

### Space Weather Services to Build Global Resilience Workshop

# Establishment of international air navigation Space Weather requirements

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#### SW as an additional hazard to aircraft operations

















Los Angel

 Year 2000: New air transpolar routes opened up between North America and East Asia

- Later: Polar routes across the South Pole
- Today: More than 10,000 operations in trans- or cross-polar routes per year (N and S Poles)

 Polar trajectories are more cost effective for airlines

> Shorter, more direct, longhaul routes

Hong Kor

- saving fuel and minimizing environmental impact
- ...and more convenient for passengers
  - Less time in the air

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EUROPE





- Recognition that aircraft operating on high latitude polar routes could be exposed to hazardous levels of solar radiation that could affect crew and passenger health, communications, navigation and avionics
- Recommendation that an assessment be conducted of the need for the provision of information for international air navigation on solar radiation storms and other bio-hazards

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### Impact on aircraft operation



 Space weather can cause GPS position errors, or even total loss of "lock"

 Space weather can cause loss of both voice and data link communications

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### Impact on aircraft operation



- Radiation exposure is a concern to aircraft occupants during high latitude flights
- Sophisticated onboard avionics are vulnerable to solar radiation storms



### Use of the SW information



The timely notification of space weather activity allows users to undertake mitigation action increasing flight safety and efficiency, especially during polar operations



### **Recent progress**

- Development of initial guidance material on space weather with emphasis on the description of the impact of space weather on international air navigation
- 4 States plus WMO
- Available at: <u>http://www.icao.int/safety/mete</u> <u>orology/iavwopsg/</u>

- Development of draft requirements for Space Weather
  - Drafting of operational requirements and associated guidance material
  - Development of milestones for the development and rollout of a Space Weather service for international air navigation
- 7 States, IATA, IFALPA, IFATCA, in coordination with ICAO and WMO



### **Recent progress**

- Development of operational requirements for space weather products
  - High-level user requirements from IATA
  - Draft Concept of Operations for international space weather information in support of aviation
  - State feedback
  - Product requirement specification (Report to IAVWOPSG/7, March 2013)

 ICAO 12<sup>th</sup> Air Navigation Conference (Nov 2012)

 ICAO MET Divisional Meeting conjoint with WMO CAeM-XV (Jul 2014)





- Assessed the work carried out by the IAVWOPSG to develop draft initial provisions
- Recommended to address:
- requirements for information concerning space weather
- establishment of optimal number of global centres

✓ augmented by an optimal number of regional centres





- Global centres (for solar radiation storms and solar flares, as well as for geomagnetic storms and ionospheric disturbances <u>at the</u> predictive stage)
- regional centres (for geomagnetic storms and ionospheric disturbances <u>at the observation</u> <u>stage</u>)





#### **Need for further work on:**

a) roles, requirements and capabilities of the global and regional centres (together with the optimal number of centres)

b) development of a process for the designation of global and regional centres, their governance (including cost recovery and competency standards) and duration of mandate



#### **Future steps**

ICAO expected to establish an expert group on SW under the umbrella of the MET Panel, in close coordination with WMO

Expert group on SW to undertake work in accordance with the mandate of MET Divisional Meeting 2014



#### **Future steps**

#### ICAO expert group on space weather (with the assistance of WMO (ICTSW)) to:

- a) Complete development of SW requirements in line with the Global Air Navigation Plan and integrating the information in the future system-wide information management (SWIM);
- b) Advise ICAO about capabilities of the global and regional centres to be designated, its governance and mandate.

2013–2028 Global Air Navigation Plan





#### **Future steps**

- Nomination by ICAO of global centres and by PIRGs of regional centres;
- Inclusion of SW requirements in Amendment 78 (Nov 2018) to ICAO Annex 3 – Meteorological Service for International Air Navigation;
- Development of appropriate guidance material;
- Implementation of SW provisions; and,
- Monitoring of SW information provision to ensure that it continues to meet evolving operational requirements





## Space Weather information provision in support of ICAO Strategic Objectives

#### A. Safety:

Enhance global civil aviation safety.

#### B. Air Navigation Capacity and Efficiency:

Increase capacity and improve efficiency of the global civil aviation system.







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