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English only

**Committee on the Peaceful
Uses of Outer Space**
Scientific and Technical Subcommittee
Fiftieth session
Vienna, 11-22 February 2013
Long-term sustainability of outer space activities

**Proposed candidate guidelines of expert groups A-D of the
Working Group on the Long-term Sustainability of Outer
Space Activities, as at joint expert group meeting held on
15 February 2013**

Information note by the Chair

I. Introduction

At the joint meeting of expert groups A-D that took place on 15 February 2013, the co-chairs of the four expert groups reported on the progress that had been made within their respective groups concerning their proposed candidate guidelines. It was noted that a number of the proposed guidelines listed in conference room papers A/AC.105/C.1/2013/CRP.11-14 had been modified or removed to reflect discussions in the expert group meetings, and that some new proposed guidelines had also been introduced. Hence those conference room papers no longer reflected the latest set of guidelines under discussion. The Chair of the Working Group was requested to compile a list of the candidate guidelines under consideration by the expert groups as of that date, and to distribute this list to all delegations.

This document comprises the collection of candidate guidelines under consideration by the four expert groups as of 15 February 2013. Since no attempt has been made to consolidate or harmonise these candidate guidelines, this collection will inevitably have elements of duplication and a certain fragmentary character. This document is for information only and is produced simply as an *aide memoire* of the candidate guidelines as presented at the joint expert groups meeting.

At the time of the joint expert groups meeting, the expert groups still needed some time to complete their revisions of some of their candidate guidelines. These

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revisions will be reflected in the collected set of guidelines to be issued in all official languages as soon as practicable after the end of the fiftieth session of the Subcommittee.

II. Expert Group A: Sustainable space utilization supporting sustainable development on Earth

The following candidate guidelines are proposed by expert group A:

1. Promote, according with ITU Radio Regulations, that Member States consider in their electromagnetic spectrum use the requirements of Earth Observation Systems and Space Services.

In this regard, the following guidelines are proposed:

(a) Member states should consider in their use of electromagnetic spectrum the requirements for space-based Earth observation systems in support of sustainable development on Earth, in accordance with the ITU Radio Regulations.

(b) Member states should consider in their use of electromagnetic spectrum the requirements of space services in support of sustainable development on Earth, in accordance with the ITU Radio Regulations.

2. Promote the institutional and public awareness of space activities and applications for sustainable development on Earth, early warning of potential disasters and support for management of disaster-related activities.

In this regard, the following guidelines are proposed:

(c) Initiate the voluntary collection of Member State information on public awareness and education tools and programs aimed at disseminating the benefits of space to sustainable development and request the assistance of communications experts from Member states and the Office for Outer Space Affairs to help in the preparation of a living repertory of such information with the view of facilitating the development and implementation of similar initiatives with consistent messages as much as possible.

(d) Public awareness of space applications for sustainable development should be promoted through the joint effort of the public institutions, private sectors entities and civil society, in particular taking into account the needs of the youth and the future generations.

(e) Courses on enhancing knowledge and practice on utilizing space applications to achieve sustainable development should be paid special attention to in designing space education programs.

(f) In accordance with General Assembly resolution 41/65, *Principles relating to remote sensing of the Earth from space*, and in response to emergency situations that may affect fundamental social well-being, such as natural disasters and other major harmful incidents and catastrophes, efforts should be made to make relevant space-based information and data accessible to affected countries, applying the principles of neutrality, impartiality and non-discrimination.

3. Support and promote international cooperation for capacity building, data accessibility and processing, taking into account the needs and interests of developing countries.

In this regard, the following guidelines is proposed:

(g) International cooperation efforts related to space-related capacity building and accessibility should be coordinated in order to avoid duplication, taking into account the needs and interests of the developing countries.

(h) Regional and international cooperation should be promoted and supported to assist countries in assembling human and financial resources and achieving efficient space-related capacity, technical, physical and human, enhancing the long-term sustainability of outer space activities and supporting sustainable development on Earth.

(i) New forms of regional and international collaboration should be explored, without prejudice to on-going international collaboration initiatives, to assist countries to implement at the national level: space practices, standards and governance approaches, taking into account the need for the long-term sustainability of space activities and the needs and interests of the developing countries.

4. Promote international cooperation to support the growing interest of many countries to establish national capacities for outer space activities through capacity building and transfer of technology without affecting intellectual property rights, taking into account the requirement of long term sustainability of those activities.

In this regard, the following guidelines are proposed:

(j) Promote international technical cooperation to enhance the long-term sustainability of outer space activities and support the sustainable development on Earth.

