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Long-term sustainability of outer space activities

Guidelines for the long-term sustainability of outer space activities

Working paper by the Chair of the Working Group on the Long-term Sustainability of Outer Space Activities

The present conference room paper reflects progress made during the fifty-fourth session of the Scientific and Technical Subcommittee towards the development of a compendium of guidelines for the long-term sustainability of outer space activities.

* A/AC.105/C.1/L.355.

Part A

Agreed guidelines

A. Policy and regulatory framework for space activities[1]

Guidelines 1, 2, 3 and 4 provide guidance on the development of policies, regulatory frameworks and practices that support the long-term sustainability of outer space activities for Governments and relevant international intergovernmental organizations authorizing or conducting space activities.

Guideline 1

Adopt, revise and amend, as necessary, national regulatory frameworks for outer space activities

1.1 States should adopt, revise and amend, as necessary, national regulatory frameworks for outer space activities, taking into account their obligations under the United Nations treaties on outer space as States responsible for national activities in outer space and as launching States. When adopting, revising, amending or implementing national regulatory frameworks, States should consider the need to ensure and enhance the long-term sustainability of outer space activities.

1.2 With the increase in outer space activities by governmental and non-governmental actors from around the world, and considering that States bear international responsibility for the space activities of non-governmental entities, States should adopt, revise or amend regulatory frameworks to ensure the effective application of relevant, generally accepted international norms, standards and practices for the safe conduct of outer space activities.

1.3 When developing, revising, amending or adopting national regulatory frameworks, States should consider the provisions of General Assembly resolution 68/74, on recommendations on national legislation relevant to the peaceful exploration and use of outer space. In particular, States should consider not only existing space projects and activities but also, to the extent practicable, the potential development of their national space sector, and envisage appropriate, timely regulation in order to avoid legal lacunae.

1.4 States, in enacting new regulations, or in revising or amending existing legislation, 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 regulations have 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. At the same time, regulations should not be so prescriptive as to prevent initiatives addressing the long-term sustainability of outer space activities.

[1] While the chapeau texts of each section are, in principle, agreed texts, the present document includes only the first lines of the various chapeaux in part A, recognizing that the longer chapeau texts still need to be finalized, now that the guidelines are divided into part A and part B. The full chapeau texts are retained in part B.

Guideline 2

Consider a number of elements when developing, revising or amending, as necessary, national regulatory frameworks for outer space activities

2.1 When developing, revising or amending, as necessary, regulatory measures applicable to the long-term sustainability of outer space activities, States and international intergovernmental organizations should implement international obligations, including those arising under the United Nations space treaties to which they are party.

2.2 In developing, revising or amending, as necessary, national regulatory frameworks, States and international intergovernmental organizations should:

(a) Consider the provisions of General Assembly resolution 68/74, on recommendations on national legislation relevant to the peaceful exploration and use of outer space;

(b) Implement space debris mitigation measures, such as the Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space, through applicable mechanisms;

(c) Address, to the extent practicable, risks to people, property, public health and the environment associated with the launch, in-orbit operation and re-entry of space objects;

(d) Promote regulations and policies that support the idea of minimizing the impacts of human activities on Earth as well as on the outer space environment. They are encouraged to plan their activities based on the Sustainable Development Goals, their main national requirements and international considerations for the sustainability of space and the Earth;

(e) Implement the guidance contained in the Safety Framework for Nuclear Power Source Applications in Outer Space and satisfy the intent of the Principles Relevant to the Use of Nuclear Power Sources in Outer Space through applicable mechanisms that provide a regulatory, legal and technical framework that sets out responsibilities and assistance mechanisms, prior to using nuclear power sources in outer space;

(f) Consider the potential benefits of using existing international technical standards, including those published by the International Organization for Standardization (ISO), the Consultative Committee for Space Data Systems 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 and the Committee on Space Research;

(g) Weigh the costs, benefits, disadvantages and risks of a range of alternatives and ensure that such measures have a clear purpose and are implementable and practicable in terms of the technical, legal and management capacities of the State imposing the regulation. Regulations should also be efficient in terms of limiting the cost for compliance (e.g., in terms of money, time or risk) compared with feasible alternatives;

(h) Encourage advisory input from affected national entities during the process of developing regulatory frameworks governing space activities to avoid unintended consequences of regulation that might be more restrictive than necessary or that conflicts with other legal obligations;

(i) Examine and adapt existing relevant legislation to ensure its compliance with these guidelines, considering the need for transition periods appropriate to their level of technical development.

Guideline 3

Supervise national space activities

3.1 In supervising space activities of non-governmental entities, States should ensure that entities under their jurisdiction and/or control 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 enhancing 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.

3.2 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 applicable international law. In fulfilling this responsibility, States should encourage each entity conducting space activities to:

(a) Establish and maintain all the necessary technical competencies required to conduct the outer space activities in a safe and responsible manner and to enable the entity 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 to the extent feasible.

3.3 In addition, States are encouraged to designate a responsible entity or entities to plan, coordinate and assess space activities with the aim of promoting their effectiveness in supporting the Sustainable Development Goals and in supporting the objectives of the guidelines for the long-term sustainability of outer space activities in a broader perspective and vision.

3.4 States should ensure that the management of an entity that conducts outer space activities establishes 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. 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 commitment to promoting the long-term sustainability of outer space activities within the entity, as well as in relevant interactions with other entities;

(c) Urging, to the extent practicable, 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 enhancing the 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.

3.5 States should 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 4

Ensure the equitable, rational and efficient use of the radio frequency spectrum and the various orbital regions used by satellites

4.1 In fulfilling their obligations under the Constitution and the Radio Regulations of the International Telecommunication Union (ITU), States should pay particular attention to the long-term sustainability of space activities and sustainable development on Earth and to facilitating the prompt resolution of identified harmful radio frequency interference.

4.2 As provided for in article 44 of the ITU Constitution, radio frequencies and any associated orbits, including the geostationary-satellite orbit, are limited natural resources that must be used rationally, efficiently and economically, in conformity with the provisions of the Radio Regulations, so that countries or groups of countries may have equitable access to those orbits and frequencies, taking into account the special needs of developing countries and the geographical situation of particular countries.

4.3 Consistent with the purpose of article 45 of the ITU Constitution, States and international intergovernmental organizations should ensure that their space activities are conducted in such a manner as not to cause harmful interference with the reception and transmission of radio signals related to the space activities of other States and international intergovernmental organizations, as one of the means of promoting the long-term sustainability of outer space activities.

4.4 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 ITU Radio Regulations and the ITU Radiocommunication Sector (ITU-R) Recommendations.

4.5 States and international intergovernmental organizations should ensure the implementation of the radio regulation procedures established by ITU for space radio links. Moreover, States and international intergovernmental organizations should encourage and support regional and international cooperation aimed at improving efficiency in decision-making and implementation of practical measures to eliminate identified harmful radio frequency interference in space radio links.

4.6 Spacecraft and launch vehicle orbital stages that have terminated their operational phases in orbits that pass through the low-Earth orbit (LEO) region should be removed from orbit in a controlled fashion. If this is not possible, they should be disposed of in orbits that avoid their long-term presence in the LEO region. Spacecraft and launch vehicle orbital stages that have terminated their operational phases in orbits that pass through the geosynchronous Earth orbit (GEO) region should be left in orbits that avoid their long-term interference with the GEO region. For space objects in or near the GEO region, the potential for future collisions can be reduced by leaving

objects at the end of their mission in an orbit above the GEO region such that they will not interfere with, or return to, the GEO region.

B. Safety of space operations

Guidelines 12, 13, 16 and 17 provide guidance to Governments and relevant international intergovernmental organizations on the conduct of space operations in a manner that supports the safety and long-term sustainability of outer space activities.

Guideline 12

Improve accuracy of orbital data on space objects and enhance the practice and utility of sharing orbital information on space objects

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

12.2 Recognizing that spaceflight safety strongly depends upon the accuracy of orbital and other relevant data, States and international intergovernmental organizations should promote techniques and the investigation of new methods to improve such accuracy. Those methods could include national and international activities to improve the capabilities and geographical distribution of existing and new sensors, use of passive and active on-orbit tracking aids, and combining and validating data from different sources. Special attention should be paid to encouraging the participation and capacity-building of developing countries with emerging space capabilities in this domain.

12.3 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 13

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

13.1 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. States and international intergovernmental organizations should also promote the sharing and dissemination of derived data products and methodologies in support of research and international scientific cooperation on the evolution of the orbital debris population.

Guideline 16

Share operational space weather data and forecasts

16.1 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 of enhancing the long-term sustainability of outer space activities.

16.2 States should be encouraged to monitor, to the extent feasible, space weather continuously and to share data and information with the aim of establishing an international space weather database network.

16.3 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 archiving of such data for mutual benefit.

16.4 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. The real-time sharing of these data could provide a valuable experience for sharing in real time other kinds of data relevant to the long-term sustainability of outer space activities.

16.5 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.

16.6 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 in this domain.

16.7 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;

(d) Undertake coordinated dissemination of space weather forecasts among space weather service providers and to operational end users.

Guideline 17

Develop space weather models and tools and collect established practices on the mitigation of space weather effects

17.1 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 possible, this should include coordinated efforts to support and promote research and development to further advance space weather models and forecasting tools, incorporating the effects of the changing solar environment and evolving terrestrial

magnetic field as appropriate, 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 and the International Space Environment Service.

17.2 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 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 on-orbit operations. 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 related to space weather-induced effects;

(f) Encouraging training on and knowledge transfer relating to the use of space weather data, taking into account the participation of countries with emerging space capabilities.

17.3 It is acknowledged that some data may be subject to legal restrictions and/or measures for the protection of proprietary or confidential information, in accordance with national legislation, multilateral commitments, non-proliferation norms and international law.

17.4 States and international intergovernmental organizations should work towards the development of international standards and the collection of established practices applicable for the mitigation of space weather effects in satellite design. This could include the 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.

17.5 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 on the Peaceful Uses of Outer Space. This should include appropriate margin analysis.

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

17.7 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.

C. International cooperation, capacity-building and awareness

Guidelines 25 and 26 provide guidance on international cooperation measures aimed at promoting the long-term sustainability of outer space activities among Governments and relevant international intergovernmental organizations authorizing or conducting space activities.

