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Updated set of draft guidelines for the long-term sustainability of outer space activities

Note by the Secretariat

At its fifty-third session, in February 2016, the Scientific and Technical Subcommittee of the Committee on the Peaceful Uses of Outer Space requested the Secretariat to present to the Committee at its fifty-ninth session a revised version of document A/AC.105/C.1/L.348, including updates to the text of the guidelines as presented during the fifty-third session of the Subcommittee (A/AC.105/1109, para. 221). The present document is therefore based on the previous version of the updated set of draft guidelines, as contained in A/AC.105/C.1/L.348, and includes updates to the text of the draft guidelines as presented during the fifty-third session of the Subcommittee. Where suggestions for updates to the text of the draft guidelines overlapped, the Chair of the Working Group on the Long-term Sustainability of Outer Space Activities has attempted to include in this document a balance of the various views.

The draft guideline numbers appearing in document A/AC.105/C.1/L.348 have been retained in this version of the updated set of draft guidelines for ease of reference. The ideas contained in draft guideline 5 have, however, been assimilated into the text of draft guideline 6 and therefore the text of draft guideline 5 no longer appears in the set of draft guidelines.

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

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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.

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 possibilities of collisions and interference with the operation of space objects raise concerns about the long-term sustainability of space activities, particularly in the low-Earth orbit 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 providing 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 is to remain an operationally stable, safe and conflict-free environment for future generations, open for peaceful uses and international cooperation. The guidelines address the policy, regulatory, operational, safety, scientific, technical, international cooperation and capacity-building aspects of space activities. As such, they support the objectives of various transparency and confidence-building measures in outer space activities proposed by the Group of Governmental Experts on Transparency and Confidence-Building Measures in Outer Space Activities.[1]

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 and protect the outer space environment in such a manner that takes into account the needs of future generations.

6. The long-term sustained development of outer space activities implies a balance between the needs of States, international intergovernmental organizations and the international community in general for an intensive use of outer space and the abilities thereof to maintain outer space fit for operationally safe, stable and

[1] Report of the Group of Governmental Experts on Transparency and Confidence-Building Measures in Outer Space Activities (A/68/189).

conflict-free use. Ensuring long-term sustainability of outer space should be understood to mean a strategy, as collectively and individually pursued by States and international intergovernmental organizations, of achieving the objectives of chrono-holistic transition to space policy design and implementation that would provide strong rationale, as well as practical opportunities and incentives, for keeping such a balance. States and international intergovernmental organizations are to assure a full understanding and support of these objectives across all sectors of their space activities and with regard to all aspects of space policy decision-making.

7. The concept and policy of ensuring the long-term sustainability of outer space activities, as the guidelines endow them with specific regulatory functions, entail the need to identify a general context of, and modalities for, continuous changes for the better in the way States and international intergovernmental organizations, while developing, planning and executing their space activities, attest to their peaceful intentions with regard to outer space and take into meaningful consideration the imperative of preserving outer space environment for future generations. In consonance with this overriding task it should be strongly presumed that the interests of States and international intergovernmental organizations in outer space, as they have or may have defence/national security implications, are to be fully compatible with preserving outer space free for exploration and use, as well as safeguarding its status pursuant to article I of the 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies 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 meet contingencies in outer space.

8. 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, and to all phases of a mission life cycle, including launch, operation and end-of-life disposal.

9. The guidelines provide a foundation for the development of national and international practices and safety frameworks for conducting outer space activities, while allowing for flexibility in adapting such frameworks to specific national circumstances and organizational structures.

10. The legal framework relevant to the guidelines includes the existing United Nations treaties and principles on outer space. 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 regulatory requirements.

11. The guidelines themselves 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 these guidelines should be interpreted as a revision, qualification or reinterpretation of these principles and norms.

12. The implementation of the guidelines is considered a prudent and necessary step towards preserving the outer space environment for 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.

