

26 April 2021

English only

---

**Committee on the Peaceful  
Uses of Outer Space**  
**Fifty-eighth session**  
Vienna, 19–30 April 2021  
**Agenda item 10 of the provisional agenda\***  
**Space weather**

**Progress report on the work of the Expert Group on Space  
Weather at the 58th session of the Scientific and Technical  
Subcommittee of the Committee on the Peaceful Uses of  
Outer Space**

**Submitted by the Rapporteur of the Expert Group on Space  
Weather**

**I. Introduction**

1. The present document contains information for delegations on the progress of work of the Expert Group on Space Weather, as will be presented to the Subcommittee by the Rapporteur of the Expert Group, Ian Mann of Canada.
2. The Expert Group notes the growing interest in addressing the challenges associated with mitigation of the adverse impacts of space weather in the member States of the Committee on the Peaceful Uses of Outer Space, and highlights the important opportunity to improve global preparedness through the implementation of the space weather-related approved Guidelines for the long-term sustainability of outer space activities ([A/AC.105/C.1/L.366](#)).
3. The Expert Group further notes the increasing global activity over recent years in a number of international organizations to address improved global preparedness and increased international collaboration against the threat of space weather including, but not limited to, the World Meteorological Organisation (WMO), the International Space Environment Service (ISES), the Committee on Space Research (COSPAR), the Coordination Group for Meteorological Satellites (CGMS), and in the context of space weather services for aviation developed in response to user needs identified by the International Civil Aviation Organization (ICAO).
4. The Expert Group reiterates the need for member States to take action in this context to increase their global preparedness in the face of the potential impact on their technological systems arising from space weather events. In this context, a major activity of the Expert Group over the past year has been to engage in a survey of member State activities, plans, and preparedness, in particular in the context of the implementation of the space weather-related Guidelines for the long-term sustainability of outer space activities. Two member State surveys addressed national



current and future activities and needs for space weather impact mitigation. A further survey of international organizations operating in the domain of, or affected by, space weather was also completed. This work was consistent with the mandate and work plan for the Expert Group approved by the Subcommittee at its 57th session in 2020 (A/AC.105/1224; para. 170).

5. The responses from these surveys highlighted the interest amongst responding member States in addressing the space weather threat, and specifically highlighted the importance many respondents placed on improved communication between member States and relevant national and international organizations in the context of further space weather research to further advance understanding of space weather phenomena, and in the development of enhanced space weather services and approaches to mitigate the adverse impacts of space weather.

6. The Expert Group further notes that Space Weather is an important element of all of the four pillars of the “Space2030” agenda, which have already been identified by the Committee and General Assembly resolution 73/6. The Expert Group also notes the importance of aligning its work with the implementation of the approved Guidelines for the long-term sustainability of outer space activities, including B.6 (Share operational space weather data and forecasts) and B.7 (Develop space weather models and tools and collect established practices on the mitigation of space weather effects), and for capacity-building under C.1-C.4, under the new Working Group on the Long-Term Sustainability of Outer Space Activities (“LTS 2.0”).

7. In this context, the Expert Group on Space Weather reiterates the strategic importance of the Committee to elevate awareness of the threat posed by space weather, and recommends that the Scientific and Technical Subcommittee encourage member States to take concrete steps to protect their infrastructure and broader efforts to increase global resilience both within their national institutions and through active participation in relevant international space weather organizations.

8. The Committee can play a key role in facilitating communication and promoting increased international collaboration to address the challenges of understanding and mitigating the impacts of both severe space weather and moderate occurrences, for the benefit of all humankind.

9. In this context, the Expert Group on Space Weather of the Scientific and Technical Subcommittee of the Committee on the Peaceful Uses of Outer Space established a writing group made up of volunteers drawn from the Expert Group (hereafter the “Writing Group”), which drafted both domain specific and overarching draft recommendations for the States members of the Committee. These are presented in draft format for wider input and for further comments from member States and for the information of the Subcommittee in the “Draft Report of the Expert Group on Space Weather: Survey of the State of member State Preparedness, and Current and Future Activities and Needs for Space Weather *Impact Mitigation*” circulated to delegations at the 58th session of the Subcommittee as A/AC.105/C.1/2021/CRP.14.

10. In addition to its intersessional work, the Expert Group held three meetings on the margins of the 58th session of the Scientific and Technical Subcommittee, a pre-meeting on the 19th, and two Expert Group meetings on the 20th and 23rd April, 2021.

## II. Facilitating International Coordination

11. The Expert Group reiterates its view that the Committee can play a key role in facilitating improved coordination within, and between, member States and relevant international organizations against the threat of space weather. With the active involvement of member States, a central element of this could be the development of improved international coordination between international space weather organizations. Collectively this could lead to better identification of potential gaps in space weather services and products, more efficient and sustainable observations,

advances in research, and would promote and encourage the national implementation of the Guidelines for the long-term sustainability of outer space activities.