(k) To support current initiatives and new forms of regional and international collaboration to promote space capacity building, taking into account the needs and interests of developing countries and in accordance with national and international laws.

(l) Promote technology safeguards arrangements that may facilitate space capacity-building in support of long-term sustainability.

(m) [*Note:* The Russian Federation proposes an additional guideline that is at the end of this chapter]

5. Promote international cooperation to assist countries to gather human resources, achieve technical and legal capabilities and standards compatible with the relevant regulatory frameworks, especially for countries that are beginning to develop their capacities in outer space applications and activities.

In this regard, the following guidelines are proposed:

(n) Support current initiatives and promote regional and international cooperation to assist countries to gather human and financial resources, achieve

efficient technical capabilities and standards for outer space activities, compatible with long-term sustainability and relevant regulatory frameworks.

(o) Support current initiatives and promote new forms of regional and international cooperation to assist emerging space countries to implement national space regulations taking into account the need for the long-term sustainability of space activities.

6. Promote the development of studies and other initiatives on the regulatory regime for the sustainable use of outer space including the other celestial bodies.

In this regard, the following guidelines are proposed:

(p) In the peaceful use and exploration of outer space, including celestial bodies, member states should take into account, with reference to the Rio+20 declaration, the three dimensions of sustainable development on Earth: social, economic, and environmental.

(q) Member states should consider adequate safety measures to protect the Earth and the space environment in order to prevent harmful contamination, taking advantage of existing and further developing measures, best practices and guidelines that may apply to those activities.

In general this expert group estimates that the following recommendations should be considered to be integrated in the final document:

(i) The Committee on the Peaceful Uses of Outer Space should consider examining the issue of exploitation of outer space in the context of sustainable development.

(ii) A compendium should be created of measures, practices, standards and others elements conducive to the safe conduct of space exploitation activities; the compendium should be made freely available and promoted.

(iii) States are encourage in the development standards of the avoidance of harmful contamination to take into account the long term sustainability of outer space including celestial bodies.

(iv) The Committee on the Peaceful Uses of Outer Space should initiate work toward the development of a voluntary interaction model for equitable access to space for the sustainable development on Earth.

[Guideline proposed by the Russian Federation on topic 4 (consensus was not reached and further discussion needs to be conducted):

Subject to the provisions of articles I, III and VI of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, of 27 January 1967, States undertaking (authorizing) or intending to undertake (authorize) international space activities with the use of goods (objects, materials, items, hardware or other types of products), whose embedded technologies are not subject to unauthorized disclosure or retransfer and, therefore, warrant appropriate levels of protection, shall assure that such activities are conducted in accordance with these principles and the norms of international law, irrespective of whether such activities are carried out by

governmental or non-governmental entities or through international organization to which such States are parties.

With the purpose of promoting the growth, sustainability, efficiency, stability and security of international cooperation in the exploration and use of outer space and in space applications, the States concerned shall provide opportunities for securing, with regard to such cooperation, enhanced legal and administrative regulation to the degree which would be particularly relevant or even essential owing to the properties of the exported/imported controlled goods. In this context, States should strive to establish cooperative relations, on the basis of mutual advantage and equitable benefits, in the consideration and resolution of issues of coordination of the procedures for the protection of controlled products. In order to maximize, to the extent possible, the availability of benefits from such practice, States are encouraged, through agreements or other arrangements, to provide for the effectuation of measures, appropriately institutionalized under their domestic laws, ensuring security and safety of imported controlled products while they are in the territory of the importer.

In particular, States, acting on statutory grounds, undertake to enter consultations with a view to reaching concurrence regarding:

- Post-market (post-delivery) monitoring and verification to ascertain that controlled items are not at risk of unauthorized use or retransfer;
- Consolidation of end-use certification and authentication procedures at state (government) level;
- Legal supervision of contracts and operations under contracts to effectively promote proper administration of end-use arrangements and preclude the evolvment of any circumstances whereby exported protected items while in the territory of the importer may be the object of challenged jurisdiction and (or) any malpractice;
- Conferring to appropriate State bodies of effective powers to monitor end-use of controlled items and adopt expedient measures (including the issuance of relevant exigency requirements) if the presumption of non-observance of end-use is raised.]