Guideline 25

Promote and support capacity-building

25.1 States and international intergovernmental organizations with experience in space activities should encourage and support capacity-building in developing countries with emerging space programmes, on a mutually acceptable basis, through measures such as improving their expertise and knowledge on spacecraft design, flight dynamics and orbits, performing joint orbital calculations and conjunction assessments, and providing access to appropriate precise orbital data and appropriate tools for the monitoring of space objects through relevant arrangements as appropriate.

25.2 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 methods that support the long-term sustainability of outer space activities and sustainable development on Earth.

25.3 States and international intergovernmental organizations should 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. Capacity-building activities include education, training and sharing of appropriate experience, information, data, tools and management methodologies and techniques, as well as the transfer of technology.

25.4 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, guided by considerations of humanity, neutrality and impartiality, and to support capacity-building activities aimed at enabling the receiving countries to make optimal use of such data and information. These space-based data and information with appropriate spatial and temporal resolution should be freely, quickly and easily available for countries in crisis.

Guideline 26

Raise awareness of space activities

26.1 States and international intergovernmental organizations should 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 should:

(a) Promote institutional and public awareness of space activities and their applications for sustainable development, environmental monitoring and assessment, disaster management and emergency response;

(b) Conduct outreach, capacity-building and education on regulations and established 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;

(d) Raise awareness among relevant public institutions and non-governmental entities about national and international policies, legislation, regulations and best practices that are applicable to space activities.

26.2 States and international intergovernmental organizations should promote public awareness of space applications for sustainable development, environmental monitoring and assessment, disaster management and emergency response through information-sharing and joint efforts with public institutions and non-governmental entities, taking into account the needs of current 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 other initiatives with similar objectives.

26.3 States and international intergovernmental organizations should 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 a website 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 entities engaged in space activities 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 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 for participants in space activities.

26.4 Cooperation between Governments and non-governmental 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 ITU Radio Regulations related to

space services; and the development of open, transparent standards for the exchange of data necessary to avoid collisions, harmful radio frequency interference or other harmful events in outer space. Non-governmental entities can 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.

D. Scientific and technical research and development

Guidelines 27 and 28 provide guidance of a scientific and technical nature for Governments, international intergovernmental organizations and national and international non-governmental entities that conduct space activities. They encompass, among other things, the collection, archiving, sharing and dissemination of information on space objects and space weather, and the use of standards for information exchange. These guidelines also address research into and the development of ways to support the sustainable use and exploration of outer space.[2]

Guideline 27

Promote and support research into and the development of ways to support sustainable exploration and use of outer space

27.1 States and international intergovernmental organizations should promote and support research into and the development of sustainable space technologies, processes and services and other initiatives for the sustainable exploration and use of outer space, including celestial bodies.

27.2 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 (General Assembly resolution 66/288, annex), the social, economic and environmental dimensions of sustainable development on Earth.

27.3 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.

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

27.5 States and international intergovernmental organizations conducting research and development activities to support the sustainable exploration and use of outer space should also encourage the participation of developing countries in such activities.

[2] The full chapeau text of the section on scientific and technical research and development has been included here, as consensus on both guidelines in the section has been reached.

Guideline 28

Investigate and consider new measures to manage the space debris population in the long term

28.1 States and international intergovernmental organizations should investigate the necessity and feasibility of possible new measures, including technological solutions, and consider implementation thereof, in order to address the evolution of and manage the space debris population in the long term. These new measures, together with existing ones, should be envisaged so as not to impose undue costs on the space programmes of emerging spacefaring nations.

28.2 States and international intergovernmental organizations should take measures at the national and international levels, including international cooperation and capacity-building, to increase compliance with the Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space.

28.3 Investigation of new measures could include, inter alia, methods for the extension of operational lifetime, novel techniques to prevent collision with and among debris and objects with no means of changing their trajectory, advanced measures for spacecraft passivation and post-mission disposal and designs to enhance the disintegration of space systems during uncontrolled atmospheric re-entry.

28.4 Such new measures aimed at ensuring the sustainability of space activities and involving either controlled or uncontrolled re-entries should not pose an undue risk to people or property, including through environmental pollution caused by hazardous substances.

28.5 Policy and legal issues, such as ensuring that these new measures are compliant with the provisions of the Charter of the United Nations and applicable international law, may also need to be addressed.

Part B

Preambular text and guidelines still under discussion[3]

I. Context of the guidelines for the long-term sustainability of outer space activities

A. Background

1. Space science and space applications improve our fundamental knowledge of the universe and the daily lives of people worldwide through environmental monitoring, management of natural resources, early warning systems to help mitigate disasters and support disaster management, meteorological forecasting, climate modelling, satellite navigation and communications. Therefore, space science and technology make a major contribution to the well-being of humanity, supporting the goals of major United Nations conferences and summits and playing a vital role in various aspects of economic, social and cultural development on Earth. Hence, the long-term sustainability of outer space activities is of interest and importance not only for current and aspiring participants in space activities, but also for the international community as a whole.

[3] The text of part B of the present document is a working text that reflects the progress of the work of the Working Group at the conclusion of its third intersessional meeting, held from 19 to 23 September 2016.

2. The space environment is being used by an increasing number of States, international intergovernmental organizations and non-governmental entities. The proliferation of space debris and the increased risks of collision and interference with the operation of space objects raise concerns about the long-term sustainability of space activities, particularly in LEO and geostationary orbit environments.

3. Over the years, the Committee on the Peaceful Uses of Outer Space has considered different aspects of the long-term sustainability of outer space activities from various perspectives. Building on those previous efforts and relevant related efforts by other entities, the Working Group on the Long-term Sustainability of Outer Space Activities of the Scientific and Technical Subcommittee has proposed a set of voluntary guidelines with a view to setting out a holistic approach to promoting the long-term sustainability of outer space activities.

4. The following set of voluntary guidelines is premised on the understanding that outer space should remain an operationally stable, safe and conflict-free environment for current and future generations, open for peaceful exploration, use and international cooperation in the interest of all countries, irrespective of their degree of economic or scientific development, without discrimination of any kind. The guidelines address the policy, regulatory, operational, safety, scientific, technical, international cooperation and capacity-building aspects of space activities. The guidelines also take into account the recommendations contained in the report of the Group of Governmental Experts on Transparency and Confidence-Building Measures in Outer Space Activities.[4]

B. Scope and implementation

5. The long-term sustainability of outer space activities is defined as the conduct of space activities in a manner that balances the objectives of access to the exploration and use of outer space by all States and governmental and non-governmental entities only for peaceful purposes with the need to preserve the outer space environment in such a manner that takes into account the needs of current and future generations.

6.

[*Two alternative formulations for the first sentence of preambular paragraph 6 are given below for consideration by delegations*.]

[*Alternative 1*]

[The long-term, sustainable development of outer space activities requires balancing the increasing needs [of all States and international intergovernmental organizations] with regard to the use of outer space with the need [for humankind] to maintain outer space for operationally safe, stable and conflict-free use.]

[*Alternative 2*]

[The long-term, sustainable development of outer space activities requires a balance between the increasing use of outer space and the need to maintain outer space for operationally safe, stable and conflict-free use.]

[*Two alternative formulations for the concluding portion of preambular paragraph 6 are given below for consideration by delegations*.]

[*Alternative 1*]

[Ensuring the long-term sustainability of outer space activities should be understood to mean a strategy, collectively and individually pursued by States and international

[4] A/68/189.

intergovernmental organizations, for the continuous improvement of space policy design and implementation that would provide strong rationale, as well as practical opportunities and incentives, for maintaining such a balance. States and international intergovernmental organizations should ensure that there is full understanding of and support for those objectives across all sectors of their space activities and with regard to all aspects of space policy decision-making.]

[*Alternative 2*]

[To ensure the long-term sustainability of outer space activities, States and international intergovernmental organizations should voluntarily take measures, at the international and national levels, to establish a strategy for the continuous improvement of space policy design and decision-making, and implementation of that strategy across all sectors of their space activities.]

[7. The safe conduct of space operations requires the following of a procedure for carrying out outer space activities under which States and international intergovernmental organizations undertake a range of efficient, sufficient and timely measures at the political, regulatory, technical and organizational levels that allow them to protect their own space objects and related ground infrastructure from risks, hazards, threats and encroachments. Such measures should also prevent the creation (through intentional action or inaction) and the emergence of risks, hazards and threats to and encroachments upon foreign space objects and related ground infrastructure that could result from and/or be induced by their own space objects and related ground infrastructure. The measures to be taken by States and international intergovernmental organizations in that regard should include:

(a) Ensuring the safety of their own space objects and related ground infrastructure;

(b) Renouncing intentional actions and preventing inaction that may cause vulnerability and/or pose danger to their own and foreign space objects and related ground infrastructure;

(c) Setting tasks, developing security system parameters and the capabilities of their own space objects and related ground infrastructure and ensuring protection of their own space objects and related ground infrastructure from unauthorized outside interference and countering negative impacts in a safe manner, considering internationally recognized principles, norms and procedures, including the holding of consultations.]

[*Two alternative formulations for preambular paragraph 8 are given below for consideration by delegations*.]

[*Alternative 1*]

[8. Implementing the guidelines requires that the level of engagement in following space operations safety requirements and, in general, in monitoring safety trends that may reasonably be expected to be displayed by emerging participants in outer space activities should correspond to the level of knowledge and experience achieved by those participants. The general understanding should be that the greater the technical and other relevant capabilities at the disposal of a particular State, the greater the emphasis it should place on honouring responsibilities associated with safety. In cases where the development and enactment of standards and procedures required for the implementation of the guidelines may prove to be a difficult task, participants should seek to identify relevant promising concepts and provide for stepwise enhancements to indigenous capacity-building.]

[*Alternative 2*]

[8. States should be allowed to adopt measures to carry out the requirements of the guidelines stage by stage within their national legal framework and in accordance with their national conditions and capabilities. Insufficient regulation and unnecessary excessive regulation on the space industry should be avoided, and consideration should be given to acceptable and reasonable financial and other factors, while taking into account the needs and interests of developing countries.]

9. The concept of ensuring and enhancing the long-term sustainability of outer space activities, as understood at the international level and set out in the guidelines, entails the need to identify the general context of, and modalities for, continuous improvements in the way that States and international intergovernmental organizations, while developing, planning and executing their space activities, reaffirm their commitment to the use of outer space for peaceful purposes, so as to ensure that the outer space environment is preserved for current and future generations. In line with this overriding task, the outer space interests of States and international intergovernmental organizations, as they have or may have defence or national security implications, should be fully compatible with preserving outer space for peaceful exploration and use, as well as safeguarding its status pursuant to article I of the Outer Space Treaty and the relevant principles and norms of international law. Such an approach should be reflected in the policies and normative regulations by means of which States and international intergovernmental organizations determine operational requirements in respect of outer space, leverage space capabilities, manage their own space assets or those related to them on legal grounds and overcome unforeseen events or circumstances in outer space.