12. In the report on Thematic Priority 4: International Framework for Space Weather Services for UNISPACE+50 (A/AC.105/1171), the Expert Group previously identified six priority areas in the “Roadmap for international coordination and information exchange on space weather events” in section III of the report and which focus on:

- (a) Product and service selection
- (b) Information communication protocol
- (c) Response procedures
- (d) Product sustainment and improvement and risk assessments
- (e) Improved understanding of fundamental physical processes which cause extreme space weather
- (f) Promote capacity-building for space weather in the Committee member States

13. In the context of the ongoing work of the Subcommittee in relation to the implementation of the space weather-related Guidelines for the long-term sustainability of outer space activities, the Expert Group recalls the road map from paragraph 29 of section III of the Thematic Priority 4: International Framework for Space Weather Services for UNISPACE+50 (A/AC.105/1171), which provides a road map for actions that can be taken in these domains, and which includes traceability to how those actions aid the implementation of the space weather-related Guidelines for the long-term sustainability of outer space activities B.6 and B.7 (A/71/20), and the related Guidelines C.1-C.4 on international cooperation, capacity-building, and awareness. Moreover, the Expert Group reiterates the value of this road map report as a basis through which member States and their national and international organizations can improve their global space weather preparedness.

14. Based on analysis of the results from the surveys of member States and International Organisations completed by the Writing Group over the last year, the Writing Group has developed draft recommendations towards the goal of the implementation of the space-weather related Guidelines for the long-term sustainability of outer space activities. These are discussed and presented in more detail in section IV below. Specific recommendations for a way forward for the Expert Group over the next year are presented in section VI.

### **III. Recent Intersessional Progress: Member Interorganisational Survey**

15. Consistent with the proposal from the Expert Group to the Subcommittee at its 924th meeting in February 2020, member States of the Committee were invited to complete an initial online, high-level member State space weather survey (hereafter Survey One). The survey questions related to current space weather activities in the member States, and to their future aspirations and planning in the space weather domain, addressing topics relevant to the implementation of the Guidelines for the long-term sustainability of outer space activities.

16. Overall 40 responses from 95 member States of the Committee (42 per cent response rate) were received to Survey One, providing a good basis from which to assess the global trends in planning and actions towards space weather preparedness within member States of the Committee. Survey One also requested that responding member States provide the names of national domain experts who could be approached in a follow-on survey focussed on technical aspects within member States.

17. A follow-on survey (hereafter Survey Two) was thereby sent to those 30 member States who provided contacts identified in their response to Survey One. The responses from Survey Two continue to be analysed by the Writing Group, however, the responses received at the time of writing provided additional valuable input.

18. A survey of international organizations involved in space weather (hereafter referred to as the IO Survey) was also circulated to a list of 63 international organizations, intergovernmental organizations, and non-governmental organizations. The response to the IO Survey provided further information which was analysed by the Writing Group.

19. Based on analysis of the results from the member State and International Organisation surveys completed by the Writing Group over the last year, the Writing Group has drafted further recommendations for the consideration of the Expert Group for inclusion in a proposed final report to the Subcommittee to promote improved international collaboration, and to further the implementation of the space-weather related Guidelines for the long-term sustainability of outer space activities. Specific draft recommendations for a way forward in the Committee context are also considered.

20. The Expert Group also notes with appreciation the administrative support provided by the Secretariat, the Australian Bureau of Meteorology, the World Meteorological Organisation, and the United States in support of the intersessional activities, and analysis of the survey results.

#### **IV. Summary Survey Findings and Recommendations**

21. The Expert Group used the approach where findings from the surveys were collated into five different domains. The scope and grouping of these five domains of space weather impact and action was drawn directly from the Guidelines for the long-term sustainability of outer space activities:

A. Mitigation of space weather including risk assessments and socioeconomic impact studies

B. Space weather services and operations

C. Space weather measurements and observations

D. Space weather research

E. Space weather capacity-building

22. The Writing Group analysed the survey results in the context of these five domain specific areas, and drafted domain-specific recommendations under each focus A–E.

23. The Writing Group further proposed four overarching draft Recommendations R.1 through R.4. These draft recommendations relate to the facilitation of improved international coordination, and support member States' efforts to implement the space weather-related Guidelines for the long-term sustainability of outer space activities B.6 and B.7. They also promote further capacity-building activities to support the further development of member State capabilities to mitigate the impacts on their technological systems arising from space weather phenomena, consistent with Guidelines for the long-term sustainability of outer space activities C.4.

24. The results from the analysis of the surveys and the draft recommended approach arising from this information, and the domain-specific (A–E) recommendations as well as the overarching recommendations R.1 through R.4 are provided for the benefit and consideration of delegations, and for further input from member States, in A/AC.105/C.1/2021/CRP.14.

## V. Towards Improved Global Coordination

25. Based on the survey responses, the Writing Group's draft report emphasizes the identified need for improved communication, coordination and collaboration among national and international space weather actors. The Writing Group's draft further highlights opportunities to help facilitate this goal in the Committee context.

