather information providers

g) A source of funding and an adequate level of funding to provide the space weather information service for a period of at least 3 years

Guidance on Criteria for SW Providers

2-Operational Criteria

a. 24/7 operational capability

b. A system reliability of 99.9 percent with no single failure exceeding 90 minutes in a 24-hour period

c. A system availability of 98.0 percent with no single outage exceeding 4 hours in a 1-year period

d. A system maintainability of 95.0 percent for a 2-hour interval

Guidance on Criteria for SW Providers

3-Technical Criteria

a) Ability to provide the space weather information service, both near real-time and forecast information, as defined in the draft SARPs for Amendment 78 of ICAO Annex 3 Meteorological Service for International Air Navigation.

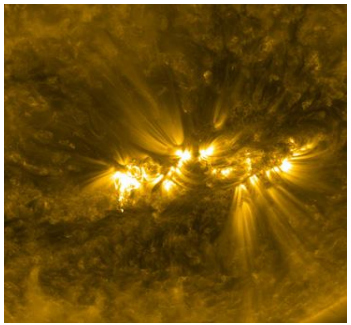
b) Ability to access observations (own observations and received from other space weather providers) of:
   - Coronal mass ejections and high-speed streams
   - Geomagnetic storms
   - Solar radiation storms
   - Solar flares
   - Solar radio bursts
   - Ionospheric activity

c) Ability to produce near real-time and forecast information regarding the potential impacts of space weather using numerical models capable of ingesting observation data from multiple sources.

d) Ability to produce near real-time and forecast information that meets the proposed functional and performance requirements.

e) Ability to coordinate and harmonize information with the space weather information providers for adjacent areas of responsibility, as necessary.

f) Ability to conduct forecast verification



Guidance on Criteria for SW Providers

4-Communication/Dissemination Criteria

a) Ability to provide the space weather information service to aviation decision-makers, as defined in the draft SARPs for Amendment 78 of Annex 3 -Meteorological Service for International Air Navigation.

b) Ability to provide a communications system and infrastructure that supports the availability, maintainability, and reliability criteria is section 2.

c) Ability to provide the space weather information service via the following means of dissemination:
- ICAO Aeronautical Fixed Service
- World Area Forecast System Internet File Service
- Secure Aviation Data Information Service
- Regional OPMET centres

Note: The criteria in paragraphs 1, 2, 3 and 4 above may be met by a single entity or a consortium of multiple space weather information providers with appropriate arrangements for coordination and harmonization

Schedule for Establishing Space Weather Information Capability

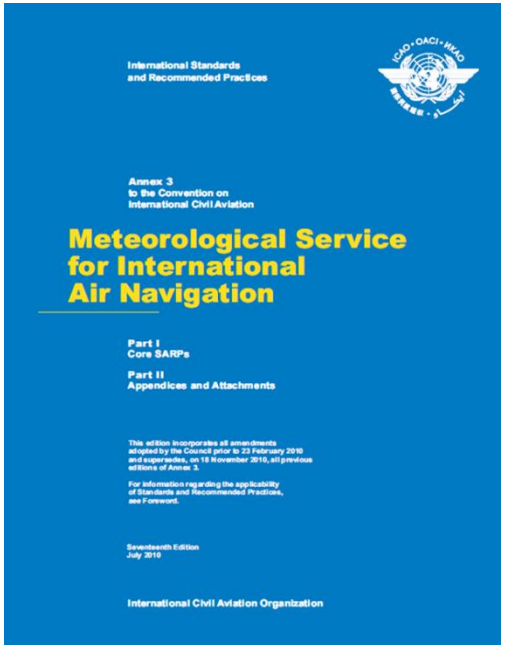
Start Date	End Date	Description	Responsibility
May 2017	June 2017	Issue State Letter requesting interest in providing the space weather information service.	ICAO
May 2017 September 2017	June 2017 October 2017	a) Request WMO assistance to evaluate candidate Provider States through site assessment visits and audits (without list of candidates States); and; b) Provide WMO with a list of candidates States.	ICAO
June 2017	September 2017	Respond to State Letter indicating ability to meet criteria for space weather information providers, including funding for site assessment visit and audit (to be conducted by WMO).	Candidate Provider States
October 2017	February 2018	Conduct site assessment visits and audits of candidate Provider States for space weather information capability.	WMO
March 2018	April 2018	Complete report to ICAO on candidate Provider States for space weather information capability.	WMO
April 2018	April 2018	Review of WMO audits report and recommend optimal number of space weather information providers.	METP
May 2018	June 2018	Review METP recommendations and provide proposals for designation of providers of space weather information for Council consideration.	ICAO ANC
June 2018	~~July~~ September/October 2018	Designate provider(s) of space weather information capability.	ICAO Council
July 2018	November 2018	Commence production and dissemination of space weather information.	Space Weather Provider(s)

Schedule- Annex 3, Requirements

SARPs in *Annex 3- Meteorological Service for International Air Navigation*

- Chapter 1-Definitions;
- Chapter 3- Specific SW requirements;
- Chapter 9- Service for operators and flight crew members;
- Appendix 2- New Space Weather Centres and Table A2-3. Template for advisory message for space weather information;
- Appendix 8- Specifications related to flight documentation; and
- Attachment E- Spatial ranges and resolutions for space weather advisory information

Amendment of Annex 3 and consequential amendments to Annex 15, PANS-ABC and PANS-ATM adopted by ICAO Council in March 2018

