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European Aviation Crisis Coordination Cell (EACCC) Space Weather Exercise 2023

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Information was based on Network Manager - Eurocontrol presentations, reports and directives

Workshop on formulating a space weather exercise

15-16 November 2023

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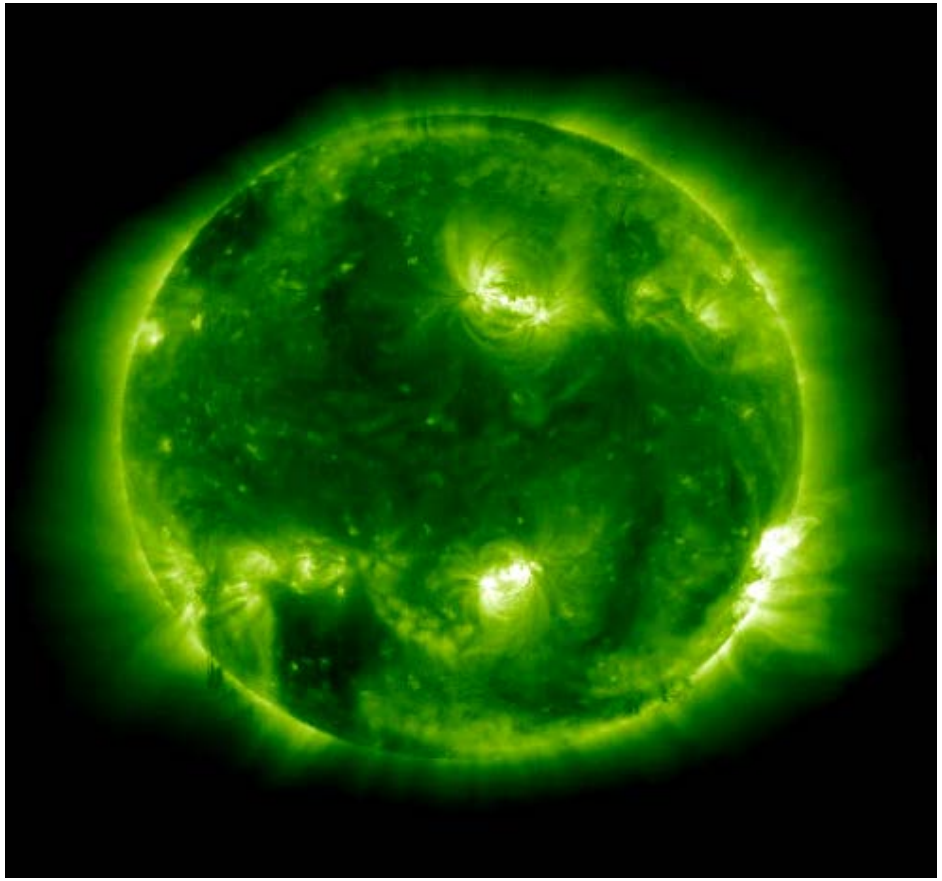
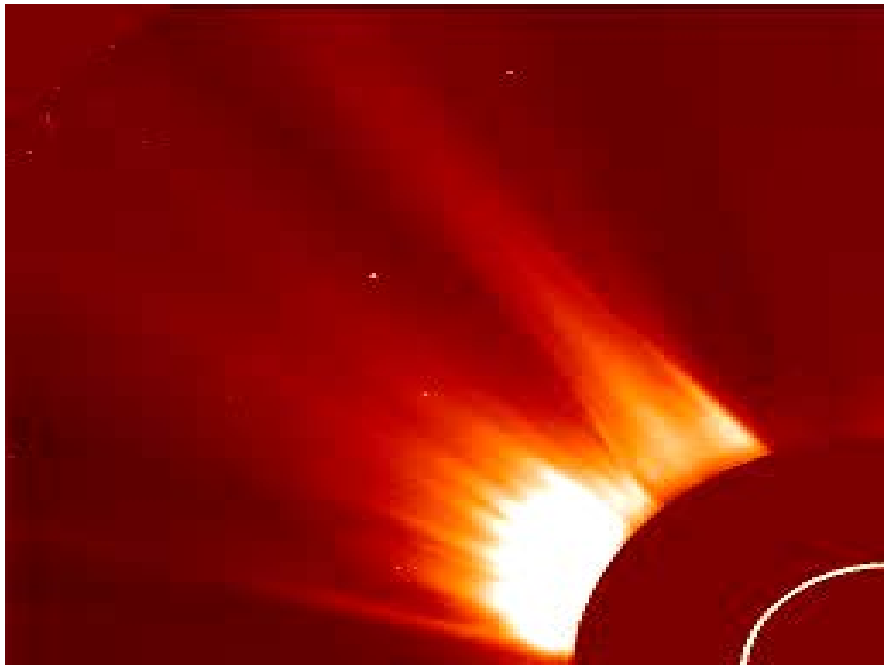
Introduction