III. Expert Group B: Space debris, space operations and tools to support collaborative space situational awareness

Member States and international organizations should voluntarily take measures, through national mechanisms, or through their own applicable mechanisms, to ensure that the following guidelines are implemented, to the greatest extent feasible:

1. Space Debris

1a. Measurements, monitoring and characterization of the space debris population

Share space debris monitoring information

Encourage the development and use of relevant technologies for the measurement, monitoring, and characterization of the [orbital and physical]

properties of space debris. Space debris data from any source should be validated for its intended use.

1b. Measures to reduce the creation and proliferation of space debris

Ensure space debris mitigation measures are implemented

In their national regulatory regimes, States should address space debris mitigation practices and procedures and implement the Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space through relevant national mechanisms.

1c. Technical developments and possibilities regarding space debris removal

No guideline proposed.

1d. Controlled and uncontrolled re-entry notifications regarding substantial space objects, and also on the re-entry of space objects with hazardous substances on board

Limit the risk to people and property from controlled spacecraft and launch vehicle orbital stage re-entries.

Consider furnishing additional appropriate information as recommended in Section 2(b)(iii) of General Assembly Resolution 62/101 (Recommendations on enhancing the practice of States and international intergovernmental organizations in registering space object). In cases of controlled re-entries, states also should consider furnishing notices to airmen and mariners using established procedures.

2. Space Operations

2a. Conjunction assessment and collision avoidance processes and procedures

(i) Investigate increasing the accuracy of orbit knowledge

Recognizing that the results of conjunction assessment depend strongly upon the accuracy of the orbital and other relevant data, methods should be investigated for increasing the accuracy of orbit knowledge. These methods could include international cooperation, combining and validating data from different sources, including existing and new sensor capabilities and distribution.

(ii) Perform conjunction assessment during all phases of flight

During all phases of flight, conjunction assessment with other space objects should be performed. If the spacecraft operator is unable to perform conjunction assessment, the spacecraft operator should provide relevant orbital information to an appropriate conjunction assessment entity to perform the analysis necessary to verify that the planned trajectory does not indicate a potential collision.

2b. Pre-launch and manoeuvre notifications (supporting on-orbit collision avoidance for functional space objects)

(i) Provide pre-launch notifications

No guideline proposed.

(ii) *Perform conjunction assessment prior to changes in trajectory*

In planning intentional changes of spacecraft trajectories during all phases of flight, conjunction assessment with other space objects should be performed. If conjunction assessment indicates a potential collision, adjustment of the trajectory should be considered to minimize the collision risk and coordinated as appropriate. If the spacecraft operator is unable to perform conjunction assessments, the spacecraft operator should provide relevant orbital information to an appropriate conjunction assessment organization to perform the analysis necessary to verify that the planned trajectory does not indicate a potential collision.

2c. Common standards, practices and guidelines

No guideline proposed.

3. Tools to Support Collaborative Space Situational Awareness**3a. Directories of spacecraft operators, space operations and space situational awareness organizations, and contact information**

Provide other States with contact information for spacecraft operations and conjunction assessment entities

States should exchange contact information about appropriate entities performing spacecraft operations and space situational awareness. Direct contact between spacecraft operations and conjunction assessment entities can enable timely coordination to reduce the probability of, and facilitate effective responses to orbital collisions, orbital break-ups, or other events which might increase the probability of accidental collision.

3b. Collection, sharing and dissemination of orbital data on functional and non-functional space objects

Use standard formats when sharing orbital information on space objects.

When sharing orbital information on space objects, operators and other appropriate entities should use common, internationally recognized standard formats to enable collaboration and information exchange. Facilitating greater shared knowledge of the current and predicted location of space objects would enable timely prediction and prevention of potential collisions.

3c. Storage and exchange of descriptive information on the operational status and characteristics of functional and non-functional space objects, as they pertain to the long-term sustainability of space activities

Provide registration information to assist in the identification of space objects

Provide registration information on space objects in accordance with the Convention on Registration of Objects Launched into Outer Space and consider furnishing enhanced registration information on any change of status in operations as recommended in General Assembly Resolution 62/101 (Recommendations on enhancing the practice of States and international intergovernmental organizations in registering space object). States should provide this registration information as soon as practicable to the Secretary-General of the United Nations to assist in the

identification of space objects and to contribute to the peaceful exploration and use of outer space.

3d. Information-sharing procedures, ensuring information consistency and information transfer reliability

No guideline proposed.

IV. Expert Group C: Space weather

Guideline 1: Space actors, and member states and their national and international agencies, should support and promote the collection, sharing, inter-calibration and dissemination of critical space weather data.

Related Best Practices:

1.1 Member States and their national and international agencies should engage experts in identifying critical data sets needed for space weather services and research.

