



International Civil Aviation Organization

**THE THIRD MEETING OF IONOSPHERIC
STUDIES TASK FORCE (ISTF/3)**

15 – 17 October 2013, Seoul, Republic of Korea



Agenda Item 2: Review of outcome of relevant meetings/conferences

c) CNS SG/17 & APANPIRG/24

**OUTCOME OF CNS SG/17 AND APANPIRG/24 ON IONOSPHERIC
RELATED ISSUES**

(Presented by the Secretariat)

SUMMARY

APANPIRG/23 adopted Decision 23/48 inviting the CNS and MET Sub-Groups to review the impact of space weather in the CNS and MET areas and report to the 24th meeting. APANPIRG/24 reviewed the outcome of discussion of CNS SG/17 on the subject and noted few information papers on the impact of space weather presented by the Secretariat, Japan and the United States. This paper *provides a brief report on the outcome of these meetings.*

1 INTRODUCTION

1.1 The Seventeenth meeting of CNS Sub-group of APANPIRG was held in Bangkok from 13 to 17 May 2013 and the Twenty-fourth meeting of APANPIRG was held in Bangkok from 24 to 26 June 2013.

2. DISCUSSION

Space Weather

2.1 While recognizing that ICAO is addressing the matter of space weather at a global level, APANPIRG/23 considered that the CNS and MET Sub-Groups should review the impact of space weather in their respective areas. Accordingly, APANPIRG/23 adopted the following decision:

Decision 23/48 – Aspect of Space Weather

That, CNS and MET SGs review the impact of space weather in the CNS and MET area and report to APANPIRG.

2.2 APANPIRG/24 meeting noted that global harmonization of space weather information was required to facilitate a uniform interpretation of the effects and development of procedures that would support seamless operations and mitigate cost to the airlines. It was recommended that the international aviation community should have a standardized format for

information and impact scenarios by adopting one of the existing international standards. Space Weather and its effect on aeronautical navigation came up for discussion in the Navigation Systems Panel (NSP) Working Group of the Whole meeting held in 2012. The NSP noted that the work for the Development of Operational Requirements for Space Weather prepared by the ICAO Meteorology section was on-going to derive operational requirements for providing the international civil aviation with space weather related services.

2.3 The meeting noted that in the Asia/Pacific Region, Ionospheric Prediction Service (IPS), a service of the Australian Department of Industry, Science and Resource had also related activities like the impact assessment of space weather on Ground Based Augmentation System (GBAS). NICT in Japan conducted activities in the field of space weather and its influence on radio propagation. Electronic Navigation Research Institute (ENRI) and National Institute of Information and Communication Technology (NICT) (both from Japan) were also conducting extensive study on Space Weather effects on GNSS performance.

2.4 The CNS SG also noted that space weather services are currently available through the international agency known as the International Space Environment Services (ISES) and that a system of space weather scales to categorize the severity of impact of space weather events is used by the United States' Space Weather Prediction Center (SWPC). More detailed information of the Space Weather Prediction Center (SWPC) is provided in the **Appendix A** to this paper.

2.5 In consideration of the ionospheric studies and the broader study of space weather impacts on CNS systems, the CNS SG made the following Decision to amend the terms of reference of the ISTF to include space weather studies, particularly with reference to the impacts on aeronautical communication and navigation:

Decision 17/13 – Space Weather Studies

That, the terms of reference of the Ionospheric Studies Task Force (ISTF) be modified to include space weather studies, particularly with reference to its effects on aeronautical communication and navigation.

Overview of MET issues on space weather

2.6 In the MET area, the meeting may recall that, in addition to its principle function for overseeing the operation and the development of the international airways volcano watch (IAVW), the IAVW Operations Group (IAVWOPSG) is also overseeing the development of:

- a) **operational requirements** for space weather products intended for international air navigation flight planning purposes and proposed for inclusion in Amendment 77 of Annex 3 — *Meteorological Service for International Air Navigation* (applicability November 2016);
- b) **guidelines/guidance** to support potential future provisions on space weather (in the form of an ICAO manual based on the “Space Weather Impacts on International Air Navigation” document); and
- c) a draft **concept of operations** for the provision of space weather information in support of international air navigation.

2.7 The development activities with respect to space weather information were reviewed by the Seventh Meeting of the IAVWOPSG (IAVWOPSG/7), held in Bangkok, Thailand, from 18 to 22 March 2013.

2.8 The proposal to amend Annex 3, referred to in 2.6, above, includes operational requirements for space weather products intended for international air navigation flight planning purposes to provide operators, air navigation service providers and flight crew with a notice that space weather is expected to affect communications and navigation systems and may pose a radiation risk to flight crew members and passengers. The IAVWOPSG considered that, with this information, the user would then refer to their operational plans and procedures (e.g. safety management system) to determine what course of action should be taken. For example, if a solar radiation storm is expected to degrade radio communications, an operator may choose to plan a flight route that avoids the affected area.

2.9 The meeting is also invited to note that the draft set of operational requirements developed by the IAVWOPSG includes the concept of a space weather centre(s) – designated by regional air navigation agreement – which would be responsible for providing information on space weather affecting the earth's surface or atmosphere that is expected to affect communications and navigation systems and may pose a radiation risk to flight crew members and passengers.