- What? – space weather exercise
- Why? – increase Network resilience
  - Create awareness and common understanding in the aviation community
  - Review (local) procedures
  - Discuss scenarios with subject matter experts and other stakeholders
  - Translate scientific results into practical information
  - Improve national contingency and crisis management plans
- Where? – approximately 40 in person at EUROCONTROL, the rest hybrid
- When? – 8 and 9 November 2023



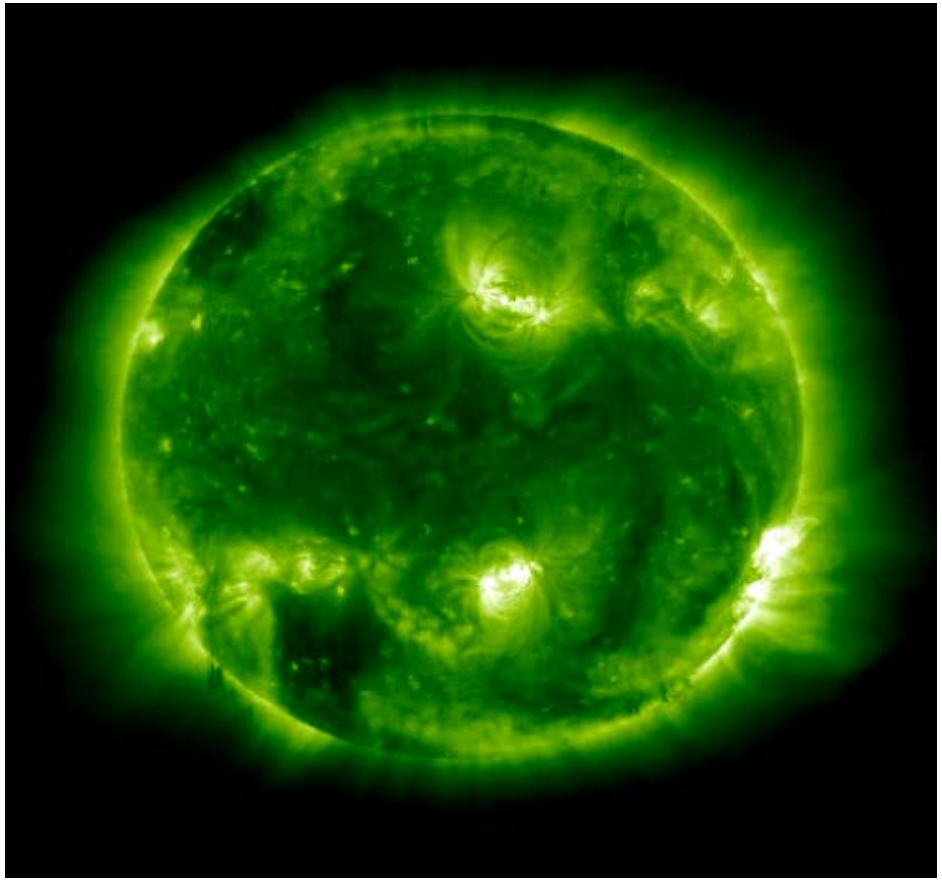
Scope and objectives

- The severity has been chosen with the following rationale:
  - Triggering a response by aviation stakeholders and States
  - Checking the suitability of existing space weather services for these kind of events
- Extreme solar events are rare
  - They may have an impact on essential aviation services
  - They may have an impact on on-board electronic equipment
  - They will have an impact on passengers and crew



Introduction

- Space weather advisories issued for:
  - HF COM – SEV
    - Generally the first half day, then MOD for several hours and again for several hours later in the day
  - GNSS – SEV
    - First couple of hours
  - RAD – SEV
    - After an hour and a half for near a few hours, then MOD for a couple of hours



