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**Proposal by the Chair of the Working Group on the
Long-term Sustainability of Outer Space Activities for the
consolidation of the set of draft guidelines on the long-term
sustainability of outer space activities**

This conference room paper contains a proposal for the consolidation of the set of draft guidelines on the long-term sustainability of outer space activities, prepared in accordance with the agreement reached by the Working on the Long-term Sustainability of Outer Space Activities at the fifty-first session of the Scientific and Technical Subcommittee. The draft guidelines were taken from the Working Paper by the Chair of the Working Group, titled “Proposal for a draft report and a preliminary set of draft guidelines of the Working Group on the Long-Term Sustainability of Outer Space Activities”, contained in document A/AC.105/C.1/L.339, and based on the proposals put forward by the four expert groups established under the Working Group.

The paper is structured as follows: Each draft consolidated guideline is placed inside a text box. At the top of the text box, a descriptive heading in bold text indicates the general content of the consolidated guideline and which of the original draft guidelines are consolidated inside the text box. The numbering of the draft guidelines is the same as in document A/AC.105/C.1/L.339. Each proposed consolidated guideline is followed by full text of the respective original draft guidelines, as contained in document A/AC.105/C.1/L.339.

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Sharing of experience and information related to the long-term sustainability of outer space activities (Guideline 1+2)

States and international intergovernmental organizations are encouraged to share experience and expertise relating to the long-term sustainability of outer space activities and to develop and adopt procedures to facilitate the compilation and effective dissemination of information that will enhance the long-term sustainability of space activities.

The experience and expertise acquired by those engaged in space activities are instrumental in the development of effective measures to enhance the long-term sustainability of outer space activities. States and international intergovernmental organizations are therefore encouraged to share relevant experience and expertise in order to facilitate and enhance the development of guidelines, rules, regulations and best practices to enhance the long-term sustainability of space activities. New participants and those with very little experience in space activities will benefit from the experience and expertise of other space actors, and established actors will also find value in developing new partnerships and sharing experiences more widely.

In developing their procedures for sharing information to enhance the long-term sustainability of space activities, States and international intergovernmental organizations are encouraged to adopt procedures that permit sharing information with private sector entities and other non-governmental entities, in addition to sharing information between States, national regulatory authorities, government agencies, and international intergovernmental organizations. In further developing their information sharing procedures, States and international intergovernmental organizations could take note of effective data-sharing mechanisms applied by private sector entities. Ratification of and compliance with the Convention on Registration of Objects Launched into Outer Space should be encouraged as a starting point in the compilation and exchange of information among States and international intergovernmental organizations.

Guideline 1

Share experience and expertise relating to the long-term sustainability of outer space activities (D.2)

The experience and expertise acquired by those engaged in space activities are instrumental to the development of effective measures to enhance the long-term sustainability of outer space. Sharing such experience and expertise with others will facilitate and enhance the development of guidelines, rules, regulations and best practices in this area. The exchange need not be limited to State-to-State level, but can occur between national regulatory authorities, government agencies, [international] intergovernmental organizations and non-governmental entities. New participants and those with very little experience in space exploration will benefit from the experience and expertise of other space actors, and established actors will also find value in developing new partnerships and sharing experiences more widely.

Guideline 2**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 space actors (D.3)**

In many cases where States and international organizations are willing to share information, the procedures to enable information to be shared are non-existent or slow, or lead to incompatible data. The information should be shared as widely as necessary to enhance the long-term sustainability of outer space activities, which means adopting procedures that permit sharing with private sector entities and national non-governmental organizations, in addition to sharing between States and international organizations. In some cases, private sector entities already have effective data-sharing mechanisms that States and other organizations might adopt. Ratification of and compliance with the Convention on Registration of Objects Launched into Outer Space should be encouraged as a starting point in the compilation and exchange of information.

Research and development to support sustainable exploration and use of outer space (Guideline 3+5)
<p>States and international intergovernmental organizations should promote and support research and development of sustainable space technologies, processes and services, and other initiatives for the sustainable use of outer space, including celestial bodies.</p> <p>In their conduct of space activities for the peaceful exploration and use of outer space, including celestial bodies, States and international intergovernmental organizations should take into account, with reference to the outcome document of the United Nations Conference on Sustainable Development (A/RES/66/288), the social, economic and environmental dimensions of sustainable development on Earth.</p> <p>States and international intergovernmental organizations should promote the development of technologies that minimize the environmental impact of manufacturing and launching space assets, and that maximize the use of renewable resources and the reusability or repurposing of space assets to enhance the long-term sustainability of those activities.</p> <p>States should consider appropriate safety measures to protect the Earth and the space environment from harmful contamination, taking advantage of existing measures, such as best practices and guidelines that may apply to those activities, and developing new measures as appropriate.</p>

Guideline 3**Promote the development of studies and other initiatives for the sustainable use of outer space, including celestial bodies (A.6)**

In the peaceful use and exploration of outer space, including celestial bodies, States should take into account, with reference to the outcome document of the

United Nations Conference on Sustainable Development, the three dimensions of sustainable development on Earth: social, economic and environmental.

States should consider adequate safety measures to protect the Earth and the space environment from harmful contamination, taking advantage of existing measures, such as best practices and guidelines that may apply to those activities, and developing new measures as appropriate.

Guideline 5

Promote and support research into and the development of sustainable space technologies, processes and services (A.7)

States and international organizations need to encourage the promotion of the development of technologies that minimize the environmental impact of manufacturing and launching space assets to enhance the long-term sustainability of those activities.

States and international organizations need to promote the development of technologies that maximize the reusability or repurposing of space assets.

States and international organizations could promote the development of space assets that maximize the use of renewable resources.

Spectrum protection (Guideline 4)

States and international intergovernmental organizations should ensure that all space activities under their jurisdiction or control are carried out in accordance with the Constitution, Convention and Radio Regulations of the International Telecommunication Union, in order to enhance the long-term sustainability of space activities and in support of sustainable development on Earth.

The radio-frequency spectrum is a limited natural resource that should be used rationally, efficiently and economically so that countries or groups of countries may have equitable access to radio frequencies for the conduct of their space activities, taking into account the special needs of developing countries and the geographical situation of particular countries. States and international intergovernmental organizations should ensure that their space activities are conducted in conformity with the Radio Regulations of the International Telecommunication Union, in order to avoid harmful interference with the space activities of other States and international intergovernmental organizations, and as one of the means to promote the long-term sustainability of outer space activities.

In their use of the electromagnetic spectrum, States and international intergovernmental organizations should consider the requirements for space-based Earth observation systems and other space-based systems and services in support of sustainable development on Earth, in accordance with the Radio Regulations and recommendations of the International Telecommunication Union.