10. The guidelines are based on a substantial body of knowledge, as well as the experiences of States, international intergovernmental organizations and national and international non-governmental entities. Therefore, the guidelines are relevant to both governmental and non-governmental entities. They are also relevant to all space activities, whether planned or ongoing, as practicable, and to all phases of a mission life cycle, including launch, operation and end-of-life disposal.

11. The guidelines are intended to support the development of national and international practices and safety frameworks for conducting outer space activities, while allowing for flexibility in adapting such practices and frameworks to specific national circumstances.

12.

[*Two alternative formulations for the first sentence of preambular paragraph 12 are given below for consideration by delegations*.]

[*Alternative 1*]

[The legal framework relevant to the guidelines includes the existing United Nations treaties and principles on outer space.]

[*Alternative 2*]

[The existing United Nations treaties and principles on outer space provide a fundamental regulatory [framework] [background] [context] for the guidelines.]

Current practices, operating procedures, technical standards, policies and experiences gained through the conduct of space activities are also taken into consideration, as the guidelines are intended to supplement guidance already available in existing standards and regulations.

13.

[*Two alternative formulations for preambular paragraph 13 are given below for consideration by delegations*.]

[Alternative 1]

[The guidelines are not legally binding under international law, but any action taken towards their implementation should be consistent with the applicable principles and norms of international law. They are formulated in the spirit of enhancing the practice of States and international organizations in applying the relevant principles and norms of international law. Nothing in the guidelines should constitute a revision, qualification or reinterpretation of those principles and norms.]

[Alternative 2]

[These guidelines and their implementation are fully voluntary, and nothing in these guidelines shall be interpreted as affecting the inherent right of each state to free access to all areas of space and celestial bodies, its freedom in the exploration and use of outer space for peaceful purposes and its free access to outer space through space science, technologies and their applications without discrimination of any kind.]

[*Two alternative formulations for preambular paragraph 14 are given below for consideration by delegations*.]

14.

[Alternative 1]

[Member States and international organizations should voluntarily take measures, through their national or other applicable mechanisms, to ensure that the guidelines are implemented to the greatest extent feasible. States and international intergovernmental organizations should implement the guidelines in accordance with their existing obligations under international law, including the provisions of applicable United Nations treaties and principles on outer space.]

[Alternative 2]

[Due to the importance of international cooperation and assistance, in particular transfer of know-how and technology to developing countries, for enabling them in the exploration and use of outer space for their socio-economic development while taking into account the requirements of the long-term sustainability of outer space activities, implementation of these guidelines, by developing countries, is dependent, to a large extent, on the facilitation of their participation in the fullest possible exchange of space science and technology, without discrimination of any kind. Accordingly, all States and relevant international intergovernmental organizations should contribute promoting international technical cooperation as one of the means to enhance the long-term sustainability of outer space activities, and facilitate the transfer, to developing countries, of related know-how and technology without any discrimination, and above all, avoided seriously of taking any restrictive measures under any pretext and circumstances.]

15. Applicable treaties include the Outer Space Treaty, in particular the principle that the exploration and use of outer space should be carried out in accordance with international law, including the Charter of the United Nations, in the interest of maintaining international peace and security and promoting international cooperation and understanding. Applicable principles include the 1996 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, in which it is noted that States and international intergovernmental organizations are free to determine all aspects of their participation in international cooperation in the exploration and use of outer space on an equitable

and mutually acceptable basis. Contractual terms in such cooperative ventures should be in full compliance with the legitimate rights and interests of the parties concerned[, and also with appropriate national legislation and regulations, international non-proliferation commitments, and relevant standards and norms. The guidelines on capacity-building set out below apply to spacecraft and space-based data activities only; such capacity-building should be carried out in accordance with relevant international non-proliferation commitments and national legislation and regulations]. [States should be guided by the principle of cooperation and mutual assistance and should conduct all their activities in outer space with due regard to the corresponding interests of all other States.]

16. The implementation of the guidelines is considered a prudent and necessary step towards preserving the outer space environment for current and future generations. States, international intergovernmental organizations and national and international non-governmental entities should voluntarily take measures, through their own applicable mechanisms, to ensure that the guidelines are implemented to the greatest extent feasible and practicable.

17. The guidelines reflect international consensus on the measures needed to enhance the long-term sustainability of outer space activities, based on current knowledge and established practices. As understanding of the various factors influencing the long-term sustainability of outer space activities deepens, the set of guidelines should be reviewed, and could be revised in the light of new findings.

18. The following set of voluntary guidelines establishes the concept of and defines the basic criteria for national and international practices for [ensuring and enhancing] the long-term sustainability of outer space activities. It is based on the understanding that outer space should remain a stable, safe and conflict-free environment for current and future generations that is used for peaceful purposes and international cooperation. States and international intergovernmental organizations should make full use of opportunities to steadily increase, through dedicated practical measures, the predictability and transparency of and the building of confidence in space activities, as those features are instrumental in the application of the guidelines for the long-term sustainability of outer space activities.

19. In order to apply the guidelines, States and international intergovernmental organizations should establish and use regulations and international cooperation mechanisms that would allow them to perform tasks related to ensuring [and enhancing] the long-term sustainability of outer space activities. [States and international intergovernmental organizations are free to determine all aspects of their cooperation on an equitable and mutually acceptable basis[, without discrimination of any kind].]

20. The guidelines are designed to provide a practical framework for achieving the more rational organization of activities in outer space so that States and international intergovernmental organizations are in a position to conduct such activities by making use of existing mechanisms and putting in place new mechanisms that would reliably accommodate needs for the development, through cooperative endeavours, of space potential and assist in reducing to a minimum or, as feasible, avoiding serious harm to the outer space environment and the safety of space operations.

21. Without prejudice to any of the constituent elements of ensuring the long-term sustainability of outer space activities, the identification of factors that influence the nature and magnitude of risks in the various areas of outer space activity and of potentially hazardous situations and developments in the space environment is the most challenging task in terms of putting into effect procedures whereby States and international intergovernmental organizations could, in accordance with applicable

legislative and conventional regulations, effectively cooperate, by advising and assisting each other in all practical ways possible.

22. The guidelines are grouped into the following categories to facilitate their implementation by various governmental and non-governmental entities: (a) policy and regulatory framework for space activities; (b) safety of space operations; (c) international cooperation, capacity-building and awareness; (d) scientific and technical research and development; and (e) implementation and updating.

II. Guidelines still under discussion

A. Policy and regulatory framework for space activities

Guidelines 6,[5] 7, 8, 9 and 10 provide guidance on the development of policies, regulatory frameworks and practices that support the long-term sustainability of outer space activities for Governments and relevant international intergovernmental organizations authorizing or conducting space activities. They also reaffirm the importance of the use of space solely for peaceful purposes[6] and of implementing transparency and confidence-building measures in outer space activities in order to prevent the occurrence of any incidents that may undermine the peaceful conduct, safety and security of outer space activities. The guidance covers the adoption of national regulatory frameworks and the promotion of recommended voluntary measures by entities conducting outer space activities to promote the safety and sustainability of such activities. The guidance also covers measures to facilitate the sharing of information on space objects and orbital events and the sharing of contact information for entities responsible for space operations.

Guideline 6
Enhance the practice of registering space objects

6.1 States and international intergovernmental organizations should ensure the effective and comprehensive implementation of registration practices in accordance with the provisions and in support of the objectives of the Convention on Registration of Objects Launched into Outer Space. In doing so, States and international intergovernmental organizations should also take into consideration the enhanced registration practices recommended by the General Assembly in its resolution 62/101. To that end, States and international intergovernmental organizations should adopt appropriate policies and regulations for enhancing their registration practices. Such policies and regulations should cover the communication of expanded information on space objects, their operation and their status, with a view to making registration practices subject to broad international acceptance and sustained over the long term. States and international intergovernmental organizations should act responsibly to that end, considering the proper registration of space objects

[5] The ideas contained in draft guideline 5 have been assimilated into draft guideline 6; draft guideline 5 therefore no longer appears in the present set of draft guidelines.

[6] It has been decided to readdress the pertinence of using the phrase “solely for peaceful purposes” throughout the text or using, rather, the phrase “for exclusively peaceful purposes”, considering international legal regulation, i.e. article IV and other provisions of the Outer Space Treaty. Delegations should exchange views on what the concept of “solely for peaceful purposes” actually means, considering all relevant circumstances and factors, and possibly introduce more clarity to and precision in interpreting its meaning and implications through the use of intelligible criteria. A shared opinion might facilitate discussions on the present text.]

as a determining factor of safety and security in outer space and, therefore, as a condition for the long-term sustainability of space activities.

6.2 It should be understood and/or provided for in regulatory instruments enforced by States and international intergovernmental organizations that States and international intergovernmental organizations should not, in any formal or practical way, neglect or unduly perform the procedure of registration, as this may have serious negative implications for ensuring the safety of space operations. States and international intergovernmental organizations should not support or allow practices inconsistent with obligations under the Registration Convention. Solutions should also be sought whenever specific launches of space objects give rise to legal or technical issues that call for diligence in the implementation of registration procedures.

6.3 Prior to the launch of a space object, the State from whose territory or facility a space object will be launched should, in the absence of prior agreement, contact the States or international intergovernmental organizations that could qualify as the launching States of that space object to jointly determine as to how to proceed with the registration of that particular space object. Following the launch of a space object, and considering relevant criteria in the Registration Convention, should States and/or international intergovernmental organizations that were involved in the launch of that space object, have reason to believe that it might not be registered, those States and/or international intergovernmental organizations should coordinate among themselves and with those States and international intergovernmental organizations that have jurisdiction and control over the non-registered space object, to determine which State or international intergovernmental organization should register the space object. In the event that a State or international intergovernmental organization receives a registration enquiry, that State or international intergovernmental organization should respond as soon as practicable in order to facilitate the clarification and/or resolution of a particular registration issue.