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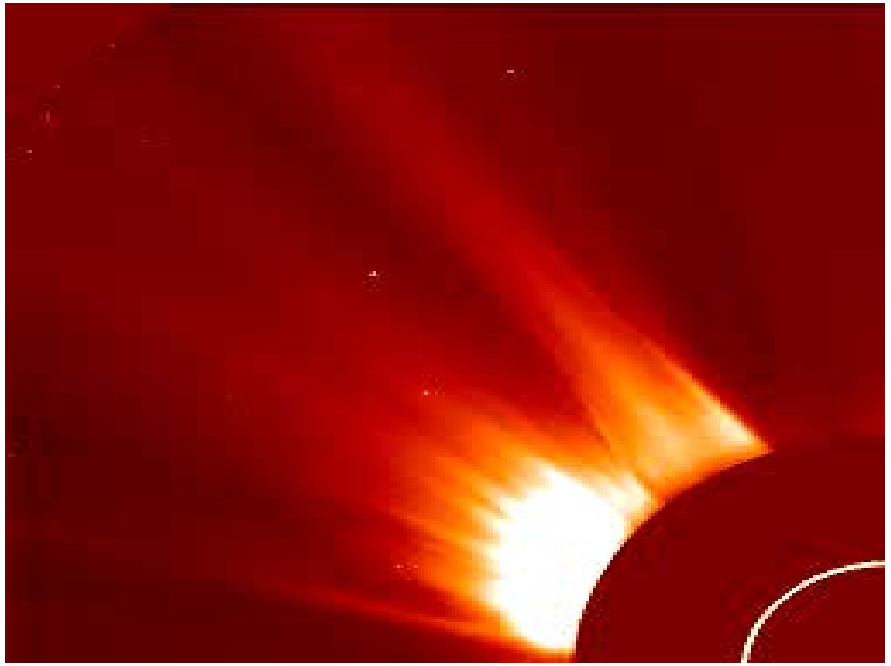
Initial stakeholder feedback summary – prior exercise

- Awareness
  - Basic awareness is present in most organisations
- Procedures
  - Most organisations do not have specific space weather procedures
  - Some have quite clear and detailed procedures
- ICAO SWX advisories
  - These advisories are not yet widely used
  - Other SWX sources seem to be preferred
- Radiation limits
  - If radiation limits are applied, they are based on ICPR (International Commission on Radiological Protection) and EURATOM (European Atomic Energy Community) recommendations
  - Some organisations stated that they are monitoring the exposure



Initial summary of exercise

- Understanding
  - Feedback from field needed
    - Operators with HF COM, GNSS issues through e.g. Eurocontrol voluntary ATM incident reporting (EVAIR), AOs using high latitudes, ACCs
      - Event on 5 Nov 2023 impacted a large part of the U.S. & Canada (SBAS system called WAAS) and parts of S EUR (SBAS system called EGNOS) – also there have been approximately 500 SWX advisories issued this year - yet there are no reports of navigation issues – thresholds too low? Or pilots/airlines do not report?
    - Analysis by SWXCs (will provide stakeholders requested format of information)
    - On-board measurements of RAD/ rawindsondes with RAD measurement capabilities to help verify SWX Advisories of RAD

Initial summary of exercise

- SWX Advisories continuous improvement process (EUR/NAT Region as a start for best practices to feed into METP)
  - Format and content of space weather advisories (more specific and operationally useful)
    - Use of polygons and improved spatial and temporal resolutions to capture quickly evolving events;
    - Currently, could provide radiation levels in remarks section;
    - In future, could use D-index and geomagnetic latitude (use of MOD and SEV considered vague);
    - Always keep in mind, how does this information translate to **impacts** to operators/stakeholders (see examples of products used by operators in the U.S.);
    - Colour coding type of advisory could be considered;
    - Improve cancelling methodology to make clear the previous advisory issued is cancelled (vs. *swx effect* field indicating e.g. GNSS SEV and at the same time *obs swx* indicating day/time NO SWX EXP)
    - Long term – consider other SWX situations and effects

Initial summary of exercise

- SWX Service Provision
  - Distribution of space weather advisories
    - Inter-regional and regional dissemination in place, NOCs need to provide this information to ACC/FIC, AMO, for providing this information in flight-briefings
    - Continue with training/awareness programs
  - Forecasting/prediction
    - Continuously improve
  - Differences in response speeds
    - Proactive vs. reactionary
  - Consistency issues among space weather advisory centres
    - On 5 Nov 2023, some SWXCs would have issued advisories for this event, but not all (to be investigated)

Initial summary of exercise

- Responding to event

  - Is the provided information sufficient for the response
    - If not, what are the requirements
    - Guidance regarding passenger radiation exposure needed
  - Lack of operational procedures
  - Proactive vs. conservative
  - Harmonisation
  - ‘’Oceanic’’ ANSPs better prepare than other ANSPs
    - Yet, still not sure what the approximately 700 flights in the high latitudes of the NAT would have done with e.g. RAD SEV – would many request a lower altitude near the same time and/or route further south?
  - SRA approach for space weather events
    - Should be achievable based on volcanic ash exercises and national policy changes that accept the SRA approach

Initial summary of exercise

- Communications
  - Media will play a big role in radiation events
  - Communication plan is essential
    - Is the available information sufficient
  - Educating the media
    - Have a Q/A ready

- Regulation
  - Are ICAO space weather services regulated/certified?
  - Do we need regulations for operation under SWX conditions
    - NAT Doc 006, Part III, space weather contingency plans, used as guidance
    - National regulators should also have procedures – based on regional procedures

Thank You!

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