Guideline 4

Promote, in accordance with the Radio Regulations and recommendations of the International Telecommunication Union, that Member States consider, in their use of the electromagnetic spectrum, the requirements of Earth observation systems and space-based services (A.1)

In their use of the electromagnetic spectrum, States should consider the requirements for space-based Earth observation systems and other space-based systems and services in support of sustainable development on Earth, in accordance with the International Telecommunication Union (ITU) Radio Regulations and recommendations.

Registration of space objects and contact information (Guideline 6+20)
<p>States and international intergovernmental organizations are encouraged to provide contact information for entities responsible for spacecraft operations and conjunction assessment and are further encouraged to provide registration information as soon as practicable to assist in the identification of space objects.</p> <p>States and international intergovernmental organizations are encouraged to exchange contact information for entities responsible for spacecraft operations and conjunction assessment and to establish appropriate procedures to enable timely coordination to reduce the probability of, and facilitate effective responses to, orbital collisions, orbital break-ups and other events that might increase the probability of accidental collisions.</p> <p>States and international intergovernmental organizations should provide registration information on space objects in accordance with the Convention on the Registration of Objects Launched into Outer Space and consider furnishing enhanced registration information, as recommended by the General Assembly in its resolution 62/101. States should provide registration information to the Secretary-General of the United Nations as soon as practicable to assist in the identification of space objects and to contribute to the peaceful exploration and use of outer space.</p>

Guideline 6

Provide registration information to assist in the identification of space objects (B.8)

States and international intergovernmental organizations should provide registration information on space objects in accordance with the Registration Convention and consider furnishing enhanced registration information, as recommended by the General Assembly in its resolution 62/101. States should provide that registration information to the Secretary-General of the United Nations as soon as practicable to assist in the identification of space objects and to contribute to the peaceful exploration and use of outer space.

Guideline 20**Provide appropriate contact information (B.6)**

States and international organizations are encouraged to exchange contact information for appropriate entities responsible for spacecraft operations and conjunction assessment.

States and international organizations are also encouraged to establish appropriate procedures to enable timely coordination to reduce the probability of, and facilitate effective responses to, orbital collisions, orbital break-ups and other events that might increase the probability of accidental collisions.

Awareness (Guideline 7+8+15)

States and international intergovernmental organizations are encouraged to raise general public awareness of the important societal benefits of space activities and of the consequent importance of enhancing the long-term sustainability of outer space activities. To this end, States and international intergovernmental organizations are encouraged to:

- (a) promote institutional and public awareness of space activities and their applications for sustainable development, disaster management and emergency response;**
- (b) conduct outreach, capacity-building and education on regulations and best practices relevant to the long-term sustainability of space activities;**
- (c) promote activities of non-governmental entities that will enhance the long-term sustainability of outer space activities.**

States and international intergovernmental organizations should promote public awareness of space applications for sustainable development, disaster management and emergency response through information sharing and joint efforts with public institutions, private sector entities and civil society, taking into account the needs of young people and future generations. In designing space education programmes, States, international intergovernmental organizations and non-governmental entities should pay special attention to courses on enhancing knowledge and practice of the utilization of space applications to support sustainable development. States and international intergovernmental organizations should initiate the voluntary collection of information on public awareness and education tools and programmes with a view to facilitating the development and implementation of similar initiatives with consistent messages.

States and international intergovernmental organizations are encouraged to foster outreach activities by or with industry, academia, and other relevant non-governmental entities. Outreach, capacity-building and educational initiatives could take the form of seminars (in person or broadcast over the Internet), published guidelines to complement national and international regulations, or an Internet site with basic information on a regulatory framework and/or a contact point within the Government for regulatory information. Appropriately targeted outreach and education can assist all space actors in gaining a better appreciation

and understanding of the nature of their obligations, in particular relating to implementation, which can lead to improved compliance with the existing regulatory framework and the best practices currently being employed to enhance the long-term sustainability of outer space activities. This is particularly valuable where the regulatory framework has been changed or updated, resulting in new obligations.

International cooperation between Governments and non-governmental and private sector entities should be encouraged and fostered. Non-governmental entities, including professional and industry associations and academic institutions, can play important roles in increasing international awareness of issues associated with space sustainability, as well as promoting practical measures to enhance space sustainability. Such measures could include adoption of the Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space, compliance with the Radio Regulations of the International Telecommunication Union related to space services and the development of open, transparent standards for the exchange of data necessary to avoid collisions, radio frequency interference or other harmful events. Non-governmental entities also play important roles in bringing stakeholders together to develop common approaches to certain aspects of space activities that can collectively enhance the long-term sustainability of space activities.

Guideline 7

Promote institutional and public awareness of space activities and applications for sustainable development on Earth, disaster risk reduction, early warning of potential disasters, disaster management and disaster relief (A.2)

States and international organizations should initiate the voluntary collection of information on public awareness and education tools and programmes aimed at disseminating information on the benefits of space for sustainable development and request the assistance of communications experts from States and the Office for Outer Space Affairs of the United Nations Secretariat to help in the preparation of a living repository of such information, with a view to facilitating the development and implementation of similar initiatives with consistent messages.

Space actors, including States and international organizations, should promote public awareness of space applications for sustainable development through a joint effort by public institutions, private sector entities and civil society, in particular taking into account the needs of young people and future generations.

In designing space education programmes, States and international organizations should pay special attention to courses on enhancing knowledge of and practice on the utilization of space applications to achieve sustainable development.

In accordance with the Principles Relating to Remote Sensing of the Earth from Outer Space (General Assembly resolution 41/65, annex) and in response to emergency situations that may affect fundamental social well-being, such as natural disasters and other major harmful incidents and catastrophes, States and international organizations should undertake efforts to make relevant space-based

information and data accessible to affected countries, applying the principles of neutrality, impartiality and non-discrimination.

Guideline 8

Encourage and promote 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 (D.5)

Non-governmental organizations and private sector entities conduct activities that have significant impacts, both directly and indirectly, on the long-term sustainability of space activities. Private commercial activities in space are a growing part of the global economy, and many entities have taken steps to implement technical measures in conformity with the Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space. Universities and other educational institutions have shown increasing interest in using small satellites for scientific and teaching purposes. Given the technical and cost constraints often associated with small-satellite missions, particular attention to the activities of non-governmental and private sector entities may be warranted to ensure that their activities do not become a significant source of long-lived orbital debris in the future.

Non-governmental organizations play important roles in bringing potential stakeholders together to develop consensus approaches to the conduct of space activities. For example, the International Organization for Standardization has adopted several standards on best practices and data-exchange formats for collision avoidance. States are encouraged to evaluate those standards and seek to use common standards, where practicable, for debris mitigation, orbit lifetime estimates, safe disposal of hardware, re-entry management and satellite characteristics and trajectories. This will, in turn, promote valuable contributions by non-governmental organizations in this field.