6.4 The Office for Outer Space Affairs of the Secretariat should be effectively engaged in executing integrated functions pertaining to: (a) the accumulation of information on orbital launches performed (i.e., completed launches resulting in the placement of objects into Earth orbit or beyond) and on orbital objects (i.e., space objects that have been launched into Earth orbit or beyond); and (b) the assignment of international designations to orbital launches and orbital objects in accordance with Committee on Space Research notation, as well as the provision of such designations to the States of registry. The Office should be committed to promoting initiatives that would enable States to satisfactorily adhere to accepted practice by furnishing expanded registration information in accordance with General Assembly resolution 62/101.

6.5 The launching States and, where appropriate, international intergovernmental organizations should assume responsibility for requesting space launch service providers and users to meet all registration requirements under the Registration Convention and for encouraging their receptiveness to, and urging them to contemplate, the provision of expanded registration information. States and international intergovernmental organizations, having institutionalized the practice of providing expanded registration information, should strive to sustain such practice and identify circumstances complicating the achievement of that task.

6.6 States and international intergovernmental organizations should act in line with subparagraph 2 (b) (ii) of General Assembly resolution 62/101 by considering providing information describing the status of a space object and changes in orbital location of a space object. For the purpose of systemizing understanding in terms of the information required in accordance with subparagraph 2 (b) (ii) of General

Assembly resolution 62/101, the following list contains information on changes of status of operations that may be used:

(a) Termination or renewal of the functioning of a space object;

(b) Loss of functionality of a space object owing to technical flaws or other reasons;

(c) Loss of ability to control the flight of a space object, with simultaneous emergence of the risk of harmful radio frequency interference with the radio links of other functioning space objects and/or the risk of potentially hazardous conjunctions with other functioning space objects;

(d) Separation (if envisaged) of subsatellites and/or technological elements of space objects;

(e) Deployment (if envisaged) of technological elements that change the properties of a space object that influence its orbital lifetime.

6.7 States and international intergovernmental organizations, acting in the same manner, should consider providing the information referred to in paragraph 4 (a) (iii) of General Assembly resolution 62/101, describing changes in the orbital location of the space object, in accordance with the following list:

(a) Change of the orbital parameters of a space object as a result of which the space object moves to a different region of near-Earth space;

(b) Placement of a space object into a graveyard orbit or an orbit with reduced ballistic lifetime;

(c) Change in location in geostationary orbit;

(d) Repositioning (not entailing significant changes in basic orbital parameters) of a spacecraft operating as part of a satellite constellation among nominal slots within the orbital structure of the constellation.

6.8 In cases where a launched space object contains other space objects planned for future separation and independent orbital flight, States and international intergovernmental organizations should, when inscribing these objects in their registry and when furnishing registration information to the Secretary-General of the United Nations, indicate (for example, in the form of side notes) the number and names of space objects planned for future separation from the main one, on the understanding that those space objects should not be given different or modified names when they are subsequently registered.

6.9 In accordance with article IV, paragraph 2, of the Registration Convention, and considering General Assembly resolution 62/101, on registration practices, as well as principle 4.3 of General Assembly resolution 47/68, States and international intergovernmental organizations should provide information to the Office for Outer Space Affairs through internationally accepted mechanisms on all space activities or objects that involve the use of nuclear power sources in outer space.

Guideline 7

Provide, in national legal and/or policy frameworks, for a commitment to conducting space activities solely for peaceful purposes

7.1 States conducting, authorizing or supervising outer space activities, as well as international intergovernmental organizations conducting such activities, should uphold the long-standing principle that the exploration and use of outer space are to be carried out for the benefit and in the interests of all countries and should commit, in

their national legal and/or policy frameworks, to conducting space activities solely for peaceful purposes. Without prejudice to a possible broader conceptual meaning that may, within the United Nations system and/or international treaties, be attributed to the use of outer space solely for peaceful purposes and satisfy additional criteria, the conduct of space activities solely for peaceful purposes would not prevent the conduct of monitoring activities [through the use of information and military space systems][, which support national security]. Such commitment to upholding the solely peaceful use of outer space should be considered as commensurate with the need to contribute to a regime of transparency and confidence-building measures in outer space activities and to engage constructively in international dialogues, including discussions within the General Assembly, on possible challenges to space security and sustainability. Insofar as States may have legitimate security interests in outer space, those interests should comply with applicable international law and should take into account the common interests of all humankind.

7.2 States, in particular those with major space capabilities, should contribute actively to the goal of preventing an arms race in outer space as an essential condition for the promotion of international cooperation in the exploration and use of outer space for peaceful purposes. As established in article IV of the Outer Space Treaty, States parties to the Treaty undertake not to place in orbit around the Earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction, install such weapons on celestial bodies or station weapons in outer space in any other manner. Accordingly, States are encouraged to work collectively to prevent threats to the peace, safety and security that can compromise the long-term sustainability of outer space activities. In that context, States should bear in mind, inter alia, the report of the Group of Governmental Experts on Transparency and Confidence-Building Measures in Outer Space Activities.[7]

Guideline 8

Implement operational and technological measures of self-restraint to forestall adverse developments in outer space[8]

8.1 As part of defining, validating and supporting their space operations' tasks and requirements and space security-related guidance, operational principles and procedures, as well as identifying and employing appropriate capabilities in establishing and satisfying the needs in this area, States and international intergovernmental organizations should ensure that their related governmental agencies and establishments, respectively, as well as relevant non-governmental entities under their jurisdiction and/or control, have a basic awareness of the need to align their objectives and means with criteria and requirements attributable under international law, including the provisions of article IX of the Outer Space Treaty, and should make sure that such operations do not interfere with foreign space objects, unless there is an express agreement to such interference on the part of or coordination of actions with the States or international intergovernmental organizations that exercise jurisdiction and/or control over those space objects.

8.2 In undertaking space operations with a view to gathering information on objects, events and situations in near-Earth space orbit through general surveillance and monitoring or any other operations, which may involve approaches at relatively short distances and fly-bys in close proximity to foreign space objects, States and international intergovernmental organizations should provide for safeguards to protect

[7] A/68/189.

[8] At the Working Group's first intersessional meeting, held from 5 to 9 October 2015, it was proposed that the present draft guideline be moved to the section entitled "Safety of space operations". However, the Working Group has not yet taken a decision on this.

against adverse physical and operational effects on foreign space objects. To avoid a situation whereby approaches at relatively short distances and fly-bys in close proximity to foreign space objects may be characterized as unauthorized and/or hostile actions and may thus give rise to conflict, States and international intergovernmental organizations, by taking full cognizance of the limitations derived from international law and related internationally recognized standards to be followed when assessing and/or directing such operations in outer space, should avoid negatively influencing and/or compromising the safe operation of foreign space objects in a way that they would not deem pertinent and/or acceptable as applied to their own space objects.

8.3 States and international intergovernmental organizations, especially those that have the relevant capacities and practices, are encouraged to share with the Committee on the Peaceful Uses of Outer Space their assessment of the situation in outer space from the perspective of the overall consideration of maintaining outer space as an operationally safe, stable and conflict-free environment. They are also encouraged to share characteristics, in as much detail as they deem necessary, of the phenomena and events that influence the security of outer space.

Guideline 9

Implement policy aimed at precluding interference with the operation of foreign space objects through unauthorized access to their on-board hardware and software[9]

[*Two alternative formulations of guideline 9 are given below for consideration by delegations.*]

[*Alternative 1*]

[9.1 By regulating and administering the functions involved in ensuring the safe and responsible conduct of space operations, States and international intergovernmental organizations, acting, inter alia, subject to the requirements of article VI of the Outer Space Treaty, should not directly or indirectly engage in, and/or associate themselves with, activities that support or assist any practice whereby any instruments and/or software that are modified to interfere in an unauthorized manner in the regular operation of hardware and/or to access in an unauthorized manner the information systems of foreign space objects embedded in space objects and/or their components destined for export or use, through sale, lease or otherwise, by foreign recipients or users. Likewise, States and international intergovernmental organizations should require entities under their jurisdiction and/or control to provide guarantees or assurances against any such practice on their part or that of their personnel, contractors or subcontractors at any level. The absence of any such embedded instruments and/or software should be officially attested by States or international intergovernmental organizations exercising jurisdiction and/or control with respect to manufacturers and suppliers of spacecraft and/or their components, as part of standing safety and security validation and assurance processes and/or at the request of the recipient or user. It should be a common understanding that any practice to the contrary, irrespective of the motives that could serve to substantiate it, and/or of the nature, scope, duration or intensity of the potential effect of any particular embedded instrument and/or software, or the engagement criteria used or ultimate objectives pursued in that context, would entail serious implications for the safety of space operations, since altered control programmes and any other component that may be embedded in space objects could, if conceivably activated, negatively affect the

[9] At the Working Group's first intersessional meeting, held from 5 to 9 October 2015, it was proposed that the present draft guideline be moved to the section entitled "Safety of space operations". However, the Working Group has not yet taken a decision on this.

operational capabilities and mission sustainment of the space objects accommodating them and, specifically, escalate the risks of failures and increase the probability of incidents and accidents.

9.2 Considering that any practice covered by the present guideline and that could exert an effect on foreign space objects that could lead, in particular, to the compromising of command transmissions would deny the rights and interests of States and international intergovernmental organizations that exercise jurisdiction and/or control over those objects, such practices should be qualified as violations of and/or prejudicial to the principles and norms of international law, specifically those deriving from article IX of the Outer Space Treaty, as well as the established criteria for good-faith practices and commercial integrity.]

[*Alternative 2*]

[9.1 States should take reasonable steps to ensure the integrity of the supply chain so that end users can have confidence in the security of information and communications technology products. States should seek to prevent the proliferation of malicious information and communications technology tools and techniques and the use of harmful, hidden functions.]

Guideline 10

Refrain from intentional modifications of the natural space environment[10]

10.1 States and international intergovernmental organizations should be fully aware of the need to focus on the avoidance and management of crisis situations that may be associated with the misuse of technology and technical means of intentional modification of the natural space environment, as those situations may pose a threat to, and/or cause vulnerabilities of, space systems. Accordingly, States and international intergovernmental organizations should prioritize the use of technology and technical means that meet the safety requirements of space operations covered by the Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques, which was opened for signature on 18 May 1977 and entered into force on 5 October 1978. States and international intergovernmental organizations should agree that the use of environmental modification techniques for peaceful purposes may, unless supported by relevant safety criteria and procedures, damage or harm the operational space objects in orbit and have widespread and/or long-lasting and/or severe effects. Such effects may pose immediate and/or projected threats of fragmentation of foreign or any other space objects and result in the mass proliferation of space debris, hindering use of the orbit.