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

II. Guidelines for the long-term sustainability of outer space activities

14. The following set of voluntary guidelines establishing the concept of, and defining basic criteria and domestic and international practices for ensuring, the long-term sustainability of outer space activities is premised on the understanding that outer space is to continuously remain an operationally stable, safe and conflict-free environment for future generations, open for peaceful uses and international cooperation, as intrinsically interrelated with the international community making 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 conducive to and instrumental in the application of the guidelines for the long-term sustainability of outer space activities.

15. In applying the guidelines in good faith, States and international intergovernmental organizations should provide for the establishment and effectuation of an appropriate system for internal regulation (including the necessary procedures and requirements) and international cooperation mechanisms in order to execute relevant functions with the aim of performing tasks related to ensuring the long-term sustainability of outer space activities.

16. The guidelines, as applied by States and international intergovernmental organizations through the use of appropriate means that would neither neglect nor challenge in any formal or practical way the existing applicable principles and norms of international law, are designed to provide an effective regulatory framework for addressing practical ways and means of 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.

17. In achieving the goal of ensuring the long-term sustainability of outer space activities, States and international intergovernmental organizations should refrain from any acts and practices, as well as from the use of means or methods, that could, purposefully or inadvertently, affect in any way, in violation of the applicable principles and norms of international law, and/or harm, in the same manner, assets in outer space and/or lead to the evolvement of circumstances which could render full and effective application of the guidelines impracticable on national security grounds.

18. Without prejudice to any of the constituent elements of the concept of and practices for ensuring the long-term sustainability of outer space activities, risk monitoring for the purpose of identifying factors influencing the nature and magnitude of risks in the various segments of outer space activity and potential hazardous situations and developments in the space environment should be perceived as the most challenging task in terms of providing the context for creating incentives with regard to putting into effect and observing operational procedures whereby States and international intergovernmental organizations could, considering applicable legislative and conventional regulations, effectively cooperate, advising and assisting each other in all practical ways possible.

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

A. Policy and regulatory framework for space activities

Guidelines [...] to [...] 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 for peaceful purposes and 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 addresses 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. This guidance also includes measures to facilitate sharing of information on space objects and orbital events and sharing of contact information for entities responsible for spacecraft operations.

Guideline 1 [formerly guidelines 9 + 12]

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

1.1 States should adopt, revise or 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 long-term sustainability of outer space activities.

1.2 With the increase of 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. It is important for national regulations to address the specific nature and characteristics of the State's space sector, as well as its general economic framework, which provides the context in which the space sector may further expand.

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.

Guideline 2 [formerly guidelines 10 + 11 + 13 + 22 + 23]

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. Ways to manage risks to public health and safety can include: quality assurance and risk management techniques; methodologies to assess probabilities of injury to people or damage to property from objects reaching the surface of the Earth from space or as a result of launch attempts; probabilistic risk assessments, hazard analyses and environmental impact studies that address the complete life cycle of space missions; and measures for planetary protection. In cases of controlled re-entries of spacecraft or launch vehicle orbital and/or suborbital stages, States and international intergovernmental organizations should consider furnishing notices to aviators and mariners using already established procedures;

(d) Promote regulations and policies that support the idea of minimizing the impacts of human activities on Earth as well as in the outer space environment. They are encouraged to plan their activities based on 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 [formerly guidelines 14 + 32 + 33]

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. States should ensure that appropriate communication and consultation mechanisms are in place within and among the competent bodies that oversee or conduct space activities.

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 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.

3.6 States and international intergovernmental organizations undertaking space activities that involve the use of nuclear power sources should, prior to using nuclear power sources in outer space, implement the Safety Framework for Nuclear Power Source Applications in Outer Space through applicable mechanisms that provide a regulatory, legal and technical framework that sets out responsibilities and assistance mechanisms and conforms with the intent of the Principles Relevant to the Use of Nuclear Power Sources in Outer Space, applicable international law, the Charter of the United Nations and the United Nations treaties on outer space.

Guideline 4 [formerly 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, the Convention 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-R Recommendations.

4.5 States and international intergovernmental organizations should assure 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.