26. The Expert Group further recognizes the importance of supporting member States in the implementation of the approved space weather related Guidelines for the Long-Term Sustainability of Outer Space Activities, B.6 and B.7, and the additional opportunity to continue to support this effort through the LTS 2.0 Working Group as recommended by the Committee at its 62nd session (A/74/20).

27. The Expert Group also notes the opportunity for improved global coordination in the space weather domain with the activities under consideration within World Meteorological Organization (WMO) to identify how space weather will be incorporated into its governance structure. The WMO, a United Nations specialized agency with nearly 200 member States, has passed resolutions supporting to WMO action in the space weather domain. In 2015 the 17th World Meteorological Congress decided that WMO should undertake international coordination of operational space weather monitoring and forecasting with a view to supporting the protection of life, property and critical infrastructure, and affected economic activities. A major purpose of WMO is international data exchange which is also reflected in the WMO Convention. Similar strategic and action plans have been developed in a number of other entities focussed on the implementation of space weather services, including, but not limited to, International Space Environment Service (ISES), CGMS, IGS, ICAO, and others.

28. The Expert Group believes that further coordination and maximise efficiencies across all space weather domains is needed.

29. The Expert Group notes with pleasure work by the COSPAR Panel on Space Weather (PSW) in developing International Space Weather Actions Teams (ISWAT), to advance scientific knowledge and improve the scientific models that support transitional efforts for research to operations to enable future improved space weather operational services. The Expert Group identifies this activity as a major opportunity for member States to advance their efforts in space weather research dedicated to meet the needs of member States to protect their technological infrastructure from the adverse effects of space weather.

30. The Expert Group on Space Weather again highlights the domain specific progress achieved through international cooperation towards operational space weather services with the designation by International Civil Aviation Organization (ICAO) of global space weather information providers for international air navigation, which became operational on 7 November 2019. The Expert Group highlights this as a good example of enhanced international coordination to deliver a global service for the benefit of a specific industry susceptible to space weather.

## VI. Future Mandate and Work Plan for the Expert Group

31. Consistent with the analysis of the member State and International Organisation Surveys, with the Guidelines for the Long-Term Sustainability of Outer Space Activities (A/71/20), and with the Expert Group report Thematic Priority 4: International Framework for Space Weather Services for UNISPACE+50 (A/AC.105/1171), the Expert Group has identified a number of strongly synergized and common themes across the goals of multiple entities engaged in space weather including, but not limited to, COSPAR, WMO and ISES, and which could be elaborated in the course of the implementation of specific joint projects by such entities.

32. Consistent with the mandate from the 57th session of the Subcommittee, the Expert Group has undertaken “intersessional work to compile a report to be submitted to the Subcommittee at its 58th session” and which “assess[es] the activities of the multiple international space weather entities in the context of the Guidelines for the long-term sustainability of outer space activities, in particular B.6 and B.7, and the LTS 2.0 Working Group”. Further, consistent with its mandate, the Expert Group has “provide[d] recommended best practices for their implementation, and assess[ed] potential future approaches for the consideration of the Committee in relation to the mitigation of the effects of adverse space weather beyond the end of the current mandate of the Expert Group on Space Weather in 2021”.

33. The outcomes from this work have been reported to delegations at this session in the form of a draft report in Conference Room Paper CRP.14 (A/AC.105/C.1/2021/CRP.14). The Expert Group welcomes member State comments on the draft report, and requests that input is directed to the Rapporteur of the Expert Group, ideally prior to the next meeting of the Committee, and with a deadline of 31st August 2021.

34. The Expert group work plan for the period of its mandate and workplan up to 2021 was approved at the 55th session of the Scientific and Technical Subcommittee in 2018 (see also the reports from the Expert Group provided to the Subcommittee in 2018, 2019 and 2020 in A/AC.105/C.1/2018/CRP.14, A/AC.105/C.1/2019/CRP.12, and A/AC.105/C.1/2020/CRP.13, respectively).

35. In order to complete its work, the Expert Group recommends that the Subcommittee extend the group’s mandate through the 59th session of the Subcommittee in 2022.

36. In this context, and during the period of a one-year extension to the mandate of the Expert Group, the following Work Plan is proposed for upcoming intersessional work:

(a) Finalize analysis of the results from member State Survey Two, and from the International Organisation survey;

(b) Finalize the draft conference room paper CRP.14 taking account of any further inputs from the Expert Group and from member States, and make the final version of this report on the surveys available to all delegations at the 59th session of the Subcommittee;

(c) Compile a Final Report from the Expert Group, including final recommendations to support, promote, and better serve member States’ space weather needs in the Committee context, through improved international collaboration, and including recommendations directed towards implementation of the relevant Guidelines for the long-term sustainability of outer space activities. This Final Report would be submitted for the consideration of States members at the 59th session of the Subcommittee.

37. In order to promote the engagement of all States members of the Committee, the Expert Group recommends that member States request the assistance of the Secretariat for the translation of the Final Report from the Expert Group into all official languages of the United Nations.