International Civil Aviation Organization

WORKING PAPER

Asia and Pacific (APAC)
Thirteenth Meeting of the Meteorological Services Working Group (MET/S WG/13)

Bangkok, Thailand, 29 to 31 March 2023

Agenda Item 6: Guidance and education related to the provision of meteorological services

SPACE WEATHER EXERCISE & EDUCATION

(Presented by Australia)

SUMMARY

This paper provides a summary of the space weather exercises conducted by the Bureau of Meteorology (the Bureau) with support from New Zealand Civil Aviation Authority (CAA NZ) during October 2022, and shares key recommendations from the exercises. It also details a plan for a future space weather exercise. The paper highlights the need for broad education on SWX impacts and the ICAO SWX service and recommends the creation of a Steering Group to progress space weather education and exercises within our region.

1. INTRODUCTION

1.1 The International Civil Aviation Organization (ICAO) introduced the space weather (SWX) advisory (SWXA) service in late 2019, with four global ICAO SWX Centres in place to monitor and provide advisory information on space weather phenomena expected to affect high-frequency (HF) radio communications, communications via satellite[1], GNSS-based navigation and surveillance systems and/or pose a radiation risk to aviation occupants.

1.2 Solar activity is likely to increase as the sun progresses to solar maximum in 2025 and is likely to be stronger than the previous 2014 solar maximum. Due to the relatively rare nature to date of disruptive space weather phenomena at mid-latitudes, operators and air navigation service providers may not have fully developed procedures to deal with SWXA.

1.3 The Bureau, with support from CAA NZ, conducted a space weather exercise on 19 and 26 October 2022 (via MS Teams) with participants invited from Australia, Fiji, and New Zealand airlines, civil aviation authorities, meteorological service providers and other interested government organisations.

[1] Advisories for SWX impacts to satellite communications are not currently issued.

2. DISCUSSION

Space Weather Exercise October 2022

2.1 The purpose of the space weather exercise was to:

a) raise awareness of space weather and the space weather advisory procedures and services (Session 1);
b) work through the exercise in a collaborative format (Session 2); and
c) determine best practices for how to manage SWX events within the aviation system (Sessions 1 & 2).

2.2 The first session included presentations from the Bureau's Australian Space Weather Forecasting Centre and Hazardous Weather Unit, introducing space weather and explaining the space weather advisory system and dissemination. This was followed by presentations of example procedures from Airservices Australia and Qantas, on Air Navigation Service Provider (ANSP) and airline perspectives respectively.

2.3 During this first session, both exercise and conveniently timed operational SWX advisories were issued, allowing the participants to assess whether their systems are receiving and displaying SWX advisories effectively. At the end of the session, participants were requested to complete a questionnaire to prepare for the second session.

2.4 The second session started with an evaluation of the receipt of SWX advisories by participants, followed by a collaborative exercise, whereby participants worked through a series of HF communication (HF COM) advisories. Participants were asked to consider their organisation's action in response to the series of escalating SWXA.

2.5 The discussion looked at the impact of a Moderate (MOD) HF COM SWXA, impact of Severe (SEV) HF COM SWXA and impact of Radiation SWXA.

2.6 The users were reminded that unlike Tropical Cyclone Advisories and Volcanic Ash Advisories there are no SIGMETs issued for SWX events. As a result, systems and procedures will need to be based off the SWXA and consider whether the SWXA impacts the ANSP airspace. It was noted that there remains a lack of clarity about a requirement for ATC to broadcast these advisories.

2.7 For ATC, it was noted that SWXA are simply another trigger for airline requests for route and/or altitude changes. It was agreed that it is the airlines' decision whether to take any actions on receipt of a SWXA.

2.8 The following recommendations were recorded for airlines and ANSPs:

a) Review and include space weather events into their contingency procedures;
b) Consider benefits of broadcasting MOD and SEV SWXA when impacting the ANSP's airspace;
c) Ensure systems are configured to support all ICAO space weather advisory headers (FNXX01-04);
d) Consider non-ICAO information sources to increase situational awareness as part of managing risks associated with SWX events; and
e) Consider sending both Operational and Exercise SWXA to operational briefing systems, noting Test Advisories do not need to be disseminated beyond communication systems.

2.9 It was agreed that further space weather exercises, for other space weather phenomena such as GNSS and radiation, would be valuable as these are likely to have larger impacts on aviation operators.

Future Space Weather Exercise

2.10 The Bureau, in coordination with CAA NZ, plans to conduct another space weather exercise by the end of 2023, with the focus on GNSS.

2.11 Similar to the first exercise, two sessions are proposed as follows:

- Session 1: Educational focus (optional – intended for those who did not attend the first exercise)
  - what space weather is and how it might affect aviation;
  - how the SWX advisory system works; and
  - what information the SWX advisories will contain and how they are made available.
- Session 2: Issuance and evaluation of receipt of a GNSS Exercise (EXER) SWXA
  - an evaluation of the participant receipt of EXER SWXA;
  - working through a GNSS event exercise in a collaborative format; and
  - discuss any issues, improvements and resulting recommendations.

2.12 It is proposed that the attendees will include participants from airlines, air traffic services, the ICAO regional office, meteorological service providers and the Australian Space Weather Centre.

2.13 The ICAO Regional Office also has plans to run a space weather seminar, so there may be some opportunities to merge these two events.

Space Weather Education

2.14 In conducting the aforementioned space weather exercise, it is apparent that there remains very limited knowledge of the ICAO Space Weather Advisories across the sector, including any requirement for ATC to broadcast SWXA and recommended actions pilots should take upon receipt of a space weather event affecting their aircraft or intended route.

2.15 The meeting will recall a related action from MET/S WG/12:

MET/S WG/12 Action 05
Delegate an ad hoc group to investigate further opportunities for educating users on the ICAO SWX service (e.g., education material or activities).

2.16 The APAC Volcanic Exercise Steering Group (APAC VOLCEX/SG) has been instrumental for increasing knowledge and improving procedures associated with volcanic ash events. It is recommended that a similar capability is created for space weather. This could either be a separate dedicated steering group, or a modification of the name and terms of reference of VOLCEX SG to include space weather.

3. CONCLUSION

3.1 In view of the discussion above, the meeting is invited to consider formulating the following Draft Conclusion, for possible adoption by the MET SG/25 meeting

Draft Conclusion MET/S/13-xx – *Space Weather Education and Exercise*

That, the MET SG approves the creation of cross cutting APAC Space Weather Exercise Steering Group with scope to:

a) develop space weather education materials; and

b) conduct space weather exercises.

4. ACTION BY THE MEETING

4.1 The meeting is invited to:

a) note the information contained in this paper;
b) discuss any relevant matters; and
c) consider formulating the Draft Conclusion in para 3.1.

– – – – – – – – – – – – – – –