Non-governmental organizations, such as industry associations, academic institutions and educational public interest entities, can play important roles in increasing international awareness of issues associated with space sustainability, as well as practical measures to enhance sustainability. Such measures could include adoption of the Space Debris Mitigation Guidelines of the Committee, compliance with ITU Radio Regulations related to space services and the development of open, transparent standards for the exchange of data necessary to avoid collisions, radio frequency interference or other harmful events. To these ends, international cooperation between Governments and non-governmental organizations and private sector entities should be encouraged and fostered.

Guideline 15

Conduct appropriately targeted outreach, capacity-building and education on regulations and best practices relevant to long-term sustainability in view of the increasing number and diversity of existing and potential space actors (D.4)

Appropriately targeted outreach and education can assist all space actors in gaining a better appreciation and understanding of the nature of their obligations, which can lead to improved compliance with the existing regulatory framework and

the best practices currently being employed to enhance the long-term sustainability of outer space activities. While regulators should always strive for clarity when designing measures to enhance long-term sustainability, outreach and education can assist with any implementation issues that arise out of national regulatory frameworks. This is particularly valuable where the regulatory framework has been changed or updated, resulting in new obligations. States are encouraged to foster outreach activities by or with industry, academia, regulators and other relevant organizations.

States, including their regulators and agencies, can also benefit from the input of space actors when designing regulations and issuing guidelines to the space industry. Outreach programmes may provide a valuable, iterative feedback mechanism for regulators.

Outreach, capacity-building and educational initiatives could take the form of seminars (in person or broadcast over the Internet), published guidelines to complement national or regional laws and regulations, an Internet site with basic information on a regulatory framework or the availability of a contact person within the Government who can assist participants in finding crucial information.

The availability of resources to support such initiatives varies greatly among States; thus, fostering similar initiatives by industry, academia and international organizations is strongly encouraged, as those entities can contribute valuable input on regulatory matters and best practices.

Adoption of regulatory frameworks (Guideline 9+12)

States should adopt national regulatory frameworks for space activities that provide clear guidance to actors under their jurisdiction and control. When adopting or implementing national regulatory frameworks, States should consider the long-term sustainability of outer space activities.

With the globalization and generalization of space activities, in particular the emergence of new actors in non-governmental services and operations, States should adopt regulatory frameworks to ensure the effective application of international norms, considering the specificities of non-governmental entities, for which States bear international responsibility. States are encouraged to consider the application of relevant, generally accepted standards and best practices for the safe conduct of outer space activities.

When developing and adopting national regulatory frameworks, States are particularly encouraged to consider not only existing space projects and activities but also the potential development of their national space sector, and to envisage appropriate timely regulation in order to avoid legal lacunae. It is important for national regulation to address the specific nature and characteristics of the State's space sector, as well as its general economic framework, which provides the context in which the space sector may further expand.

States, in enacting new regulations, should bear in mind their obligations under article 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. Traditionally, national regulation has been concerned with issues such as safety, liability, reliability and cost. As new regulations are developed, States should consider regulations that enhance the long-term sustainability of outer space activities but at the same time, regulations should not be so prescriptive as to prevent initiatives aimed at improving the long-term sustainability of space activities.

Guideline 9

Adopt national regulatory frameworks suitable for space activities that provide clear guidance to actors under the jurisdiction and control of each State (D.10)

With the globalization and generalization of space activities, in particular the emergence of new actors in non-governmental services and operations, States should adopt regulatory frameworks to ensure the effective application of international norms, considering the specificities of non-governmental entities for which States bear international responsibility. States are encouraged to consider the application of relevant, generally accepted standards and best practices.

States are particularly encouraged to consider not only existing space projects and activities but also the potential development of their national space sector, and to envisage appropriate timely regulation in order to avoid legal lacunae. It is important that national regulation address the specific nature and characteristics of the State's space sector, as well as its general economic framework, which provides the context in which the space sector may further expand.

Guideline 12

When adopting or implementing national regulatory frameworks, consider the long-term sustainability of outer space activities (D.6)

Traditionally, national regulation has been concerned with issues such as safety, liability, reliability and cost. As new regulations are developed, States should consider regulations that enhance the long-term sustainability of outer space activities. There are three major aspects to such regulation. The first is that States, in enacting new regulations, should bear in mind their obligations under article 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. The second is ensuring that space actors under the jurisdiction of the regulator are encouraged to conduct their activities in a manner that preserves the long-term sustainability of space activities. The third is the encouragement of appropriate new methods for ensuring the long-term sustainability of space activities. Regulation should not be so prescriptive as to prevent initiatives aimed at improving the long-term sustainability of space activities.

Development of regulatory frameworks (Guideline 10+11+13)

In developing regulatory measures applicable to the long-term sustainability of outer space activities, States should

- (a) weigh the costs, benefits, disadvantages and risks of a range of alternatives;**
- (b) consider the potential benefits of using existing international technical standards and definitions;**
- (c) address risks to people, property, public health and the environment associated with the launch, in-orbit operation and re-entry of space objects;**
- (d) encourage advisory input from affected national stakeholders.**

In developing regulatory measures applicable to the long-term sustainability of outer space activities, States should ensure that such measures are implementable and practicable in terms of the technical, legal and management capacities of the State imposing the regulation, as a regulation should not require a technical innovation or exceed the current state of practice for the space activity being regulated. Regulations should also be efficient in terms of imposing the least cost for compliance (e.g. in terms of money, time or risk) when compared with feasible alternatives, and effective in that they have a clear intended purpose and accomplish their intended purpose. States should share regulations and experience resulting from their implementation with other States, and consider information available on other States' regulatory frameworks when creating their own regulatory frameworks.

When creating regulatory frameworks, States should also consider the potential benefits of using existing international technical standards and definitions, such as those published by the International Standards Organization (ISO), the Consultative Committee on Space Data Standards (CCSDS), and national standardization bodies. In addition, States should consider the utilization of recommended practices and voluntary guidelines proposed by the Inter-Agency Space Debris Coordination Committee (IADC) and the Committee on Space Research (COSPAR).

When creating regulatory frameworks, States should address risks to public health, safety, and potential harm to persons and property not directly taking part in space operations, taking into consideration the potential risks of space operations and the different liability regimes for harm occurring on the Earth versus in space. Reducing risks to public health and safety should be considered as part of national regulations applicable to the launch, in-orbit operations and atmospheric re-entry of space objects.