Concept of operations

2.10 The meeting is invited to note that IAVWOPSG/7 reviewed the draft concept of operations for the provision of space weather information in support of international air navigation, version 2.2 of December 2012, which was last revised based on consideration of more than 800 comments provided by States. Furthermore, IAVWOPSG/7 agreed that further changes to the draft concept of operations may be required to take into consideration additional comments received from the World Meteorological Organization (WMO) Inter-Programme Coordination Team on Space Weather (ICTSW) before a final version of the concept of operations is provided to the proposed ICAO Meteorology Divisional Meeting (July 2014). Therefore, IAVWOPSG/7 adopted the following conclusion:

IAVWOPSG/7 Conclusion 7/40 – Draft concept of operations for the provision of space weather information in support of international air navigation (Target date for part b: November 2013)

That:

- a) the draft concept of operations for the provision of space weather information in support of international air navigation, version 2.2 of December 2012, as supported in principle by the group, be made available by the Secretary on the IAVWOPSG website by May 2013; and*
- b) an ad-hoc group consisting of Australia, China, France, Japan, the United Kingdom (Rapporteur), the United States, IATA, ICCAIA and WMO, assisted by the Secretary, be tasked to review the concept of operations referred to in a) above and propose further changes, as necessary, in time for IAVWOPSG/8 in view of the provision of a final version to the proposed ICAO Meteorology Divisional Meeting (July 2014).*

2.11 It should be noted that the potential future adoption of provisions for space weather products, as proposed by the IAVWOPSG for inclusion in Annex 3, would have implications for the Region, including the designation by regional air navigation agreement of a (specialized) space weather centre(s). In addition, the draft concept of operations for space weather, being developed under the auspices of the IAVWOPSG, is expected to be finalized in time for consideration and endorsement at the proposed ICAO Meteorology Divisional Meeting (July 2014), which will address space weather as a component of the enhanced meteorological services for international air navigation required to support the “One Sky” concept and to promote improvements to safety and efficiency.

2.12 As part of the follow-up to APANPIRG/23 Decision 23/48, the MET SG/17 reviewed information on space weather outlining the role of the IAVWOPSG in overseeing the development of operational requirements for space weather products, guidelines/guidance to support potential future provisions on space weather and a draft concept of operations for the provision of space weather information. MET SG/17 also noted information on the organization, role and capability of the United States’ Space Weather Prediction Center (SWPC) to provide information on space weather in support of international air navigation.

Report of Second Meeting of Ionospheric Study Task Force (ISTF/2)

2.13 APANPIRG/24 noted that the Second Meeting of the Ionospheric Studies Task Force (ISTF/2) held from 15 to 17 October 2012 agreed to develop guidance material such as siting criteria of receivers, their performance and collection of scintillation data at strategic locations. Draft guidance material was expected to be finalized by December 2012. To facilitate its study, ISTF/2 requested APEC GIT to share its test-bed data. Also, the ISTF/2 meeting decided to acquire the Long-term Ionosphere Anomaly Monitoring (LTIAM) tool from the International GBAS Working Group (IGWG).

2.14 The meeting also noted that ISTF/2 had agreed to categorise the ionospheric delay and scintillation measurements collected into geographical regions to verify if there was an even spread of all observation sites in the APAC region. Japan presented a plan to set up a data server in ENRI, Japan for the collection, integration, administration and distribution of data collected from the States and Administrations. ISTF/2 also discussed issues related to the handling of huge quantum of data and restrictions imposed by some contributing States regarding the use of their data. ISTF/2 agreed to develop a mechanism to support data usage restrictions imposed by the contributing States and Administrations.

3. ACTION BY THE MEETING

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

APPENDIX A

UNITED STATES SPACE WEATHER PREDICTION CENTER

- The Space Weather Prediction Center (SWPC) is one of nine Centers that provides specialized services as part of the United States National Centers for Environmental Prediction (NCEP) of the National Oceanic and Atmospheric Administration's (NOAA) National Weather Service. SWPC provides real-time monitoring and forecasting of solar and geophysical events which impact satellites, power grids, communications, navigation, and many other technological systems SWPC is designated as a National Critical System of the United States Government, afforded the highest level of security and supportability for its services.
- SWPC staff are on duty 24/7, monitoring space weather activity and issuing a suite of products and services. A sample of products and services for aviation can be found at: <http://www.swpc.noaa.gov/aviation/index.html>.
- SWPC has facilities on site to download real-time satellite data from NOAA's Geostationary Operational Environmental Satellites (GOES) and the National Aeronautics and Space Administration's (NASA's) Advanced Composition Explorer (ACE) satellites, each critical to forecasting and specification of the near-earth space environment.
- Real-time space weather operations require a robust chain of procedures and capabilities to quickly serve a wide variety of users. SWPC ingests real-time satellite data (i.e., solar wind magnetic field, speed, density; solar x-rays; magnetospheric charged particles and magnetic field, to cite a few key ingredients), and then in-house processing and display systems make the information available to forecasters and in-house research staff.
- SWPC also has a unique focus to understand and serve highly technical user communities. SWPC staff has supported aviation for over 20 years. SWPC participates in the Cross Polar Working Group (CPWG), and has hosted airline space weather conferences for more than 15 years.
- SWPC has a backup center at the National Weather Service facility in Cheyenne, Wyoming, which ensures that critical operations can be continued in the event of a disruption of capabilities at the Boulder facility. SWPC serves as the World Warning Agency of the 14 State International Space Environment Service, an International Union of Radio Science (URSI)-chartered organization to share data and forecasts of space weather globally.

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