10.2 For the purposes of the present guideline, “deliberate manipulation of natural processes” shall mean the intentional alteration of characteristics of the space environment (electron concentration and temperature of the ionosphere, density and chemical composition of the upper atmosphere, intensity of electromagnetic emissions and characteristics of radiation belts, including the creation of artificial radiation belts). Accordingly, when planning and conducting outer space activities, States and international intergovernmental organizations should not use and/or allow entities under their jurisdiction and control to use modification techniques that could impact the condition of the space environment in a way that would negatively influence operational spacecraft, associated ground infrastructure or the space environment to a degree either equivalent to or comparable with the effects listed in article I of the Convention on the Prohibition of Military or Any Other Hostile Use of Environmental

[10] At the Working Group’s first intersessional meeting, held from 5 to 9 October 2015, it was proposed that the present draft guideline be moved to the section entitled “Safety of space operations”. However, the Working Group has not yet taken a decision on this.

Modification Techniques. States and international intergovernmental organizations should be fully aware that such negative influence may lead to the incapacitation of operational spacecraft and associated ground infrastructure, interference in space radio links, failures in space objects' control processes, on-board equipment and navigation systems, and the distortion of radio signals used for measuring the trajectory parameters of space objects. These effects could result in an increase in the number and frequency of collisions and the proliferation of small objects or particles of space debris.

10.3 States and international intergovernmental organizations should regulate issues that form the substance of the present guideline in a preventive and reactive manner. Such regulations should be applicable to activities that they or their related entities conduct or participate in and should include the following:

(a) Enhancing awareness of the risks associated with any deliberate manipulation of natural processes in the context provided for in the present guideline, as well as advancing a systemic approach to assessing and controlling such risks;

(b) Designing and implementing administrative, operational and technological restraints when developing and while implementing experiments or other types of activity involving any deliberate manipulation of natural processes in the context provided for in the present guideline;

(c) Setting safety-critical parameters of the space environment with regard to the scale and effect of any minor manipulations of natural processes in the context provided for in the present guideline, so that the use of such manipulation techniques does not result in damaging phenomena.

10.4 Notwithstanding article III, paragraph 2, of the Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques and without prejudice to the procedures provided for in guideline 16 (entitled "Share operational space weather data and forecasts"), should it be established, in the context of implementation of the present guideline, that safety-critical values of space environment parameters have been reached, States and international intergovernmental organizations should be available for consultation and/or provision of information, if available, in the event of a request from other States and international intergovernmental organizations interested in such consultations and/or information for good and valid reasons.

B. Safety of space operations

Guidelines 11, 14, 15, 18, 19, 20, 21, 22, 30, 31 and 32 provide guidance to Governments and relevant international intergovernmental organizations on conducting space operations in a manner that supports the long-term sustainability of outer space activities. The guidance covers the exchange of contact information as a means of expediting the exchange of information on space objects and orbital events. The guidance also covers the collection, sharing and dissemination of information on space objects and the performance of conjunction assessments for space objects during orbital phases of spaceflight and for newly launched space objects. Guidance is provided on the sharing of operational space weather data and forecasts, as well as on the sharing of space weather models, tools and experiences with regard to the mitigation of space weather effects on space systems. The guidance includes measures to safeguard the security and resilience of ground infrastructure. Guidance is provided on the development of criteria and procedures for the active removal of space objects from orbit and on the conduct, in extreme cases, of operations resulting in the destruction of registered and unregistered space objects in orbit. The above-mentioned

guidelines also cover approaches to the design and operation of small-size space objects, compliance with procedures for mitigating risks associated with the uncontrolled re-entry of space objects and the observance of safety precautions when using sources of laser beams passing through outer space.

Guideline 11
Provide updated contact information and share information on space objects and orbital events

11.1 States and international intergovernmental organizations should exchange and/or make readily available regularly updated contact information on their designated entities authorized to engage in exchanges of appropriate information on, inter alia, space operations, conjunction assessments and the monitoring of objects and events in outer space, in particular those entities that are responsible for processing incoming incident reports and forecasts and adopting precautionary and response measures.

11.2 States and international intergovernmental organizations should establish appropriate means to enable timely coordination to reduce the probability of and/or to facilitate effective responses to orbital collisions, orbital break-ups and other events that might increase the probability of accidental collisions or may pose a threat to human lives, property and/or the environment, in the case of uncontrolled re-entries.

11.3 States and international intergovernmental organizations should exchange, on a voluntary basis and as mutually agreed, relevant information on space objects and information related to actual or potential situations in near-Earth space that may affect the safety of outer space operations. The information exchanged should, to the extent practicable, be reliable, accurate and complete, and conclusively presumed as such by the providing entity. Its time reference and period of applicability should be noted. The information should be exchanged in a timely manner to enable precautionary actions.

11.4 To implement the present guideline, States and international intergovernmental organizations should, through a dedicated consultative process, consider, acquire specific understanding of, and develop shared positions on, the practical issues and modalities relating to the exchange of relevant information on space objects and events in near-Earth space obtained from different authorized sources, in order to ensure harmonized and standardized record-keeping on objects and events in outer space.

11.5 As part of identifying pragmatic approaches to collaborative information-sharing, States and international intergovernmental organizations should consider the options for effectively accumulating and providing access to information on objects and events in outer space on a timely basis and for achieving consistency in the interpretation and use of such information as one of the means to support their activities aimed at maintaining the safety of space operations. The options for consideration could include: standards and formats for representing information to enable the interoperability of information shared on a voluntary basis; bilateral arrangements to exchange information; regional or multilateral coordination among providers of information to enable cooperation and interoperability; and the establishment of a United Nations information platform. Those options could serve as a basis for a distributed international information system for multilateral cooperation in sharing and disseminating multi-source information on objects and events in near-Earth space.

Guideline 14

Perform conjunction assessment during all orbital phases of controlled flight

14.1 Conjunction assessment should be performed for all spacecraft capable of adjusting trajectories during orbital phases of controlled flight for current and planned spacecraft trajectories. States and international intergovernmental organizations should, through national mechanisms and/or international cooperation, perform conjunction assessments during all orbital phases of controlled flight for current and planned spacecraft trajectories. With due consideration to article VI of the Outer Space Treaty, States should encourage entities, including spacecraft operators and conjunction assessment service providers under their jurisdiction and/or control to perform conjunction assessments through national mechanisms, when applicable. International intergovernmental organizations should perform such assessments through their respective mechanisms.

14.2 States and international intergovernmental organizations should develop and implement approaches to and methods for conjunction assessment that may include: (a) improving the orbit determination of relevant space objects; (b) screening current and planned trajectories of relevant space objects for potential collisions; (c) determining the risk of collision and whether an adjustment of trajectory is required to reduce the risk of collision; and (d) sharing information on the proper interpretation and usage of the conjunction assessment results, as appropriate. States and international intergovernmental organizations should, where applicable, encourage entities under their respective jurisdiction and/or control, including spacecraft operators and conjunction assessment service providers, to develop or help develop such approaches and methods to conjunction assessment.

14.3 Spacecraft operators, including those of non-governmental entities, that are unable to perform conjunction assessments should seek support, via State authorities, as necessary and in accordance with relevant applicable regulations, from appropriate around-the-clock conjunction assessment entities. International intergovernmental organizations that are unable to perform conjunction assessments should seek support through their respective mechanisms.

14.4 States and international intergovernmental organizations should, in a dedicated international consultative process, acting through their designated entities, as appropriate, share knowledge and experience related to the interpretation of conjunction assessment information with the objective of developing [interoperable] [technically credible] [mutually understandable] [technically compatible]- methods and consistent criteria for assessing collision risks and making avoidance manoeuvre decisions.

[*Two alternative formulations for the last sentence of 14.4 are given below for consideration by delegations*.]

[*Alternative 1 for the last sentence of 14.4*]

States and international intergovernmental organizations that have developed practical methods and approaches for conjunction assessments and collision avoidance manoeuvre decision-making processes also [are encouraged to] [should] share their expertise by, inter alia, providing training opportunities for emerging spacecraft operators[, without any discrimination].

[*Alternative 2 for the last sentence of 14.4*]

In like manner, spacecraft operators that have developed practical methods and approaches for conjunction assessments are encouraged to share their expertise by, inter alia, providing training opportunities and disseminating [best practices]

[knowledge and experience] among emerging spacecraft operators [on a non-discriminatory basis] [on a fair basis].

14.5 Considering the degree of responsibility which characterises decision making on collision avoidance, and all practical limitations of the conjunction assessment process it should be practically important to agree upon criteria to be used for selecting conjunctions that may result in collisions to avoid false alarms and missed events. Conjunction assessment service provider are encouraged to reach consensus on the standard of the level of collision risks with spacecraft operators and pertinent parties (i.e. launching States), before providing conjunction assessment result stated above.

Guideline 15

Develop practical approaches for pre-launch assessment of possible conjunctions of newly launched space objects with space objects already present in near-Earth space

15.1 [States and international intergovernmental organizations should advise launch service providers under their jurisdiction and control to consider pre-launch conjunction assessment for newly launched space objects to avoid possible collisions during [early] orbital insertion. States and international intergovernmental organizations should also coordinate with other States and international intergovernmental organizations, as appropriate, [on this issue] [including to seek support, via State authorities, as necessary and in accordance with relevant applicable regulations, for pre-launch conjunction assessment from appropriate conjunction assessment entities].] States and international intergovernmental organizations should develop and implement, as far as technically feasible, methods and procedures to accomplish pre-launch conjunction assessments.

[*Two alternative formulations for the last sentence of 15.1 are given below for consideration by delegations*.]

[Alternative 1]

[States and international intergovernmental organizations should develop common international standards and establish procedures for sharing information on the planned flight trajectory of a launch vehicle during the orbital insertion of spacecraft or payloads, as this would improve the safety of space operations.]

[Alternative 2]

[States and international intergovernmental organisations should develop common international standards for describing the planned trajectory of a launch vehicle during the early orbital insertion of spacecraft or payloads to facilitate the provision of pre-launch conjunction assessment, as mutually agreed.]