[Guideline 5]

[*Note*: The ideas contained in draft guideline 5 have been assimilated into draft guideline 6 and therefore the text of draft guideline 5 no longer appears in the set of draft guidelines.]

Guideline 6 [formerly guideline 40]

Enhance the practice of registering space objects

[*Two alternative formulations of paragraph 6.1 are given below for consideration by delegations*.]

[*Alternative 1*]

[6.1 States and international intergovernmental organizations, acting in support of the objectives of the Convention on Registration of Objects Launched into Outer Space of 14 January 1975, should, on a continuous basis, take measures to ensure effective and comprehensive implementation of the registration procedure established by the said Convention. In this context, they should also undertake to translate into successful political action, through practical tools and normative regulation, the accomplishment of the tasks of enhancing the practice in registering space objects, as set by the relevant resolutions and recommendations of the United Nations General Assembly, so that the procedures for provision of expanded registration information gain wide international acceptance and are sustained in the long term. States and international intergovernmental organizations should act in this domain in a responsible way, considering proper registration of space objects an important factor of security in outer space, and should accordingly be guided by, and make their policies contingent upon, the following overriding principles and understandings.]

[*Alternative 2*]

[6.1 States and international intergovernmental organizations should, in accordance with the provisions and the objectives of the Convention on Registration of Objects Launched into Outer Space of 14 January 1975, [as well as the relevant international legal norms,] ensure the effective and comprehensive implementation

of registration practices as recommended by the United Nations General Assembly. To that purpose, States and international intergovernmental organizations should adopt appropriate policies and regulations for enhancing those practices, in particular as they include the communication of expanded information on the space objects, on its operation and on its status, with a view to making such practices subject to broad international acceptance and sustained in the long term. States and international intergovernmental organizations should act responsibly to that end, considering proper registration of space objects as a determinant factor of safety and security in outer space, and therefore, as a condition for the long-term sustainability of space activities. To that purpose, the appropriate State to authorize and supervise the performing of the launch of an object into outer space, according to article VI of the Outer Space Treaty, should ensure that, prior to the launch, all appropriate arrangements and commitments are duly taken in order to have the object properly registered by (one of) the launching State(s).][2]

6.2 It should be conclusively assumed and/or provided for under regulatory instruments enforced by States and international intergovernmental organizations and related to space policies that States and international intergovernmental organizations should not, in any formal or practical way, neglect or unduly perform the procedure of registration, and that non-registration of space objects may have serious negative implications for ensuring the safety of space operations. States and international intergovernmental organizations should [discourage non-registration and should not provoke, support or allow any non-registration practices for whatever reason] [not support or allow [registration] 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.

[*Two alternative formulations of paragraph 6.3 are given below for consideration by delegations*.]

[*Alternative 1*]

[6.3 In the case that it can be plausibly [maintained] [asserted] that a space object has not been registered in accordance with the criteria provided for in the Registration Convention and resolutions of the General Assembly, States and international intergovernmental organizations may direct a request to the State(s)/international intergovernmental organization(s) that presumably abstained from registration to clarify its intentions or officially refute the fact of non-registration. Any assumption of non-registration should be substantiated accordingly. Such requests should be responded to, and the presumed fact of non-registration should be commented on, with a view to clearing up any possible misconceptions and/or resolving concerns. In making appropriate responses, the requested States/international intergovernmental organizations should, when appropriate, provide for the assurance of the absence of ulterior motives and/or specific intent behind a non-registration that actually took place. [States and international intergovernmental organizations are obliged to act in such a way as to avoid abuse of the right to direct such requests.]

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[2] At the intersessional meeting of 5-9 October 2015, it was proposed that if alternative 2 for paragraph 6.3 is accepted, the last sentence of this paragraph could be deleted.