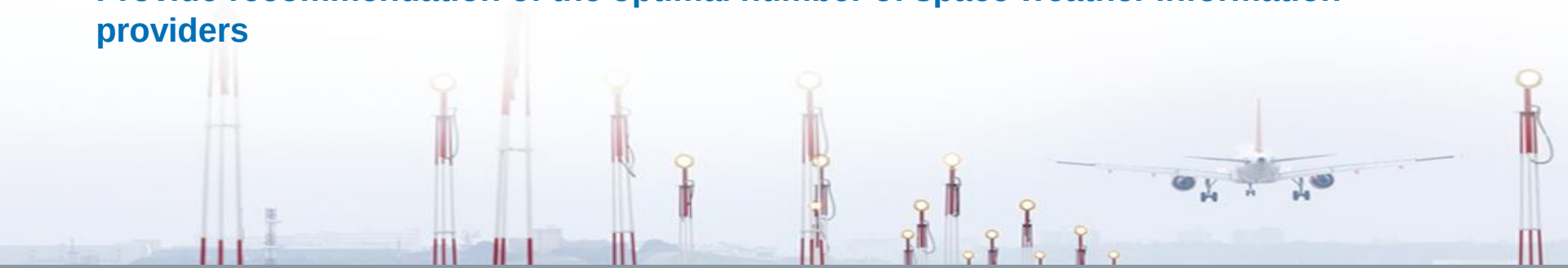


METP/3 Meeting

Held in Montreal, from 26 to 27 April 2018. Attended by members and observers nominated by 10 Contracting States and 5 international organizations

Review of WMO audit reports, performed on behalf of ICAO, of prospective space weather information providers' capability to fulfil proposed ICAO provisions for a space weather information service

Provide recommendation of the optimal number of space weather information providers



Recommendation

Overall recommendation on the compliance (at the time of observation and against the ICAO-defined criteria) of the prospective space weather information providers:

COMPLIANT	COMPLIANT BUT WITH QUALIFICATION	NOT COMPLIANT
Australia	South Africa	*[None]*
Canada		
China		
France		
Japan		
PECASUS*		
Russian Federation		
United States of America		

* Austria, Belgium, Cyprus, Finland, Germany, Italy, the Netherlands, Poland and the United Kingdom

WMO OMM

Note. — It is the sole responsibility of ICAO to decide whether or not to take the WMO findings presented in this report into account during its (ICAO's) designation of the space weather information provider(s) that will serve international civil aviation.

METP/3 Meeting Outcome

Recommendation 3/1 — Demonstrated capability of prospective space weather information service providers at the time of assessment

That , in view of the WMO audit report (Appendix A to this report) performed on behalf of ICAO, on the capability of prospective space weather information providers' of space weather providers' for a space weather information service for international civil aviation:

a) **Australia, Canada, China, France, Japan, PECASUS, Russian Federation, and the United States**; be considered compliant at the time of the site assessment and audit; and,

b) **South Africa** be considered compliant but with qualification at the time of the site assessment and audit.

Note.- PECASUS is a Pan-European Consortium of Aviation Space Weather User Services formed by Austria, Belgium, Cyprus, Finland (as consortium lead), Germany, Italy, the Netherlands, Poland and the United Kingdom.

Note.- Appendix B to this report contains a summary of the strengths and weaknesses of the prospective space weather information providers and is to be used in conjunction with Appendix A.

METP/3 Meeting Outcome

Recommendation 3/2: Optimal number of space weather information providers

That, in the context of the optimal number of space weather information providers considered necessary to fulfil the associated ICAO Annex 3 – Meteorological Service for International Air Navigation provisions, the Meteorology Panel (METP) recommends that:

a) Not later than November 2018, **two (2) global space weather information providers** be established that conjointly provide information on space weather impacts to High Frequency (HF) radio communications, satellite communications, Global Navigation Satellite System (GNSS)-based navigation and surveillance, and radiation exposure at flight levels;

b) In addition to a) and not later than November 2022, **up to four (4) regional space weather information providers** be established that provide complementary higher-resolution information for HF communications, satellite communications and GNSS-based navigation and surveillance in support of the global space weather information service and,

c) Not later than 2027, ICAO, in close coordination with the World Meteorological Organization (WMO), **reassesses the optimum number of global and regional space weather information providers**.

C-DEC 215/7 (16 November 2018)

- a) agreed that, as recommended by the ANC, **the ACFJ consortium, the PECASUS consortium, and the United States** serve as global space weather information service providers, on the understanding that the space weather information services would be provided at no cost to the aviation user community for the first three years of operation;

- b) agreed that, as recommended by the ANC, two regional centres, comprising the **China/Russian Federation consortium and South Africa**, be established no later than November 2022;

- c) noted the interest expressed by China and the Russian Federation to serve together as a global centre

METP Coordination Group on Initial Coordination and Governance of the Space Weather Information Service (SWXC-CG)

- ***First Meeting, Melbourne, Australia, 18 to 21 February 2019. On-going work***
- ***Facilitate the development of coordination methodologies between designated global and regional centres as necessary to ensure the provision of consistent space weather information***
- ***Develop guidance for coordination between service provider States including roles and responsibilities***
- ***Develop governance for the oversight of the space weather information service***
- ***Main outcome:***
  - ***Rotation cycle between designated providers;***
  - ***Consistency of information;***
  - ***Implementation of SWXC Service (07 November 20190***
- ***On-going work***

Next Steps

- ANC Progress Report to Council (May 2019).
- Finalization of work towards the implementation of the Service by SWXC-CG.
- Providers start production and dissemination of space weather information (November 2019).
- Review global and regional implementation and cost of service in 2022, and reassessment of the optimal number of service providers by 2027

Conclusion

ICAO is confident that the implementation of the space weather information service will be a significant contribution to the achievement of the safety level needed by civil aviation, especially in light of the remarkable traffic growth that is forecasted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THANK YOU!