[15.2[States and international intergovernmental organizations that launch objects into outer space should uphold the general approach that the development and implementation of transparency and confidence-building measures for outer space activities are to be perceived as a process that should give rise to common practices in pre-launch information provision, based on the understanding that:]

(a) States and international intergovernmental organizations should be encouraged to provide, using relevant existing and/or other dedicated mechanisms, launch schedules that include the information necessary for a preliminary assessment of changes in the future population of space objects (general information on planned launches such as range of launch dates, launch place, type of launch vehicle, the number of spacecraft to be launched and the destination regions of near-Earth outer space where newly launched objects are intended to be placed);

(b) States and international intergovernmental organizations should be encouraged to provide, using relevant existing and/or other dedicated mechanisms, pre-launch notifications containing information on the launch plan that would be useful for matching specific objects to be launched with the registration information on newly launched space objects provided by launching States. Such notifications would preferably include information on planned dates and times of scheduled launches, types of launch vehicles, notices for mariners and pilots on restricted zones at sea and in airspace and basic information on space objects planned for insertion into orbit that contains, as a minimum, reference to the destination regions of near-Earth outer space where the newly launched objects are to be placed and/or basic parameters of the nominal orbit of each object and the possible dispersion of their values.]

[15.3 States and international intergovernmental organizations should undertake efforts to develop and use compatible formats for the pre-launch sharing of information on the nominal orbital parameters and probable dispersion of their values for each space object planned for separation and independent insertion into a target orbit in order to allow assessment of possible conjunctions and to coordinate planned in-orbit operations accordingly. States and international intergovernmental organizations are encouraged to engage in a dialogue and hold consultations, as feasible, with the aim of achieving and/or systemizing understanding as to how the experience gained and methods developed could be summarized, institutionalized and covered by spaceflight safety planning and launch readiness reporting procedures as far as technically and otherwise practicable. States and international intergovernmental organizations should be encouraged to align their practices and to promote the use of such practices to meet the objectives of practical and effective safety measures.]

Guideline 18

Ensure the safety and security of terrestrial infrastructure that supports the operation of orbital systems and respect the security of foreign space-related terrestrial and information infrastructures

18.1 States and international intergovernmental organizations should consider the safety and security of terrestrial infrastructure that provides for the proper operation of, and receiving and processing of data from, orbital systems as forming an integral part of the concept of and practices for ensuring the long-term sustainability of outer space activities. As part of the responsible and peaceful conduct of space activities and when providing overall institutional support for the concept of and practices for ensuring the long-term sustainability of such activities, States and international intergovernmental organizations should adopt decisions that are reasoned and effectively formalized at the policy and regulatory levels for the exclusion and prevention of any actions on their part and that of natural and legal persons under their jurisdiction and control that could impair or adversely affect the serviceability of terrestrial infrastructure under foreign jurisdiction and/or control.

18.2 States and international intergovernmental organizations should establish and pursue, both internally and through active efforts at the international level, an information security policy that would appropriately address effective cooperation in preventing, identifying, investigating and deterring malicious usage of information and communications technologies and/or any other activities that may endanger or disrupt critical national, foreign and international information infrastructure that may be directly involved in ensuring the safe and secure operation of orbital systems under national or foreign jurisdiction. Consequently, States and international intergovernmental organizations should, whenever needed and/or as requested, liaise and engage in practical interaction with each other in response to relevant real-time,

emerging and potential threats and incidents that may affect the terrestrial infrastructure in question.

18.3 Taking into account applicable international law, including the Outer Space Treaty and the ITU Constitution and Convention and Radio Regulations, States and international intergovernmental organizations should refrain from the use of radiofrequencies and/or the conduct of activities that they have reason to believe may cause [potentially] harmful interference to the terrestrial infrastructure supporting the operation of the orbital systems of other States and international intergovernmental organizations, including infrastructure under the jurisdiction and/or control of another State. States and international intergovernmental organizations should provide, at the policy level, for the exclusion of any actions that could impair or adversely affect the serviceability of terrestrial infrastructure under foreign jurisdiction and/or control. To facilitate communication regarding emerging and potential threats to terrestrial infrastructure that supports the operation of orbital systems, States and international intergovernmental organizations should designate points of contact for information exchanges.

18.4 States and international intergovernmental organizations should strengthen the security and resilience of their terrestrial infrastructure that supports the operation of orbital systems. States and international intergovernmental organizations involved in the establishment and/or operation of a particular terrestrial infrastructure that supports the operation of orbital systems are encouraged to cooperate to strengthen the security and resilience of that infrastructure. Such efforts could include information exchanges between and among governmental and non-governmental entities responsible for terrestrial infrastructure — via State authorities as necessary and in accordance with relevant applicable regulations — regarding effective practices for withstanding and recovering from accidents and incidents.

18.5 When considering appropriate measures for the protection and improvement of the resilience of terrestrial infrastructure and information infrastructure used for the operation of and for providing support to space systems, notably in order to ensure the continuity of critical services, States and international intergovernmental organizations should conduct a comprehensive assessment of the potential impact that the total or partial loss of the infrastructure’s functionality may have on national and foreign users of the services it supports.

18.6 In implementing the present guideline, States and international intergovernmental organizations should provide for regulation that ensures that the methods and procedures used to support the resilience of terrestrial infrastructure preclude any action that could impair or adversely affect the operation of terrestrial and information infrastructures under foreign jurisdiction and/or control.

Guideline 19

Ensure the safety and security of terrestrial infrastructure that supports the operation of orbital systems

19.1 Terrestrial infrastructure, including supporting information infrastructure, supports the proper operation of, and the receiving and processing of data from, orbital systems. Therefore, States and international intergovernmental organizations should recognize that the safety and security of terrestrial infrastructure that supports orbital systems are integral to ensuring the long-term sustainability of outer space activities.

19.2 Taking into account applicable international law, including the Outer Space Treaty and the ITU Constitution and Convention and Radio Regulations, States and international intergovernmental organizations should refrain from activities that they have reason to believe may cause potentially harmful interference to the terrestrial

infrastructure that supports the operation of the orbital systems of other States and international intergovernmental organizations, including infrastructure under the jurisdiction and/or control of another State. To facilitate communication regarding emerging and potential threats to terrestrial infrastructure that supports the operation of orbital systems, States and international intergovernmental organizations should designate points of contact for information exchanges.

19.3 States and international intergovernmental organizations should strengthen the security and resilience of their terrestrial infrastructure that supports the operation of orbital systems. States and international intergovernmental organizations party to the establishment and/or operation of a particular terrestrial infrastructure that supports the operation of orbital systems are encouraged to cooperate to strengthen the security and resilience of that infrastructure. Such efforts could include information exchanges between and among governmental and non-governmental entities responsible for terrestrial infrastructure — via State authorities as necessary and in accordance with relevant applicable regulations — regarding effective practices for withstanding and recovering from accidents and incidents.

19.4 When considering appropriate measures for the protection and improving the resilience of terrestrial infrastructure and information infrastructure used for the operation of and for providing support to space systems, notably in order to ensure the continuity of critical services, States and international intergovernmental organizations should conduct a comprehensive assessment of the potential impact that the total or partial loss of the infrastructure's functionality may have on national and foreign users of the services it supports.

Guideline 20

Develop and implement criteria and procedures for the preparation and conduct of space activities aimed at the active removal of space objects from orbit

20.1 States and international intergovernmental organizations considering or initiating involvement in, or the execution of, active removal of space objects, either functioning or non-functioning, whatever their legal status may be, should, in the process of making their judgments with regard to the feasibility and safety of such operations and throughout their preparation and execution stages, thoroughly review and effectively implement a coherent set of stringent requirements and measures aimed at ensuring the identification, analysis, evaluation and prevention of risks, as well as employing appropriate means and methods that would make such operations safe and fully consistent with the principles and norms of international law.

20.2 Decisions on risk mitigation methods and the choice of tools and techniques to implement active removal operations should be aligned with the overriding task of preventing any actions or omissions that could make vulnerable or threaten space objects owned and/or operated by other States, international intergovernmental organizations or foreign entities, and/or result in the loss, operational malfunction, degradation or loss of integrity of such objects, and thus impair or circumscribe the rights and interests of those States, international intergovernmental organizations or foreign governmental or non-governmental entities. It should be understood that any active removal operations:

(a) Will not have negative technological impacts on the above-mentioned space objects, unless agreed to in advance of such operations by the State (including the State of registry), international intergovernmental organization and/or entity concerned;

(b) May not lead to any irregularities in the jurisdiction and/or control functions of foreign space objects.

20.3 It should be presumed that the present guideline applies equally to any operation in outer space that involves any kind of physical impact on, and/or handling of, space objects owned and/or operated by other States, international intergovernmental organizations or foreign governmental or non-governmental entities.

Guideline 21
Establish procedures and requirements for the safe conduct of operations resulting in the destruction of in-orbit space objects

21.1 Recognizing that space debris poses a threat to space operations, the intentional destruction of any on-orbit spacecraft and launch vehicle orbital stages or other harmful activities that generate long-lived debris should be avoided. However, under certain exceptional circumstances, States and international intergovernmental organizations may need to consider the destruction of a space object under their jurisdiction and/or control because those circumstances afford no other technical option, and because the alternatives to such an action would have far more negative consequences. Such a course of action should be duly substantiated as an unavoidable measure to avert an immediate or potential serious threat to human life, the environment or property in outer space or on the ground, in the air or at sea in case of re-entry of the space object.

21.2 When the intentional destruction of a space objects is determined to be necessary/unavoidable, States and international intergovernmental organizations contemplating such an action should inform the international community well in advance, through the Office for Outer Space Affairs or other appropriate channels, of the circumstances that warrant such an action, their plans for carrying out such an operation, and the measures that will be taken to ensure that intentional destruction is conducted at sufficiently low altitudes to limit the orbital lifetime of resulting fragments. It should be a general principle that the greater the probability of side effects from such an operation, the more detailed should be the information made available at different stages of the operation's preparation and implementation. Where practicable, the prerequisites for organizing the provision of information in an expeditious reactive mode or in a near real-time mode should be properly considered.

21.3 Any operation that could result, through mechanical impact or the use of other means, in direct or indirect damage to or destruction of a space object under foreign jurisdiction and control should not be contemplated unless explicitly agreed to by the States or international intergovernmental organizations that exercise jurisdiction and control over that space object.

21.4 Any operations resulting in the intentional destruction of an in-orbit space object should be carried out in conformity with the Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space as they relate to the need to avoid the generation of long-lived debris.

Guideline 22

Develop criteria and procedures for the active removal of space objects and for the intentional destruction of space objects, specifically as applied to non-registered objects

22.1 In the course of applying the guidelines on active removal and/or intentional destruction of space objects, States and international intergovernmental organizations should ensure conformity with the provisions of the present guideline, which covers objects launched into outer space but not registered in line with the Registration Convention. States and international intergovernmental organizations should ensure the completeness of regulation of active removal and/or intentional destruction

operations on the basis of a fully integrated approach, in order to avoid any loose, random or abusive practices.