Due consideration should be given to international practices of space-faring States and the development of new practices as a result of new technologies and capabilities. Ways to manage risks to public health and safety can include: quality assurance and risk management techniques; methodologies to assess probabilities of harm to people and property from objects reaching the surface of the Earth

from space or as a result of launch attempts; probabilistic risk assessments, hazard analyses, and environmental impact studies that address the complete life-cycle of space missions; implementation of “Principles relevant to the use of nuclear power sources in outer space” for space operations using nuclear power; and measures for planetary protection.

States should encourage advisory input from affected national stakeholders during the process of developing regulatory frameworks governing space activities. The stakeholders may include private sector entities, universities, research organizations and non-governmental organizations operating under the jurisdiction of the State, agencies of the State or other bodies that play a role in space activities and that will be affected by the proposed regulatory initiative. By allowing early advisory input, the State can avoid unintended consequences of regulation that may have an adverse impact on key stakeholders, is more restrictive than needed, or conflicts with other legal obligations.

In developing or refining national regulatory frameworks, States should consider the need for appropriate transition periods and milestones for the implementation of measures to improve the long-term sustainability of space activities.

Guideline 10

Encourage advisory input from affected national stakeholders in the process of developing, refining and implementing national regulatory frameworks governing space activities (D.8)

States may find it beneficial and efficient to receive advisory input from affected national stakeholders during the process of developing regulatory frameworks governing space activities. The stakeholders may include private sector entities, universities, research organizations, non-governmental organizations operating under the jurisdiction of the State, agencies of the State or other bodies that play a role in space activities and that will be affected by the proposed regulatory initiative.

For a State with advanced space capabilities, stakeholders are likely to have a practical understanding of how a regulatory framework affects or will affect the operations or administration of the space activities. By allowing early advisory input, the State can avoid unintended consequences of regulation that have an adverse impact on key stakeholders. Those stakeholders might also be aware of conflicting obligations by law or agreement. Identifying such conflicts early can avoid jurisdictional disputes after the regulatory framework is adopted.

States with developing space capabilities should identify the essential components of a national regulatory framework after advisory input from, or consultation with, relevant stakeholders. Without such input, the State might regulate its stakeholders too heavily by writing a regulatory framework that is more restrictive than is needed. In instances in which the State has not previously attempted to legally control or regulate space activities, the State may wish to consider other States’ space legislation or, by analogy, other national laws, as a guide to drafting. Without experience, however, the State might inadvertently write

laws that are not applicable or not technically accurate for the particular space activities or space actors under its control.

In developing or refining national regulatory frameworks, all States should consider the need for appropriate transition periods and milestones for the implementation of measures to improve the long-term sustainability of space activities.

Guideline 11

Address risks to people, property, public health and the environment associated with the launch, in orbit operation and re-entry of those space objects in the development of national regulatory frameworks and international standards.

(D.11)

Taking into consideration the potential risks of space operations and the different liability regimes for harm occurring on the Earth versus in space, States should address risks to public health, safety, and potential harm to persons and property not directly taking part in space operations. Reducing risks to public health and safety should be considered as part of national regulations applicable to the launch, Earth entry of space objects, and in-orbit operations.

Due consideration should be given to international practices of spacefaring States and the development of new practices as a result of new technologies and capabilities. Ways to manage risks to public health and safety can include:

- (a) Quality assurance and risk management techniques;
- (b) Methodologies to assess probabilities of harm to people and property from objects reaching the surface of the Earth from space or as a result of launch attempts;
- (c) Probabilistic risk assessments, hazard analyses, and environmental impact studies that address the complete life-cycle of space missions;
- (d) Implementation of “Principles relevant to the use of nuclear power sources in outer space” for space operations using nuclear power;
- (e) Measures for planetary protection.

For purposes of developing and implementing relevant national regulations, States are encouraged to consider standards published by the International Standards Organization (ISO), the Consultative Committee on Space Data Standards (CCSDS), and national standardization bodies. In addition, States should consider the utilization of recommended practices by the Inter-Agency Space Debris Coordination Committee (IADC) and the Committee on Space Research (COSPAR). As State and non-State space actors gain experience in space operations, updated standards, recommended practices, voluntary guidelines, and national regulatory measures may be needed to address risks to public health and safety.

Guideline 13

Weigh the costs, benefits, disadvantages and risks of a range of alternatives in developing regulatory measures applicable to the long-term sustainability of outer

space activities and consider the potential benefits of using existing international technical standards and definitions (D.9)

States should create and implement their own regulations, applicable to those persons subject to their jurisdiction or control as appropriate, and share such regulations and resulting experience with other States as models for consideration.

Regulations should be practicable, in that they should be capable of actually being implemented in terms of the technical, legal and management capacities of the State imposing the regulation. A closely related concept is that of technical feasibility, in that a regulation should not require a technical innovation or exceed the current state of practice for the space activity.

The effect of regulations should be predictable. The groups to which the regulation applies should know the effects of the regulation on their activities in advance of conducting those activities, as far as possible. A reporting regime to gather information on how the regulations are being applied in practice should be considered.

Regulations should be both efficient and effective. Effective regulations are those that accomplish their intended purpose. An important component of effective regulation is to ensure that the regulation has a clear intended purpose. At the same time, regulations need to be efficient in terms of imposing the least cost for compliance (e.g. in terms of money, time or risk) when compared with feasible alternatives. Compliance costs fall upon the regulator and the entity being regulated in both immediate and long-term effects. A best practice for controlling compliance costs is to ensure that regulations are performance-based and responsive to technical innovation. Their requiring a particular technical approach or proprietary solution that constrains future innovation should be avoided.

Implementation of regulatory frameworks, principles and guidelines relevant to the long-term sustainability of outer space activities (Guideline 14+22)

States and international intergovernmental organizations are encouraged to implement space debris mitigation measures and to communicate within and among competent authorities to facilitate efficient and effective measures for enhancing the long-term sustainability of space activities.

In accordance with the Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space, States and international intergovernmental organizations should address, establish and implement space debris mitigation measures through applicable mechanisms.

States are also encouraged to ensure that appropriate communication and consultation mechanisms are in place within and among the competent bodies that oversee or conduct space activities. Communication within and among relevant regulatory bodies can promote regulations that are consistent, predictable and transparent so as to ensure that regulatory outcomes are as intended.

Guideline 14**Communicate within and among competent authorities to facilitate efficient and effective measures for the long-term sustainability of space activities (D.7)**

States are encouraged to ensure that appropriate communication and consultation mechanisms are in place within and among the competent bodies that oversee or conduct space activities. This is because the regulation of space activities draws on many disciplines, such as economics, law, public policy and the social sciences, in addition to physical science and engineering, and no single entity can be expected to cover all disciplines. For example, licences imposing conditions on space operations may involve many distinct activities, such as launches, on-orbit operations, radio frequency usage, remote sensing activities and end-of-life disposal of space objects in orbit. Communication within and among relevant regulatory bodies can promote regulations that are consistent, predictable and transparent so as to ensure that regulatory outcomes are as intended.

