International Civil Aviation Organization

Twelfth Meeting of the Air Traffic Management Sub-Group (ATM/SG/12) of APANPIRG

Bangkok, Thailand, 23 – 27 September 2024

Agenda Item 7: AOP, AIM, MET, SAR

SPACE WEATHER ADVISORIES VIA FLIGHT INFORMATION SERVICES

(Presented by Secretariat, on behalf of Meteorology Sub-group)

SUMMARY

This paper presents issue identified by the Meteorology Sub-group in relation to the inconsistent approach to sharing of space weather information across the Asia and Pacific region and invites the meeting to consider options for addressing the problem.

1. INTRODUCTION

1.1 The Meteorology Sub-group (MET SG) of APANPIRG organized the 2024 Meteorology Seminars, just prior to its 28th meeting (MET SG/28) held in Bangkok 8-12 July 2024. Presentations were made to both physical and online audience on the following topics:

- World Area Forecast System (WAFS) SIGWX Upgrade
- New Annex 3 Volcanic Hazard Information Services
- Space Weather Advisory Service for Aviation
- An Introduction to a Typical Case of Space Weather
- Space Weather: Impacts on Airlines

1.2 Presentation slides are available at https://www.icao.int/APAC/Meetings/Pages/2024-MET-SG-28.aspx, with recordings of the presentations anticipated to be published soon.

1.3 Discussion following the space weather (SWX) presentations highlighted the inconsistent approach to sharing SWX advisory information **to aircraft in flight** across the Asia and Pacific region and it was agreed that these should be further raised for discussion at the ATM/SG.

2. DISCUSSION

2.1 SWX advisories have been included as a service in Annex 3 *Meteorological Services for International Air Navigation* since November 2019, however it has not been until the last few years that solar activity has increased meaning regular advisories have been issued.

2.2 From an aviation operations perspective, space weather events can cause disruptions to (or even failures of) communications, navigation, and surveillance systems. In addition, they elevate radiation dose levels at flight altitudes, where high-energy particles may cause aircraft equipment failure or malfunction. The radiation impacts may also be of concern for aircraft occupants, in particular for pregnant high-frequency travelers or crew.

2.3 One or more of these impacts can occur during a SWX event and, while not necessarily causing aircraft malfunction or complete inability to land, they can significantly reduce the degree of safety margin provided within the aircraft and/or aviation system.

2.4 SWX advisories are issued when the impacts on aviation reach agreed thresholds (moderate or severe), as outlined in in Doc 10100 *Manual on Space Weather Information in Support of International Air Navigation*.

2.5 The ICAO SWX Centre issuing the advisory disseminates it globally via a network of Regional OPMET Centres, which then direct the advisory on to National OPMET Centres. It is from their associated NOC that users, including area coordination centres and flight information centres, can access the SWX advisory. This is described in detail in section 9.1 of the APAC ROBEX Handbook.

2.6 Unlike other meteorological hazards, there is no equivalent SIGMET issued for SWX, nor NOTAM required. This is due to the often-global nature of the SWX advisories (e.g. "daylight side") and the potential for information overload if identical SIGMET and NOTAM are issued for every flight information region. This should not be taken as an indication that SWX is less impactful.

2.7 Another crucial difference from SIGMETs is that a SWX advisory is not FIR-based. This can be challenging for ANSPs when determining whether an advisory is relevant for the FIR they are responsible for.

2.8 While Annex 11 *Air Traffic Services* does not specifically include SWX information in the list of information to be included in the provision of a flight information service (FIS), it should be clear that SWX impacts are likely to impact safety.

> 4.2.1 Flight information service shall include the provision of pertinent:
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> a) SIGMET and AIRMET information;
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> b) information concerning pre-eruption volcanic activity, volcanic eruptions and volcanic ash clouds;
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> c) information concerning the release into the atmosphere of radioactive materials or toxic chemicals;
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> d) information on changes in the availability of radio navigation services;
>
> e) information on changes in condition of aerodromes and associated facilities, including information on the state of the aerodrome movement areas when they are affected by snow, ice or significant depth of water;
>
> f) information on unmanned free balloons;
>
> and of any other information likely to affect safety.

2.9 An informal survey of States in the APAC region found a variety of ways that SWX advisories were shared with aviation operators:

- Some States share only severe SWX advisories (not moderate) via their FIS
- Some States only share SWX information from State-based service providers, such as the United States Space Weather Prediction Center (SWPC)
- Some States do not share via FIS at all, but make SWX advisories available through briefing services, such as a dedicated website or electronic flight bag

2.10 The inconsistent approach by ACC/FIC through their FIS means that a long-haul flight may receive information on SWX advisories that could impact its operation only during parts of its journey.

2.11 It would therefore be useful to create guidance material for the dissemination of relevant SWX information by ANSPs to operators in the APAC region. Such guidance for dissemination should be aligned and consistently applied, noting that the decision to operate during a period of SWX – or not – ultimately rests with the operator.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this paper;

b) discuss the need to develop guidance for the dissemination of relevant SWX information by ANSPs to operators via FIS for the APAC region; and

c) discuss any relevant matters as appropriate

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