22.2 States and international intergovernmental organizations should proceed on the understanding that securing legitimate grounds for operations for active removal or intentional destruction depends on whether the specific space object (whether or not registered in [the Register of Objects Launched into Outer Space] [compliance with the Registration Convention or General Assembly resolution 1721B of 1961]) planned for removal or destruction and a specific physical object in orbit that is presumed to be or is associated with that space object are one and the same physical body. Positive identification of the object to be actively removed or intentionally destroyed should be the determining factor when deciding whether to proceed with the operation. Accordingly, until the origin and status of a specific physical object are determined in a sufficiently precise way, the object should not be regarded as an immediate target for active removal or an intentional destruction operation. States and international intergovernmental organizations should consistently seek to establish and maintain procedures and mechanisms that would make it possible to effectively address and satisfy individual and common needs in the identification of objects in orbit.

22.3 Operations for active removal or intentional destruction should be preceded by a thorough analysis of all feasible methods of their implementation, including an assessment of the risks entailed by each method. The degree to which the international community is to be informed about the technical aspects of the method chosen for implementing the operation is to be determined at the discretion of the States and/or international intergovernmental organizations that plan and conduct such operations, on the understanding that the overall information support required for the purposes of safety of space operations should be adequately provided by them through the Office for Outer Space Affairs and other relevant channels. The security of the information systems and technical components of such operations should be ensured by the States and international intergovernmental organizations planning and conducting them. Other States and international intergovernmental organizations should, as far as possible and upon request, provide information and analytical support for such operations. In addition to the provision of valid near-Earth space monitoring information and the results of space situational analysis (if such results are available), such support may include assistance in identifying relevant space objects through analysis of the relevant monitoring or information archives and making the results of such analysis available for general access and use.

22.4 Currently, the practice of applying the Registration Convention differs, as there are varying views on the registration of component parts of space objects and/or launch vehicles that either do not possess the ability to operate independently or turn out to be incapable of sustained operational capabilities for the mission-specified time period. States and international intergovernmental organizations should, when applying the guidelines on active removal and/or intentional destruction of space objects and with a view to enhancing practice in registering space objects, proceed on the following basis:

(a) The body of rules governing the title to, and status of, a space object, as established under international law, should be understood as being based on the interaction of factors that relate to the interpretation of the legal status of component parts of space objects and launch vehicles as well as of space objects that have not been capable ab initio of performing their assigned functions, or have lost the capability to do so, in cases where States and international intergovernmental organizations have not registered those component parts and objects, with other factors that have continued relevance and, in the light of the rights and obligations

provided for in articles VII and VIII of the Outer Space Treaty, should not be dispensed with;

(b) Non-registration of component parts of objects or, when relevant, objects as described in subparagraph (a) above that result from a space launch or events during the flight of a space object should not in itself be construed as grounds for considering such component parts and objects to be devoid of title, taking into account, inter alia, the requirements of the Convention on International Liability for Damage Caused by Space Objects. The absence of specific information on those component parts and objects either in a particular registration entry or as a reference in registration entries for other objects should not be considered a reason for divesting jurisdiction and control over such component parts or objects;

(c) Compliance with the practical observations contained in subparagraphs (a) and (b) above should not decrease the motivation of States and international intergovernmental organizations with regard to developing, as appropriate, policies that would be instrumental for the ascertainment by the launching State, and/or the international intergovernmental organization that has accepted the relevant rights and obligations, of the status of non-registered component parts of space objects or non-functioning space objects under their jurisdiction and control. Such policies should provide for the possibility of States and/or international intergovernmental organizations waiving, in whole or in part, the authority they exercise with respect to such component parts of space objects or non-functioning spacecraft so as to make it possible to develop a framework for taking decisions on clearing outer space of space debris;

(d) The approach outlined in subparagraph (c) above should assist States and international intergovernmental organizations in entering into joint decisions and arrangements that could fully accommodate requests for well-defined and validated obligations and technical procedures for the implementation of space debris removal operations where such operations have been determined by the parties to such joint decisions and arrangements to be a prioritized requirement or a prioritized task.

22.5 In defining the particular features of the status of fragments, irrespective of their linear dimensions, resulting from break-ups of space objects for whatever reason, including the conduct of technological operations in orbit, consideration should be given to the fact that, for objective reasons, those fragments may not be subject to registration owing to the very nature of their origin, their physical condition and the impossibility of determining and regularly updating the parameters of their orbital movement. In order to assess the feasibility of their registration, the degree of reliability with which each particular fragment can be correlated with another identified space object that may be the object of its origin and/or with an event that led to its appearance or formation in orbit should be correctly evaluated. States and international intergovernmental organizations wishing to register fragments that they, based on the results of identification, regard as having relevance to space objects previously registered by them should direct to the Office for Outer Space Affairs confirmation of their intention to register such fragments, accompanied by information on planned applications and requests to have such information included in a relevant information resource of the Office. A strictly limited period of time should be allotted for the receipt from other States and/or international intergovernmental organizations of objections to such registration, given that the relevance of the orbital information decreases steadily unless it is updated. States and international intergovernmental organizations planning to direct requests may, at their own discretion, update, to the extent necessary, the orbital parameters of fragments that they have provided and/or show readiness to transfer such information at the request of interested States and international intergovernmental organizations. If objections are made to such requests,

all the relevant information should be reviewed and the differences that have arisen should be the subject of international consultations.

22.6 The shared vision of the practical aspects of addressing and resolving the interrelated issues of the safety of space operations and space debris mitigation should include allowing States and international intergovernmental organizations to provide, consistent with their authority and responsibilities in accordance with, and by implication of, the relevant principles and norms of the Outer Space Treaty, for options that would envisage adjustments to the status of space objects under their jurisdiction and control (including objects originally part of such space objects) that have ceased to function or to be functional, so as to provide definitive eligibility with regard to potential international efforts to clear outer space of space debris. Such practice may, in particular, be validated as an operational necessity with regard to space debris fragments if it is convincingly established that such fragments have irretrievably lost the ability to function or sustain functionality and that lifting constraints on their removal could be the best solution. The entire set of relevant activities should be motivated by a strict procedure whereby States and international intergovernmental organizations make official announcements that they anticipate the need for such an adjustment of status while fulfilling, when technically feasible, their responsibilities under international law. The decisions planned for adoption and actually adopted should be explicit as to the specific rights to exercise functions involved in determining the treatment of such objects that would either be conferred or waived. The feasibility and expediency of authorizing such practices and rendering them valid should be determined on a case-by-case basis. Acting in implementation of article IX of the Outer Space Treaty, States and international intergovernmental organizations, while strictly adhering to the understanding outlined above, should, by increasing their level of involvement in focused cooperative activities, work on integrating, as necessary, the different aspects of such activities on the basis of relevant agreements to provide for specific solutions in this area. Within such agreements, responsibilities should be defined and duties should be allocated among all participants in the activities planned. Such agreements should prescribe applicable procedures for regulating access to a space object and/or its component parts as well as measures to protect technology, where such procedures and measures are necessary and feasible in practical terms.

Guideline 30
Address approaches to the design and operation of small-size space objects

30.1 Given the possible safety challenges posed by objects in outer space which are difficult to track, States [, in accordance with their respective national needs, conditions and capabilities,] and international intergovernmental organizations are encouraged to promote, preferably on a cost and mission effective basis, active or passive design solutions that increase the trackability of small-size space objects and all other space objects that are difficult to track through [all phases of] its orbital life time, as well as the accurate determination of their position in orbit. Such design solutions could include the use of appropriate on-board technology[, such as optical reflectors and [GNSS][navigation] devices].

30.2 States [, in accordance with their respective national needs, conditions and capabilities,] and international intergovernmental organizations should also[exercise supervision] [give attention], through [[national] regulatory and policy] [practical] measures, over the operation of their small-size space objects in orbit, particularly with respect to the orbital regions where the object is located and the duration of the presence of such objects in orbit. [As with large-size space objects, manufacturers and operators of small-size space objects should adhere to applicable international and national space debris mitigation standards and/or guidelines [and], to the extent

practicable [and possible].] [, should [place small-size space objects in outer space in such a manner that their presence in protected orbits does not substantially exceed their operational lifetime]] [limit the long-term presence of small size space objects in protected orbits after the end of their mission]]. [Such measures should be in accordance with the UN Space debris mitigation guidelines.] [States and international organizations are encouraged to raise awareness of manufacturers and operators of small-size objects [about the technical requirements to achieve full compliance with national regulation] [about the relevant national regulations]].

Guideline 31

[Comply with procedures for mitigating][Mitigate] risks associated with the uncontrolled re-entry of space objects

31.1 States and international intergovernmental organizations should have in place procedures for sharing with [the international community][competent national authorities], as practicable, early information on the forecast uncontrolled re-entry of potentially hazardous space objects that are, in accordance with international law, regarded as being under their jurisdiction and control and of tracked foreign and any other unidentified potentially hazardous space objects, as well as procedures for ensuring communication and coordination for the mitigation of risks associated with such events. Without prejudice to furnishing, when feasible, preliminary [notifications][information] on possible hazardous events associated with the uncontrolled re-entry of space objects, the procedures referred to above should be employed during the final phase of the orbital flight of a space object and used until the termination of the ballistic flight of the space object is confirmed, as well as in the event of identification of the space object or its fragments that reach the surface of the Earth. States and international intergovernmental organizations should, with a view to adhering to an objective and transparent approach, furnish [to the international community] [to competent national authorities] timely [international notifications containing, to the extent deemed reasonably necessary], information at their disposal on:

(a) The predicted time and area of re-entry into the atmosphere at the last orbital path at the altitude of 80 km (with the understanding that that altitude is used as a reference criterion for practical purposes);

[(b) The predicted time that and area where fragments may fall to the surface of the Earth;]

(c) The mass and size of the space object;

(d) The presence or absence on board the space object or in the composition of its fragments of hazardous substances or materials and[, if known,] the possibility of their reaching the near-surface layer and/or surface of the Earth;

(e) The probability[, if known,] of space object fragmentation and fragments reaching the surface of the Earth (including estimated fragment mass);

(f) The safety requirements and precautions that should be observed when treating fragments that have reached the surface of the Earth.