Guideline 22**Implement space debris mitigation measures (B.2)**

In accordance with the Space Debris Mitigation Guidelines of the Committee, States and intergovernmental organizations should address, establish and implement space debris mitigation measures through applicable mechanisms.

International cooperation in support of the long-term sustainability of outer space activities (Guideline 16+18)

<p>States and international intergovernmental organizations should promote and facilitate international cooperation in the peaceful uses of outer space, conducted on a mutually acceptable basis without infringing intellectual property rights and in accordance with non-proliferation norms and principles, as a means of enhancing the long-term sustainability of outer space activities.</p>

<p>All States, particularly those with relevant space capabilities and with programmes for the exploration and use of outer space, should contribute to promoting and fostering international cooperation on the long-term sustainability of space activities on a mutually acceptable basis. In this context, particular attention should be given to the benefits for and interests of developing countries and countries with incipient space programmes. States are free to determine all aspects of participation in the exploration and use of outer space on a mutually acceptable basis. The terms of such cooperative activities, for example through contracts and other legally binding mechanisms, should be fair and reasonable.</p>

<p>States undertaking, authorizing or intending to undertake or authorize international space activities involving the use of controlled items (objects, materials, manufactured items, equipment and other products) that are based on technologies whose unauthorized disclosure and onward transfer are prohibited and thus warrant appropriate levels of control should ensure that such activities are conducted in accordance with multilateral commitments, non-proliferation</p>
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norms and principles and international law, and respect intellectual property rights, irrespective of whether such activities are carried out by governmental or non-governmental entities or through international intergovernmental organizations to which such States belong. Space activities should be in accordance with responsible standards and practices, such as subscription to and implementation of the Hague Code of Conduct against Ballistic Missile Proliferation.

States concerned should establish appropriate legal and administrative regulations relating to cooperation in cases where such controlled items are exported or imported, and seek to forge collaborative relationships based on mutual benefits and equal advantages with regard to safeguarding controlled items. States are encouraged to ensure, by means of agreements or other arrangements which are properly institutionalized under national legislation, the safety and security of imported controlled items while they are in the territory of the importing State. In particular, States should enter into consultations to reach agreement in relation to:

- (a) Post-sale monitoring and verification to ascertain that controlled items are not at risk of unauthorized use or onwards transfer;
- (b) Strengthening end-use certification and authentication procedures at the State level;
- (c) Providing legal supervision of contracts and contract-based activities in order to effectively facilitate the proper application of agreed measures on end use and to prevent any circumstances in which exported controlled items, when located in the territory of the importing State, could become the subject of disputed jurisdiction or be used for illicit purposes; and
- (d) Ensuring that the relevant State bodies have the power and capacity to monitor the end use of controlled items and to take appropriate measures where there is a presumption of non-compliance with non-proliferation norms and principles regarding end use.

Guideline 16

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. (D.1)

Guideline 16 applies to all modes of cooperation, including governmental and non-governmental; commercial and scientific; global, multilateral, regional or bilateral; and among countries at all levels of development. All States, particularly those with relevant space capabilities and with programmes for the exploration and use of outer space, should contribute to promoting and fostering international cooperation in the long-term sustainability of space activities on a mutually acceptable basis. In this context, particular attention should be given to the benefit for and interest of developing countries and countries with incipient space programmes stemming from such international cooperation conducted with countries with more advanced space capabilities. States are free to determine all aspects of participation in the exploration and use of outer space on a mutually

acceptable basis. The terms in such cooperative ventures, for example through contracts and other legally binding mechanisms, should be fair and reasonable.

Guideline 18

Promote international cooperation on a mutually acceptable basis, to support the growing interest of many countries in establishing national capacities for outer space activities through capacity-building and transfer of technology, without infringing intellectual property rights, and in accordance with non-proliferation norms and principles, taking into account the requirement of long-term sustainability of those activities (A.4)

States and international organizations should consider promoting international technical cooperation to enhance the long-term sustainability of outer space activities and support sustainable development on Earth.

States and international organizations should support current initiatives and consider 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 legislation, multilateral commitments, non-proliferation norms and international law.

States and international organizations should promote technology safeguard arrangements that may facilitate space capacity-building, while respecting intellectual property rights, and in accordance with non-proliferation norms and principles, as well as the requirements for long-term sustainability.

States undertaking, authorizing or intending to undertake or authorize international space activities involving the use of goods (objects, materials, manufactured items, equipment and other products) that are based on technologies whose unauthorized disclosure and onward transfer are prohibited and thus warrant appropriate levels of protection should ensure that such activities are conducted in accordance with non-proliferation principles and the norms of international law, irrespective of whether such activities are carried out by governmental or non-governmental entities or through international organizations to which such States belong. Space activities should be in accordance with responsible standards and practices, such as subscription to and implementation of the Hague Code of Conduct against Ballistic Missile Proliferation.

States concerned should provide opportunities to establish stronger legal and administrative regulation relating to such cooperation in cases where it would be particularly appropriate or even essential in view of the nature of the controlled goods that are exported or imported. States should seek to forge collaborative relationships based on mutual benefits and equal advantages with regard to the consideration and resolution of issues relating to the coordination of procedures for safeguarding controlled products. To maximize the potential benefits of this practice, States are also encouraged to provide, by means of agreements or other arrangements, for the implementation of measures, institutionalized appropriately under their national legislation, to ensure the safety and security of imported controlled goods while they are in the territory of the importing State. In particular, States, acting in accordance with the relevant legislation and on a mutually accepted basis, should enter into consultations to reach agreement in relation to:

- (a) Post-sale monitoring and verification to ascertain that controlled items are not at risk of unauthorized use or onward transfer;
- (b) Strengthening end-use certification and authentication procedures at the State level;
- (c) Providing legal supervision of contracts and contract-based activities in order to effectively facilitate the proper application of agreed measures on end use and to prevent any circumstances in which exported protected goods, when located in the territory of the importing State, could become the subject of disputed jurisdiction or be used for illegal purposes;
- (d) Ensuring that the relevant State bodies have the power and capacity to monitor the end use of controlled items and to take immediate measures (including the issuance of the relevant orders) where there is a presumption of non-compliance with the arrangements on end use.

Capacity-building (Guideline 17+19+31)

States and international intergovernmental organizations are encouraged to support and promote capacity-building in scientific, technical and legal capabilities and improved data accessibility as means to promote the long-term sustainability of outer space activities.