1.2 Member States and their national and international agencies should adopt policies for the free and unrestricted sharing of critical space weather data from their space and ground based assets. [6(b)]

1.3 All space actors and government, civilian and commercial space weather data owners are urged to allow the free and unrestricted access to and archival of such data for mutual benefit. [7]

1.4 Member States and their national and international agencies should share real-time and near-real-time critical space weather data and products.

1.5 Member States and their national and international agencies should:

- (i) Cross- and inter-calibrate critical space weather data and data products;
- (ii) Openly share critical space weather data and data products in a common format;
- (iii) Adopt common access protocols for their critical space weather data and data products;
- (iv) Promote the interoperability of space weather data portals promoting ease of data access by users and researchers.

1.6 Member States and their national and international agencies should undertake a coordinated approach to identify measurement gaps in order to meet critical space weather needs.

1.7 Member States and their national and international agencies should undertake a coordinated approach to fill key measurement gaps in order to meet critical space weather needs.

1.8 Space actors including Member States and their national and international agencies are urged, to fly small and low power integrated payload for space weather science and monitoring whenever and wherever possible (e.g., radiation monitors on Earth-orbiting satellite missions).

Guideline 2: Member States and their national and international agencies should support and promote further coordinated development of advanced space weather models and forecast tools in support of identified user needs.

Related Best Practices:

2.1 Member States and their national and international agencies should engage experts in a coordinated approach to document space weather research and operational models as well as forecasting tools currently in use, and assess them in relation to space weather science, service and user needs.

2.2 Member States and their national and international agencies should undertake a coordinated approach to identify gaps in models and forecasting tools needed to meet space weather needs.

2.3 Member States and their national and international agencies should undertake a coordinated approach to fill gaps in models and forecasting tools needed to meet space weather needs. Where necessary this should include coordinated efforts to support and promote research and development to further advance space weather models and forecast tools.

Guideline 3: Member States and their national and international agencies should support and promote the sharing and dissemination of space weather model outputs and forecasts.

Related Best Practices:

3.1 Member States and their national and international agencies should identify high priority needs for space weather models, space weather model outputs, and space weather forecasts.

3.2 Member States and their national and international agencies should adopt policies for the free and unrestricted sharing of high priority space weather model outputs and forecasts. [6(b)]

3.3 All space actors and government, civilian and commercial space weather model and forecast providers are urged to allow the free and unrestricted access to and archival of space weather model outputs and forecasts for mutual benefit. [7]

3.4 Member States and their national and international agencies should undertake to make available and share real-time and near-real-time space weather models outputs and forecasts to the extent possible, and as soon as is practical.

3.5 Member States and their national and international agencies should:

(i) Undertake comparisons of space weather model and forecast outputs with a goal of assessing their metrics and comparative performance towards the goal of improved model and forecast accuracy;

(ii) Openly share and disseminate historical and future critical space weather model outputs and forecast products in a common format;

(iii) Adopt common access protocols for their space weather model outputs and forecast products to the extent possible, to promote their ease of use by users and researchers including through interoperability of space weather portals.

[Guideline 4: Member States and their national and international agencies should support and promote the collection, sharing, dissemination and access to information relating to best practices for mitigating the effects of space weather on ground- and space-based systems and related risk assessments.

Related Best Practices:

4.1 Member States and their national and international agencies are urged to:

- (i) Submit, to a common archive, documentation outlining best design practices, guidelines, and lessons learned relating to the mitigation of the effects of space weather on operational systems;
- (ii) Submit, to a common archive, documentation and reports relating to space weather user needs, measurement requirements, gap analyses, cost-benefit analyses, and related space weather assessments.

4.2 Member States and their national and international agencies should provide support to enable their national agencies, satellite operators, and space weather service providers to work towards the development of international standards and best practices applicable for the mitigation of space weather effects on satellite design.

4.3 Member States and their national and international agencies should support and promote co-operation and coordination on ground-based and space-based space weather observations, forecast modelling, satellite anomaly and space weather effects reporting, in order to safeguard space activities.

This could be done in collaboration with ISES and WMO.

