



**Committee on the Peaceful
Uses of Outer Space****Fifty-sixth session**

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**Report of the Scientific and Technical Subcommittee
on its fiftieth session****Compilation of draft guidelines proposed by expert
groups A to D for consideration by the Working Group
on the Long-term Sustainability of Outer Space Activities,
as at the fifty-sixth session of the Committee on the
Peaceful Uses of Outer Space****Note by the Secretariat****I. Introduction**

1. At the fifty-sixth session of the Committee on the Peaceful Uses of Outer Space, the Working Group on the Long-term Sustainability of Outer Space Activities had before it document A/AC.105/1041, containing the set of draft guidelines proposed by expert groups A to D as at the end of the fiftieth session of the Scientific and Technical Subcommittee. The Working Group agreed that a revised version of that document, reflecting the progress made in the expert groups on their proposed draft guidelines during the fifty-sixth session of the Committee, would be made available in all official languages of the United Nations as soon as possible after the fifty-sixth session of the Committee.

2. The present document contains the revised compilation of the draft guidelines proposed by expert groups A to D as at the end of the fifty-sixth session of the Committee. No attempt has been made by the Secretariat to harmonize these draft guidelines in substance, so there is a certain element of duplication and fragmentation that will be addressed as the work of the expert groups is incorporated into that of the Working Group. This document represents an important step forward in the preparation of a draft set of guidelines of the Working Group, and it will be used as a basis for the development of a working paper by the Chair of the Working Group, containing a proposal for a draft Working Group report and a



preliminary set of draft guidelines, which will be made available in all official languages of the United Nations for the fifty-first session of the Scientific and Technical Subcommittee.

II. Draft guidelines proposed by the expert groups for consideration by the Working Group on the Long-term Sustainability of Outer Space Activities

Expert group A

Sustainable space utilization supporting sustainable development on Earth

The following draft guidelines are proposed by expert group A for consideration by the Working Group.

Guideline A.1

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

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.

Guideline A.2

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

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 and practice on utilizing 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 A.3

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

States and international organizations should coordinate international cooperation efforts in space-related capacity-building and data accessibility in order to ensure efficiency on 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 A.4

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

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 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.

Guideline A.5**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**

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

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

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.

Recommended topics for future consideration

1. The Committee on the Peaceful Uses of Outer Space should consider examining the issue of the exploitation of outer space in the context of sustainable development.
2. States and international organizations should compile a compendium of measures, practices, standards and other elements conducive to the safe conduct of

space exploitation activities; the compendium should be made freely available and promoted by all space actors, including States and international organizations.

3. States are encouraged to develop new standards for the avoidance of harmful contamination of outer space to promote the long-term sustainability of outer space, including celestial bodies.

4. The Committee on the Peaceful Uses of Outer Space should work towards the development of initiatives for space benefits and for equitable, efficient and rational access to space to support sustainable development on Earth.

Expert group B

Space debris, space operations and tools to support collaborative space situational awareness

The following draft guidelines are proposed by expert group B for consideration by the Working Group. Guidelines and terms that are still under discussion within expert group B are shown in square brackets.

Guideline B.1

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

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.

Guideline B.2

Implement space debris mitigation measures

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

Guideline B.3

Limit the risk to people and property from controlled re-entries

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 B.4**[Promote techniques to improve the accuracy of orbital data for the safety of on-orbit operations]**

[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. These 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 B.5**Perform conjunction assessment during orbital phases of controlled flight**

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.

Guideline B.6**Provide appropriate contact information**

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.

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

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 B.8

Provide registration information to assist in the identification of space objects

States and international intergovernmental organizations should 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, as recommended by the General Assembly in its resolution 62/101. States should provide this 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.

Expert group C

Space weather

The following draft guidelines are proposed by expert group C for consideration by the Working Group.

Guideline C.1

Support and promote the collection, archiving, sharing, intercalibration and dissemination of critical space weather data

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 C.2

Support and promote further coordinated development of advanced space weather models and forecasting tools in support of user needs

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 service and user needs.

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 space weather science and service and user needs. Where necessary, this should include coordinated efforts to support and promote research and development to further advance space weather models and forecasting tools.

Guideline C.3

Support and promote the coordinated sharing and dissemination of space weather model outputs and forecasts

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.

Guideline C.4

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

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 on the Peaceful Uses of Outer Space. 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.

Guideline C.5

Promote the education, training and capacity-building required for a sustainable global space weather capability

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, 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.