States and international intergovernmental organizations should support current capacity-building initiatives and promote new forms of regional and international cooperation and capacity-building that are in accordance with national and international law to assist countries in gathering human and financial resources and achieving efficient technical capabilities, standards, regulatory frameworks and governance approaches that support the long-term sustainability of outer space activities and sustainable development on Earth.

Capacity-building activities include education, training and sharing of appropriate experience, information, data and tools. States and international intergovernmental organizations are encouraged to coordinate their efforts in space-related capacity-building and data accessibility in order to ensure efficiency in the use of available resources and, to the extent that it is reasonable and relevant, avoid unnecessary duplication of functions and efforts, taking into account the needs and interests of developing countries.

States and international intergovernmental organizations should also undertake efforts to make relevant space-based information and data accessible to countries affected by natural disasters or other catastrophes, applying the principles of neutrality, impartiality and non-discrimination, and to support capacity-building activities aimed at enabling the receiving countries to make optimal use of such data and information.

Guideline 17**Support and promote international cooperation for capacity-building and data accessibility, on a mutually acceptable basis, through the sharing of data, derived information and associated tools taking into account the needs and interests of developing countries (A.3)**

States and international organizations should coordinate international cooperation efforts in space-related capacity-building and data accessibility in order to ensure efficiency in the use of available resources and, to the extent it is reasonable and relevant, avoid unnecessary duplication of functions and efforts, taking into account the needs and interests of developing countries.

States and international organizations should promote and support regional and international cooperation to assist countries in assembling human, technical and financial resources and to achieve efficient space-related capacities, enhancing the long-term sustainability of outer space activities and supporting sustainable development on Earth.

States and international organizations should explore new forms of regional and international collaboration, without prejudice to ongoing international collaboration initiatives, to assist countries in implementing 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 developing countries.

Guideline 19**Promote international cooperation to assist countries in gathering human resources and achieving technical and legal capabilities and standards compatible with the relevant regulatory frameworks, especially countries that are beginning to develop their capacities in outer space applications and activities (A.5)**

States and international organizations should support current initiatives and promote new forms of regional and international cooperation to assist countries in gathering human and financial resources and achieving efficient technical capabilities and standards for outer space activities, compatible with long-term sustainability and relevant regulatory frameworks, and to assist emerging space countries in implementing national space regulations, taking into account the need for the long-term sustainability of space activities.

Guideline 31**Promote the education, training and capacity-building required for a sustainable global space weather capability (C.5)**

Given that WMO already has extensive training programmes on terrestrial weather, expanding this activity to also include space weather training would be valuable, since it would leverage the existing infrastructure and capabilities.

States and international organizations should encourage space weather training in space weather workshops. Examples of training opportunities include the annual Space Weather Workshop in the United States of America, organized by the

United States National Oceanic and Atmospheric Administration, the European Space Weather Week, the Asia-Oceania Space Weather Alliance workshops, the International Space Weather Initiative schools and the United Nations-affiliated regional centres on space science and technology education.

Promote space debris monitoring and sharing of information (Guideline 21)

Promote the collection, sharing and dissemination of space debris monitoring information

States and international intergovernmental organizations should encourage the development and use of relevant technologies for the measurement, monitoring and characterization of the orbital and physical properties of space debris and should promote the sharing and dissemination of derived data products and methodologies for their use.

Guideline 21

Promote the collection, sharing and dissemination of space debris monitoring information (B.1)

States and international organizations should encourage the development and use of relevant technologies for the measurement, monitoring and characterization of the orbital and physical properties of space debris and should promote the sharing and dissemination of derived data products and methodologies for their use.

Data on space objects (Guideline 24+26)

States and international intergovernmental organizations should promote the development and use of techniques to improve the accuracy of orbital data for the safety of on-orbit operations and the use of common, internationally recognized standards when sharing orbital information on space objects.

Recognizing that the safety of space operations depends strongly upon the accuracy of orbital and other relevant data, States and international intergovernmental organizations are encouraged to promote the investigation of methods to improve knowledge regarding orbits [and attitudes] of space objects. Those methods could include international cooperation and combining and validating data from different sources, including existing and new sensor capabilities and distribution mechanisms, as well as passive and active on-orbit tracking aids.

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

Guideline 24 *[still under discussion]***[Promote techniques to improve the accuracy of orbital data for the safety of on-orbit operations] (B.4)**

[Recognizing that [the safety of] space operations depend[s] strongly upon the accuracy of orbital and other relevant data, States are encouraged to promote the investigation of methods to improve knowledge regarding orbits [and attitudes] of space objects. Those methods could include international cooperation and combining and validating data from different sources, including existing and new sensor capabilities and distribution mechanisms, as well as passive and active on-orbit tracking aids.]

Guideline 26**Promote use of standards when sharing orbital information on space objects (B.7)**

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

Risk assessment relating to space objects (Guideline 23+25)

States and international intergovernmental organizations should encourage entities under their jurisdiction or control that conduct space activities to perform conjunction assessment during orbital phases of controlled flight and to limit the risk to people and property from controlled re-entries.

Conjunction assessment with other space objects should be performed for all spacecraft capable of adjusting trajectories during orbital phases of controlled flight for current and planned spacecraft trajectories. If spacecraft operators, including those of the private sector, are unable to perform conjunction assessments, they are encouraged to obtain support from any appropriate around-the-clock operational conjunction assessment entities.

Appropriate steps of the conjunction assessment process include improving the orbit determination of relevant space objects, screening current and planned trajectories of relevant space objects for potential collisions and determining whether an adjustment of trajectory is required to reduce the risk of collision, in coordination with other operators and/or organizations responsible for conjunction assessment, as appropriate.

States and international intergovernmental organizations are encouraged to cooperate with all spacecraft operators to develop and implement common approaches to conjunction assessment.

In cases of controlled re-entries of spacecraft or launch vehicle orbital and/or suborbital stages, States and international intergovernmental organizations should consider furnishing notices to aviators and mariners using already established procedures [and as appropriate, inform the public and other States].

Guideline 23

Limit the risk to people and property from controlled re-entries (B.3)

In cases of controlled re-entries of spacecraft or launch vehicle orbital and/or suborbital stages, States and international organizations should consider furnishing notices to aviators and mariners using already established procedures [and as appropriate, inform the public and other States].

Guideline 25

Perform conjunction assessment during orbital phases of controlled flight (B.5)

Conjunction assessment with other space objects should be performed for all spacecraft capable of adjusting trajectories during orbital phases of controlled flight for current and planned spacecraft trajectories.