31.2 States and international intergovernmental organizations should adhere to a common practice to provide for mutual assistance (in a proactive manner and/or in responding to a request) in the interests of improving the reliability of results when predicting the time and area of the uncontrolled re-entry of potentially hazardous space objects, in particular by tracking the objects and generating information on their trajectory [and possible impact [areas] [zones]]. The provision of such assistance will depend on existing technical capabilities and resources.

31.3 Pursuant to the provisions of guideline 11 (entitled “Provide updated contact information and share information on space objects and orbital events”), States and international intergovernmental organizations should designate appropriate entities that are authorized to provide, to the Office for Outer Space Affairs and through other relevant channels, official information on the uncontrolled re-entry of potentially hazardous space objects under the jurisdiction and control of those States and international intergovernmental organizations and information on the uncontrolled re-entry of tracked foreign and any other unidentified and potentially hazardous space objects, as well as to request and obtain similar information from other States or international intergovernmental organizations.

31.4 Notwithstanding the provisions of article 5 of the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, the State having jurisdiction over the territory on which a space object or its component parts have been discovered, or have been presumed to reach the surface of the Earth should honour any request by the State or international intergovernmental organization with jurisdiction and control over the object for timely consultations with a view to making practical arrangements for the coordinated implementation of procedures concerning the search for and identification, assessment, analysis, evacuation and return of the object or its fragments. In the same manner, requests for observing procedures for the safe treatment of discovered objects or their fragments should also be accommodated. Such procedures should ensure the use of the least intrusive methods and means of identification, assessment and analysis of the object or its fragments.

Guideline 32

Observe measures of precaution when using sources of laser beams passing through outer space

32.1 When governmental and/or non-governmental entities under the jurisdiction and control of States and international intergovernmental organizations use lasers that generate beams passing through near-Earth outer space, States and international intergovernmental organizations should: analyse the probability of accidental illumination of passing space objects by laser beams; conduct a quantitative evaluation of the laser radiation power at the distance of crossing space objects; if possible, perform an assessment of the risk of malfunctioning of, damage to, and/or break-up of space objects due to such illumination; and as necessary, observe appropriate measures of precaution.

C. International cooperation, capacity-building and awareness

Guidelines 23 and 24 cover international cooperation measures for States and relevant international intergovernmental organizations authorizing or conducting space activities. The measures are aimed at promoting the long-term sustainability of outer space activities. The guidelines include measures to promote technical cooperation and capacity-building to improve the ability of developing countries to establish their own national capacities through the development of domestic knowledge, in accordance with national requirements, processes and regulations, multilateral commitments, applicable non-proliferation norms and international law. Capacity-building activities can make a significant contribution to enhancing the long-term sustainability of outer space activities by building on the knowledge gained by States and international intergovernmental organizations in their conduct of space activities over many years. The sharing of such experience can enhance the safety of space activities and benefit all users of outer space.

Guideline 23

Promote and facilitate international cooperation in support of the long-term sustainability of outer space activities

23.1 States and international intergovernmental organizations should promote and facilitate international cooperation in the peaceful uses of outer space [in accordance with related international law.][in compliance with national law and policy on a mutually acceptable basis.], without infringing intellectual property rights and in accordance with relevant international non-proliferation obligations and national [legislation] [requirements, processes and regulations]. [Such cooperation should be among governmental and non-governmental, commercial and scientific entities, at the global, multilateral, regional and bilateral levels and among countries at all levels of development.]

[*Two alternative formulations for paragraph 23.2 are given below for consideration by delegations*.]

[*Alternative 1*]

[23.2 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 space cooperation on the basis of equality, mutual benefit and non-discrimination. In that context, particular attention should be paid to the benefits and interests of developing countries and countries with [incipient][emerging] space programmes. [Developed countries are encouraged to provide the necessary technical and financial assistance to developing countries for their implementation of the present guidelines.] States are free to determine all aspects of participation in the exploration and use of outer space on a mutually acceptable basis[, in accordance with relevant international law and without unduly adversely affecting the legitimate interests of third States]. [Any action designed to prevent other States from carrying out pragmatic space cooperation should be discouraged.]]

[*Alternative 2*]

[23.2 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 that context, particular attention should be paid 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 ventures, for example in contracts and other legally binding mechanisms, should be fair and reasonable.]

23.3 States undertaking, authorizing or intending to undertake or authorize international space activities involving the use of controlled items (objects, materials, manufactured items, equipment, software or technology) 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 norms and principles and international law, and should 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.

23.4 States and international intergovernmental 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 intergovernmental 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 relevant international non-proliferation obligations and national legislation and regulations. States and international intergovernmental organizations should also promote technology safeguard arrangements that may facilitate space capacity-building, while respecting intellectual property rights and relevant requirements for long-term sustainability.

[*Two alternative formulations for paragraph 23.5 are given below for consideration by delegations*.]

[*Alternative 1*]

[23.5 States should establish appropriate legal and administrative regulations relating to cooperation in cases where 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 should ensure, by means of agreements or other arrangements that 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) The 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 controlled items, when located in the territory of the importing State, could become the subject of disputed jurisdiction or be used for illicit purposes;

(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.]

[*Alternative 2*]

[23.5 States should establish stronger legal and administrative regulation relating to international cooperation. States should seek to forge collaborative relationships based on equality and mutual benefits. To maximize the potential benefits of such collaboration, States should provide, by means of agreements or arrangements, for the implementation of measures that are institutionalized appropriately under their national legislation.]

[23.6 A voluntary international space debris fund could be established under the auspices of the Office for Outer Space Affairs in order to support activities that remove or mitigate current space debris, prevent the creation of future space debris and/or reduce the impacts of space debris. Member States, especially the leading States in space activities, might be encouraged to consider allocating a percentage of their budget for space activities to this voluntary fund in order to enhance the long-term sustainability of outer space activities, support sustainable development on Earth and support the sustainable utilization of space.]

Guideline 24

Share experience related to the long-term sustainability of outer space activities and develop new procedures, as appropriate, for information exchange

24.1 States and international intergovernmental organizations should share, [as mutually agreed] experiences, expertise and information relating to the long-term sustainability of outer space activities, including with non-governmental entities, and develop and adopt procedures to facilitate the compilation and effective dissemination of information on the ways and means of enhancing the long-term sustainability of space activities[, without any discrimination]. When further developing their information-sharing procedures, States and international intergovernmental organizations could take note of existing data-sharing practices used by non-governmental entities.

24.2 The experiences and expertise acquired by those engaged in space activities should be regarded as instrumental in the development of effective measures to enhance the long-term sustainability of outer space activities. States and international intergovernmental organizations should therefore share relevant experiences and expertise to enhance the long-term sustainability of space activities[, without any discrimination].

D. Scientific and technical research and development[11]

E. Implementation, review and updating of the guidelines

[*Two alternative formulations for the Implementation, review and updating of the guidelines are given below for consideration by delegations*.]

[*Alternative 1*]

23. States and international intergovernmental organizations engaged in or intending to engage in space activities should establish an implementing framework that [results in] [ensures] rigorous, consistent and comprehensive adherence to the present guidelines, to the greatest extent practicable , subject to national legislation. The guidelines should be understood to comprise a compendium of internationally recognized measures for, and commitment to, ensuring the long term sustainability of outer space activities and, in particular, enhancing the safety of space operations.. [Compliance with] [Implementation of] the guidelines should be demonstrated in a transparent manner. [States and international intergovernmental organization should be encouraged to effectively administer existing and, if necessary, establish new procedures to meet requirements associated with the guidelines and provide appropriate regulatory oversight.] Research by States and international intergovernmental organizations on the sustainable use of outer space and on the development of sustainable space technologies, processes and services should continue, as recommended in the guidelines, in order to address those areas. As the conduct of space activities evolves, and as more knowledge is gained, the guidelines should be periodically reviewed and revised to ensure that they continue to provide effective guidance to States and all entities engaged in space activities to promote the long-term sustainability of outer space activities.

24. The United Nations should be regarded by States and international intergovernmental organizations as the principal forum for continued institutionalized dialogue on issues related to the implementation of the guidelines. [The United Nations should, through the Committee on the Peaceful Uses of Outer Space, provide

[11] The guidelines from the present section have been moved to part A.

for specific issues associated with the implementation of the guidelines to be discussed, examined and agreed on.] [In that respect, the Committee on the Peaceful Uses of Outer Space should consider inviting States and international intergovernmental organization to provide regular status reports on their experience applying the guidelines] [,perhaps in connection with the already longstanding transparency and confidence-building mechanism,] [either in a dedicated format and/or as part of annual reports on national space activities]. [States and international intergovernmental organizations are encouraged to share their practices or experiences in the Committee on the Peaceful Uses of Outer Space regarding the implementation of the presented guidelines.] [Consistent with their responsibilities under the existing outer space treaties, conventions, principles and resolutions, States and international intergovernmental organizations should also work within the Committee on the Peaceful Uses of Outer Space, and with the Office of Outer Space Affairs as appropriate, to address concerns raised about the implementation of the guidelines.]

25. Research by States and international intergovernmental organizations on the sustainable use of outer space and on the development of sustainable space technologies, processes and services should continue, as recommended in the guidelines, in order to address those areas. As the conduct of space activities evolves, and as more knowledge is gained, the guidelines should be periodically reviewed and revised to ensure that they continue to provide effective guidance to States and all entities engaged in space activities to promote the long-term sustainability of outer space activities.

26. Proposals for new guidelines or amendments to existing guidelines may be submitted by States for consideration by the Committee.

[*Alternative 2*]

23. States and relevant international intergovernmental organizations engaged in or intending to engage in space activities are encouraged to consider establishing an implementing framework for the present guidelines, to the greatest extent practicable and in accordance with applicable their national policies, laws, regulations and administrative procedures in force.

24. The relevant United Nations body serving as the principal forum for continued institutionalized dialogue on issues related to the implementation and reviewing of the guidelines is the Committee on the Peaceful Uses of Outer Space.

25. The guidelines are based on the substantial body of knowledge that exists for conducting space activities in a safe and sustainable manner. However, the development of the guidelines has also revealed areas in which the state of scientific and technical knowledge, or the levels of experience gained, are not yet adequate for providing a sound basis for recommending a guideline. Research by States and relevant international intergovernmental organizations on the sustainable use of outer space should continue to enable States to periodically review and revise the present guidelines to ensure that they continue to provide effective guidance to promote the long-term sustainability of outer space activities.

26. Possible proposals for amending these guidelines may be submitted by a Member State of the Committee on the Peaceful Uses of Outer Space for consideration by the Committee.