Recommended topics for future consideration

1. States members of the Committee on the Peaceful Uses of Outer Space should work through the Committee 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. States members of the Committee should work under the space weather agenda item of 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. States members of the Committee should work through the Scientific and Technical Subcommittee to implement a process to evaluate the impact and review the progress of the implementation of the guidelines on the long-term sustainability of outer space activities, and 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 five years.
2. States and international organizations should investigate the coordination of space weather information, including observations, analyses and forecasts, to support decision-making and risk mitigation relating to the operation of satellites, spacecraft and suborbital vehicles, including rockets and vehicles serving manned spaceflight, including for space tourism.

Expert group D

Regulatory regimes and guidance for actors in the space arena

The following draft guidelines are proposed by expert group D for consideration by the Working Group. Guidelines and terms that are still under discussion within expert group D are shown in square brackets.

Guideline D.1

[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]

[Guideline D.1 applies to all modes of cooperation, including governmental and non-governmental; commercial and scientific; global, multilateral, regional and bilateral; and among countries at all levels of development. This principle is particularly important since, for many States, international cooperation facilitates their participation in space exploration. Article IX 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, when interpreted in the light of the Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of All States, Taking into Particular Account the Needs of Developing Countries, of 1996, bases international cooperation on the free determination of fair, equitable and mutually acceptable contractual terms.]

[Text proposed by the United States to replace current guideline D.1]

[Guideline D.1 applies to all modes of cooperation, including governmental and non-governmental; commercial and scientific; global, multilateral, regional and 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 of such cooperative ventures, for example through contracts and other legally binding mechanisms, should be fair and reasonable.]

Guideline D.2

Share experience and expertise relating to the long-term sustainability of outer space activities

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 a 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 D.3

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

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 Registration Convention should be encouraged as a starting point in the compilation and exchange of information.

[Note: consider merging with guideline B.8, noting information associated with the Registration Convention and the associated resolutions, and other relevant information.]

Guideline D.4

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

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.

[Note: the language of guideline B.7 could be used as an illustrative example under this guideline for potential space actors.]

Guideline D.5

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

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 in relation 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 D.6

When adopting or implementing national regulatory frameworks, consider the long-term sustainability of outer space activities

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 Outer Space Treaty. 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 aspect 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.

Guideline D.7

Communicate within and among competent authorities to facilitate efficient and effective measures for the long-term sustainability of space activities

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 D.8

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

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. These 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 D.9

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

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.

Guideline D.10

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

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 due time 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 D.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

[Note: the supporting language for guideline D.11 is still under consideration by expert group D.]

Recommended topics for future consideration

There is a range of areas in which future regulatory developments could potentially improve the long-term sustainability of outer space activities. The issues involved are not addressed in the guidelines contained in the present document, for various reasons. In some cases, the issue is intrinsically legal and best addressed by the Legal Subcommittee of the Committee on the Peaceful Uses of Outer Space. In other cases, international practice is not sufficiently established for expert group D to reach consensus on the best way to regulate the issue.

The first area identified for future regulatory development is the development of definitions. Regulation is generally most effective when there is a clear understanding of the scope of the regulation. In managing the key issues affecting the sustainability of outer space activities, a consistently applied definition of space debris would be valuable. In addition, the increasing connection between ground infrastructure and space infrastructure indicates that the definition of space activities may become important to States in the future, within their national regulatory frameworks.

The second area identified for future regulatory development is the development of regulations relating to the ownership of space objects. The issue of ownership is not straightforward for various reasons, including the following: first, under existing international law, all objects in space are under the jurisdiction of a State, regardless of their funding source, functionality or integrity. Secondly, space objects increasingly have multiple owners. Hosted payloads are increasingly common, increasing the number of ownership interests in a single satellite. A single launch can now transfer the payloads of many different space actors into orbit (for example, launching a number of CubeSats), which could potentially blur the lines of responsibility and ownership.

The third area identified for future regulatory development is to improve the practice of States in registering space objects. A variety of practices exist with regard to the quality and timeliness of information provided under the Registration

Convention. This undermines the utility of the Registration Convention as a global information-sharing mechanism.

The fourth area identified for future regulatory development is to improve the consistency of national regulation globally in order to avoid a disproportionate number of space objects being registered in countries with the least demanding regulations on long-term sustainability of space activities. Inconsistencies in the current practice of States concerning licensing, registration fees and insurance requirements may encourage “forum shopping”, which may not encourage efficient practices and procedures for the long-term sustainability of outer space activities.

The fifth area identified for future regulatory development is the legal framework for active removal of space debris. In this context, a number of issues have to be addressed, such as the identification of the launching State and the responsible State in relation to the space object, the question of whether it is necessary to get consensus from the relevant State or States, and the question of who bears the costs and risks of such an activity. The question of whether active space debris removal could be undertaken or authorized by a single State, or if an international framework for active space debris removal under international consensus would be more suitable should be discussed. With regard to the latter alternative, existing international organizations or forums could be involved for the development and implementation of appropriate and practicable procedures.