Appropriate steps of the conjunction assessment process include improving the orbit determination of relevant space objects, screening current and planned trajectories of relevant space objects for potential collisions and determining whether an adjustment of trajectory is required to reduce the risk of collision, in coordination with other operators and/or organizations responsible for conjunction assessment, as appropriate.

States and international organizations are encouraged to develop and implement common approaches on conjunction assessment.

Development of space weather models and tools (Guideline 28+30)

States and international intergovernmental organizations should support and promote the development of advanced space weather models and forecasting tools and the collection, sharing and dissemination of, and access to, information relating to best practices for mitigating the effects of space weather on terrestrial and space-based systems, as a means to promote the long-term sustainability of space activities.

States and international intergovernmental organizations should undertake a coordinated approach to identifying and filling gaps in research and operational models and forecasting tools required to meet the needs of the scientific community and of the providers and users of space weather information services. Where necessary, this should include coordinated efforts to support and promote research and development to further advance space weather models and forecasting tools, including within the context of the Committee on the Peaceful Uses of Outer Space and its Subcommittees, as well as in collaboration with other entities such as the World Meteorological Organization (WMO) and the International Space Environment Service (ISES).

States and international intergovernmental organizations should support and promote cooperation and coordination on ground- and space-based space weather observations, forecast modelling, satellite anomalies and reporting of space weather effects in order to safeguard space activities. Practical measures in this regard could include:

(a) Incorporating current, “nowcast” and forecast space weather thresholds into space launch criteria;

(b) Encouraging satellite operators to cooperate 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, implementation of manoeuvres, etc.;

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

(d) Encouraging the use of a common format for reporting space weather information. In relation to the reporting of spacecraft anomalies, satellite operators are encouraged to take note of the template proposed by the Coordination Group for Meteorological Satellites;

(e) Encouraging policies promoting the sharing of satellite anomaly data.

It is acknowledged that some data may be subject to legal restrictions and/or measures for the protection of proprietary or confidential information.

States and international intergovernmental organizations should work towards the development of international standards and best practices applicable for the mitigation of space weather effects in satellite design. This could include sharing of information on design practices, guidelines and lessons learned relating to mitigation of the effects of space weather on operational space systems, as well as documentation and reports relating to space weather user needs, measurement requirements, gap analyses, cost-benefit analyses and related space weather assessments.

States should encourage entities under their jurisdiction and/or control to:

(a) Incorporate in satellite designs the capability to recover from a debilitating space weather effect, such as by including a safe mode;

(b) Incorporate space weather effects into satellite designs and mission planning for end-of-life disposal in order to ensure that the spacecraft either reach their intended graveyard orbit or de-orbit appropriately, in accordance with the Space Debris Mitigation Guidelines of the Committee. This should include appropriate margin analysis.

International intergovernmental organizations should also promote such measures among their member States.

States should undertake an assessment of the risk and socioeconomic impacts of 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 States and used to inform decision-making relating to the long-term sustainability of outer space activities, particularly with regard to mitigating the adverse impacts of space weather on operational space systems.

Guideline 28

Support and promote further coordinated development of advanced space weather models and forecasting tools in support of user needs (C.2)

States and international organizations should engage experts in developing a coordinated approach to documenting space weather research, user needs and operational models, as well as forecasting tools currently in use, and assess them in relation to space weather science and the needs of services and users.

States and international organizations should undertake a coordinated approach to identifying and filling gaps in research and operational models and forecasting tools required to meet the needs of space weather science and services and users. Where necessary, this should include coordinated efforts to support and promote research and development to further advance space weather models and forecasting tools.

Guideline 30

Support and promote the collection, sharing and dissemination of and access to information relating to best practices for mitigating the effects of space weather on terrestrial and space-based systems and related risk assessments (C.4)

States and international organizations are urged to submit, to a common archive, documentation outlining best design practices, guidelines and lessons learned relating to mitigation of the effects of space weather on operational systems, as well as documentation and reports relating to space weather user needs, measurement requirements, gap analyses, cost-benefit analyses and related space weather assessments.

States and international organizations should provide support to enable 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 in satellite design.

States and international organizations should support and promote cooperation and coordination on ground- and space-based space weather observations, forecast modelling, satellite anomalies and reporting of space weather effects in order to safeguard space activities. This could be done in collaboration with the International Space Environment Service and the World Meteorological Organization (WMO).

States and international organizations should:

(a) Incorporate current, “nowcast” and forecast space weather thresholds into space launch commit criteria;

(b) 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.;

(c) Incorporate in satellite designs the capability to recover from a debilitating space weather effect, such as by including a safe mode;

(d) Incorporate space weather effects into satellite designs and mission planning for end-of-life disposal in order to ensure that the spacecraft either reach their intended graveyard orbit or de-orbit appropriately, in accordance with the Space Debris Mitigation Guidelines of the Committee. This should include appropriate margin analysis.

States and international organizations should also:

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

(b) Encourage the use of a common format for reporting the information. In relation to the reporting of spacecraft anomalies, the template of the Coordination Group for Meteorological Satellites provides an excellent proposed approach;

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

It is acknowledged that some data may be subject to legal restrictions and/or measures for the protection of proprietary or confidential information.

States should undertake an assessment of the risk and socioeconomic impacts of 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 States.

Sharing of operational space weather data, forecasts and best practices (Guideline 27+29)

States and international intergovernmental organizations should support and promote the collection, archiving, sharing, intercalibration, long-term continuity and dissemination of critical space weather data and space weather model outputs and forecasts, where appropriate in real-time, as a means to promote the long-term sustainability of outer space activities.

States and international intergovernmental organizations should support the identification of data sets critical for space weather services and research and should consider adopting policies for the free and unrestricted sharing of critical space weather data from their space- and ground-based assets. All governmental, civilian and commercial space weather data owners are urged to allow free and unrestricted access to, and archival of, such data for mutual benefit.

States and international intergovernmental organizations should also consider sharing real-time and near-real-time critical space weather data and data products in a common format, promote and adopt common access protocols for their critical space weather data and data products, and promote the interoperability of space weather data portals, thus promoting ease of data access for users and researchers.

States and international intergovernmental organizations should further undertake a coordinated approach to maintaining the long-term continuity of space weather observations, and identifying and filling key measurement gaps, so as to

meet critical needs for space weather information and/or data. Consideration should be given to flying small and low-power integrated payloads for space weather science and monitoring whenever and wherever possible (e.g. radiation monitors on Earth-orbiting satellite missions).

States and international intergovernmental organizations should identify high-priority needs for space weather models, space weather model outputs and space weather forecasts and adopt policies for free and unrestricted sharing of space weather model outputs and forecasts. All governmental, civilian and commercial space weather model developers and forecast providers are urged to allow free and unrestricted access to and archival of space weather model outputs and forecasts for mutual benefit, which will promote research and development.

