International Civil Aviation Organization

INFORMATION PAPER (IP/14)

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Agenda Item 6: Research, development and other initiatives

NEW ZEALAND AVIATION SPACE WEATHER EXERCISE

(Presented by New Zealand)

SUMMARY

This paper provides information on an aviation-focused space weather exercise for New Zealand aviation organisations, organised by the Civil Aviation Authority of New Zealand.

1. INTRODUCTION

1.1 A multi-agency aviation-focused space weather (SWX) exercise focused on an extreme SWX event was held at the premises of the Civil Aviation Authority of New Zealand (CAA NZ) on 20 February 2025.

1.2 The exercise used, as an overarching guide, the recently published National Space Weather Response Plan, which articulates the actions to be taken in New Zealand during a significant space weather event.

1.3 Participants in the exercise were from a range of organisations either in the aviation sector, or in related science or emergency management organisations. These included CAA NZ staff, Earth Sciences NZ (formerly GNS Science NZ – who maintain New Zealand's geomagnetic observatory), MetService NZ (national aeronautical meteorological service provider), Airways NZ (national air navigation service provider), Air New Zealand (national carrier), the New Zealand Defence Force, Land Information New Zealand (LINZ – operates the Southern Positioning Augmentation Network or SouthPAN), and the National Emergency Management Agency (NEMA).

2. DISCUSSION

2.1 The exercise simulated the arrival of a 'Carrington Event' equivalent coronal mass ejection (CME). Exercise participants were provided with a link to the National Space Weather Response Plan ahead the exercise, so they would have an understanding of what would be expected of them during such an event. A summary of space weather impacts was also provided as a presentation at the start of the exercise.

2.2 As the exercise unfolded, participants were provided with the information they would receive as such an event unfolded, however only if they were already receiving such information during

normal operations. For example, those that were signed up to the United States Space Weather Prediction Center (SWPC) or Australian Space Weather Forecasting Centre (ASWFC) emails received the first information of a potentially damaging SWX event, while those who did not already receive these emails waited a little longer for information. A similar process was used for ICAO SWX advisories – where aviation organisations were provided with the information, but non-aviation participants waited a little longer to see the information. The timing of relaying these pieces of information was based on a real space weather event earlier that month.

2.3 The exercise began with an HF radio communications warning, indicating of a magnetically complex region on the sun, capable of R3-R4 flaring. A solar flare was then observed, prompting both public and ICAO information to be provided on the HF radio communications impact as well as a proton storm that was simulated 15 minutes later.

2.4 The exercise then 'fast-forwarded' to T+3 hours after the flare, where public severe space weather information was issued advising of a CME expected to impact Earth in 14 hours +/- 6 hours, then fast-forwarded again to T+14 hours when the CME passed the L1 satellite point and the likely impact could be ascertained.

2.5 The key takeaways from the exercise were as follows:

- The 6-12hr window between CME warning and impact is a critical decision-making period.
- Air traffic may be able to continue during this period, but restarting after CME may be hard, as the potential loss of power may cause the biggest impact
    - For example, fuel pumping may not occur, security screening may not function, information services such as meteorological briefing, passport control may not work, etc.
- Communication is critical – before (education), during (prepare) and then afterwards, once communications are restored.
- International collaboration is important – sharing exercise and real event outcomes.

2.6 In summary, the exercise was successful in developing a common understanding of actions that would be taken during an extreme space weather event, and a clear need was expressed for more tailored guidance for the aviation industry in New Zealand.

3. ACTION BY THE MEETING

3.1 The meeting is invited to note the information contained in this paper.

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