4.4 Member States and their national and international agencies should:

- (i) Incorporate current, now-cast and fore-cast space weather thresholds into space launch commit criteria;
- (ii) Provide support to enable their satellite operators to work together with space weather service providers to identify the information that would be most useful to mitigate anomalies and to derive recommended specific guidelines for best practices for on-orbit operation. For example, if the radiation environment is hazardous, this might include actions to delay the uploading of software, action manoeuvres, etc.;
- (iii) Ensure that satellite designs include the capability to recover from a debilitating space weather effect, such as including a safe mode;
- (iv) Ensure satellite designs for end of life disposal include due regard for space weather effects in order to ensure that the spacecraft either reach their intended graveyard orbit or de-orbit appropriately, in accordance with Inter Agency Space Debris Coordination Committee (IADC) guidelines. This should include appropriate margin analysis.

4.5 Member States and their national and international agencies should:

- (i) Encourage the collection, collation and sharing of information relating to ground- and space-based space weather related system anomalies, including spacecraft anomalies;

(ii) Use a common format for reporting the information. In relation to the reporting of spacecraft anomalies, the CGMS template provides an excellent candidate approach;

(iii) Encourage policies promoting the sharing of satellite anomaly data such that the satellite anomaly archive is available to all Member States.

4.6 Member States should undertake an assessment of the risk and socio-economic impacts of the adverse space weather effects on the technological systems in their respective countries. The results from such studies should be published and made available to all Member States.]

Guideline 5: Member States and their national and international agencies should promote the education, training and capacity building required for a sustainable global space weather capability.

Candidate Recommendations for Consideration by the Scientific and Technical Subcommittee

Candidate Recommendation 1: Member States and their agencies should work through the United Nations Committee on the Peaceful Uses of Outer Space and related international organizations to develop a basis for the coordination of ground and space based research and operational infrastructure to ensure the long-term continuity of critical space weather observations.

Related Practices:

Member States should work through the Space Weather agenda item for the Scientific and Technical Subcommittee in order to provide a mechanism for the coordination of ground and space based infrastructure to ensure the long term continuity of critical space weather observations.

The Scientific and Technical Subcommittee should instigate a process to evaluate the impact and review the progress of the coordination of ground and space based infrastructure to ensure the long-term continuity of critical space weather observations. Reviews should be completed at least every 5 years.

Candidate Recommendation 2: Member States and their national and international agencies should investigate the coordination of space weather information, including observations, analyses and forecasts, to support decision making and risk mitigation related to the operation of satellites, spacecraft, and sub-orbital vehicles including rockets and vehicles serving manned spaceflight including for space tourism.

V. Expert Group D: Regulatory regimes and guidance for actors in the space arena

Draft guideline 1:

States are encouraged to promote and facilitate international cooperation in the peaceful uses of outer space as a means of enhancing the long-term sustainability of outer space activities.

Draft guideline 2:

Space actors are encouraged to share experience and expertise relating to the long-term sustainability of outer space activities.

Draft guideline 3:

States and international organizations are encouraged to develop and adopt procedures to facilitate the compilation and effective dissemination of information that will enhance the long-term sustainability of space activities, among the relevant national and international space actors.

Draft guideline 4:

In view of the increasing number and diversity of potential space actors, appropriately targeted outreach and education on regulations and technical best practices relevant to long-term sustainability should be conducted. States are encouraged to foster such activities by or with industry, academia, regulators and other relevant organisations.

Draft guideline 5:

The activities of non-governmental entities that will enhance the long-term sustainability of outer space activities, such as engaging stakeholders, developing consensus standards and common practices, and increasing international cooperation, should be encouraged and promoted.

Draft guideline 6:

States should consider the long-term sustainability of outer space activities when adopting or implementing their national regulatory frameworks.

Draft Guideline 7:

In their national regulatory frameworks, States should take measures to address space debris mitigation practices and procedures and are invited to implement the Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space in their regulation of space activities.

Draft Guideline 8: National communication among regulators and experts

States should communicate within and among their competent authorities to facilitate efficient and effective measures for the long-term sustainability of space activities.

Draft Guideline 9: Input from national stakeholders

In the development of the national regulatory frameworks governing space activities, States should allow and encourage advisory input from affected national stakeholders.

Draft guideline 10:

In developing regulatory measures applicable to the long-term sustainability of outer space activities, States are encouraged to weigh the costs, benefits,

disadvantages and risks of a range of alternatives. They are also encouraged to consider the potential benefits of using existing international technical standards.

Draft guideline 11:

States are encouraged to adopt regulatory frameworks suitable for their space activities that provide clear guidance to actors under their jurisdiction and control.

Draft Guideline 12:

In their national regulatory frameworks, States should address risks for people, property, public health and the environment associated with the launch, in orbit operation and earth entry of space objects. *[to be discussed with EG B on the issues of (1) overlap (2) relevance to LTS]*