States and international intergovernmental organizations should also encourage their space weather service providers to:

- (a) Undertake comparisons of space weather model and forecast outputs with the goal of improved model performance and forecast accuracy;
- (b) Openly share and disseminate historical and future critical space weather model outputs and forecast products in a common format;
- (c) 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; and
- (d) Undertake coordinated dissemination of space weather forecasts among space weather service providers and to operational end users.

Guideline 27

Support and promote the collection, archiving, sharing, intercalibration and dissemination of critical space weather data (C.1)

States and international organizations should engage experts in identifying data sets critical for space weather services and research and adopt policies for the free and unrestricted sharing of critical space weather data from their space- and ground-based assets. All space actors and governmental, civilian and commercial space weather data owners are urged to allow free and unrestricted access to and archival of such data for mutual benefit.

States and international organizations should also share real-time and near-real-time critical space weather data and data products and should cross-calibrate and intercalibrate critical space weather data and data products; openly share critical space weather data and data products in a common format; adopt common access protocols for their critical space weather data and data products; and promote the interoperability of space weather data portals, thus promoting ease of data access for users and researchers.

States and international organizations should further undertake a coordinated approach to maintaining long-term continuity of space weather observations, and identifying and filling key measurement gaps, so as to meet critical space weather needs. Space actors, including States and international organizations, are urged to fly small and low-power integrated payloads for space weather science and

monitoring whenever and wherever possible (e.g. radiation monitors on Earth-orbiting satellite missions).

Guideline 29

Support and promote the coordinated sharing and dissemination of space weather model outputs and forecasts (C.3)

States and international organizations should identify high-priority needs for space weather models, space weather model outputs and space weather forecasts and adopt policies for free and unrestricted sharing of space weather model outputs and forecasts. All governmental, civilian and commercial space weather model developers and forecast providers are urged to allow free and unrestricted access to and archival of space weather model outputs and forecasts for mutual benefit, which will promote research and development.

States and international organizations should also encourage their space weather service providers to undertake comparisons of space weather model and forecast outputs with the goal of assessing their metrics and comparative performance with the goal of improved model and forecast accuracy; openly share and disseminate historical and future critical space weather model outputs and forecast products in a common format; 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; and undertake coordinated dissemination of space weather forecasts among space weather service providers and to operational end users.

Guidance for entities conducting space activities (Guideline 32+33)

States should ensure that entities under their jurisdiction that conduct outer space activities have the appropriate structures and procedures for planning and conducting space activities in a manner that supports the objective of promoting the long-term sustainability of outer space activities, and that they have the means to comply with relevant national and international regulatory frameworks, requirements, policies and processes in this regard.

States bear international responsibility for national activities in outer space and for the authorization and continuing supervision of such activities, which are to be carried out in conformity with international law. However, the direct responsibility for ensuring that a given space activity does not jeopardize the long-term sustainability of outer space activities in general lies with the entity conducting that activity. In this regard, the management of that entity should take steps to:

(a) Establish and maintain all the necessary technical competencies required to conduct outer space activities in a safe and responsible manner and to enable it to comply with the relevant governmental and intergovernmental regulatory frameworks, requirements, policies and processes;

(b) Develop specific requirements and procedures to address the safety and reliability of outer space activities under the entity's control, during all phases of a mission life cycle;

(c) Assess all risks to the long-term sustainability of outer space activities associated with the space activities conducted by the entity, in all phases of the mission life cycle, and take steps to mitigate such risks.

The management of an entity that conducts outer space activities should ensure that the entity's structures and procedures for planning and conducting space activities support the objective of promoting the long-term sustainability of outer space activities. Appropriate measures to be taken by management in this regard should include:

(a) A commitment at the highest levels of the entity to promoting the long-term sustainability of outer space activities;

(b) Establishing and fostering an organizational culture and commitment to promoting the long-term sustainability of outer space activities within the entity, as well as in relevant interactions with other entities;

(c) Ensuring that the entity's commitment to the long-term sustainability of outer space activities is reflected in its management structure and procedures for planning, developing and conducting outer space activities;

(d) Encouraging, as appropriate, the sharing of the experiences of the entity in the conduct of safe and sustainable outer space activities as a contribution by the entity to the promotion of long-term sustainability of outer space activities;

(e) Designating a contact point within the entity responsible for communication with relevant authorities to facilitate efficient and timely sharing of information and coordination of potentially urgent measures to promote the safety and sustainability of outer space activities.

Guideline 32

Entities that conduct outer space activities should ensure that they have the means to comply with relevant governmental and intergovernmental regulatory frameworks, requirements, policies and processes that promote the long-term sustainability of outer space activities

States bear international responsibility for national activities in outer space and for the authorization and continuing supervision of such activities, which are to be carried out in conformity with international law. However, the direct responsibility for ensuring that a given space activity does not jeopardize the long-term sustainability of outer space activities in general lies with the entity conducting that activity. In this regard, the management of that entity should take steps to:

(a) Establish and maintain all the necessary technical competencies required to conduct outer space activities in a safe and responsible manner and to enable it to comply with the relevant governmental and intergovernmental regulatory frameworks, requirements, policies and processes;

(b) Develop specific requirements and procedures to address the safety and reliability of outer space activities under the entity's control, during all phases of a mission life cycle;

(c) Assess all risks to the long-term sustainability of outer space activities associated with the space activities conducted by the entity, in all phases of the mission life cycle, and take steps to mitigate such risks.

Guideline 33

Entities that conduct outer space activities should ensure that they have the appropriate systems and organizational culture in place to promote the long-term sustainability of outer space activities

The management of an entity that conducts outer space activities should ensure that the entity's structures and procedures for planning and conducting space activities support the objective of promoting the long-term sustainability of outer space activities. Appropriate measures to be taken by management in this regard should include:

(a) A commitment at the highest levels of the entity to promoting the long-term sustainability of outer space activities;

(b) Establishing and fostering an organizational culture and commitment to promoting the long-term sustainability of outer space activities within the entity, as well as in relevant interactions with other entities;

(c) Ensuring that the entity's commitment to the long-term sustainability of outer space activities is reflected in its management structure and procedures for planning, developing and conducting outer space activities;

(d) Encouraging, as appropriate, the sharing of the experiences of the entity in the conduct of safe and sustainable outer space activities as a contribution by the entity to the promotion of long-term sustainability of outer space activities;

(e) Designating a contact point within the entity responsible for communication with relevant authorities to facilitate efficient and timely sharing of information and coordination of potentially urgent measures to promote the safety and sustainability of outer space activities.