[*Alternative 2*]

[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 organizations that could qualify as the launching States of that space object to jointly determine which State or entity should register the space object. After a space object is launched, should State[s] have reason to believe that a space object will not be registered, States should coordinate with States that may have launched that particular object, and/or with those States which have jurisdiction and control over the non-registered space object, to determine which State or entity should register the space object. In the event that a State receives a registration inquiry, that State should respond as soon as practicable in order to determine which State or entity should register the space object.]

6.4 The Office for Outer Space Affairs should[, on a continuous basis, be vested with appropriate authority to take action to establish and sustain an implementation mechanism that would enable it to satisfactorily achieve the goal of encouraging and ensuring the adherence of States and international intergovernmental organizations to consolidated practice in furnishing expanded registration information. Specifically, the Office should] be effectively engaged in executing integrated functions pertaining to: the accumulation of information on orbital launches performed (i.e., actually completed launches resulting in the placement of objects into Earth orbit or beyond) and orbital objects (i.e., space objects which have actually been launched into Earth orbit or beyond)[; and 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].

6.5 The launching States and, where appropriate, international intergovernmental organizations should assume the responsibility for requesting, on legitimate grounds, space launch service providers and users to meet all registration requirements under the Registration Convention, and for encouraging their receptiveness to the feasibility of, 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. [In cases where such practice ceases to correspond to the interests of a State, in particular within the purview of its national security policies, or the interests of an international intergovernmental organization, in particular pertaining to security, such State or international intergovernmental organization should, in an official statement forwarded to the Office for Outer Space Affairs, identify circumstances that make such continued practice impossible.]

[6.6 States and international intergovernmental organizations, acting in a responsible way in the interests of ensuring the safety of space operations, should to the maximum extent possible provide information describing the condition (status) of a space object and changes in orbital location of a space object. Description of the condition (status) of a space object should be provided as correlated with the following indicative list of circumstances of its flight, which is to be considered immediately responsive to the task of ensuring the safety of space operations and

functionally equivalent to the occurrences presumed in paragraph 2 (b) (ii) of General Assembly resolution 62/101:

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

(b) Loss of functionality of a space object due 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 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 the construction elements which purposefully change properties of a space object that influence its orbital lifetime.]

6.7 States and international intergovernmental organizations, acting in the same manner, should to the maximum extent possible provide the information which is presumed in paragraph 4 (a) (iii) of General Assembly resolution 62/101 and which describes changes in the orbital location of the space object, in accordance with the following indicative list:

(a) Purposeful change of orbital parameters of a space object as a result of which the said 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 this 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, in the course of registering the main space object (at the stage of entry 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 separation from the main one, with the understanding that those space objects should not be given different or modified names at the stage of subsequent registration.

[6.9 [In accordance with General Assembly resolution 62/101, on registration practices,] [Consistent with article 4, paragraph 2, of the Registration Convention,] States and international intergovernmental organizations should provide information to the Office for Outer Space Affairs on all space activities or objects that involve the use of nuclear power sources in outer space through the internationally accepted mechanisms.]

Guideline 7 [formerly guideline 38]

Commit, in national legal and/or policy frameworks, 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 activities solely for peaceful purposes. When doing so, States should bear in mind the report of the Group of Governmental Experts on Transparency and Confidence-Building Measures in Outer Space Activities.[3]

7.2 This would not prevent the conduct of monitoring activities, which are essential for national security but would represent a contribution to a regime of transparency and confidence-building measures. Insofar as States may have legitimate security interests in outer space, these interests should comply with relevant international law and should take into account the common interests of all humankind. 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 shall 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 such weapons in outer space in any other manner. Accordingly, States are encouraged to work collectively to prevent threats to the peace, safety, security and sustainability in outer space.

7.3 States should refrain from conducting activities that may give rise to concerns by other States. In the event such activities should prove necessary, the State conducting them should endeavour to inform all potentially affected States and the Office for Outer Space Affairs.

Guideline 8 [formerly guideline 39]

Implement operational and technological measures of self-restraint to forestall adverse developments in outer space[4]

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 involved non-governmental entities under their jurisdiction and/or control, have a basic awareness of the need to align the objectives sought and the means employed by them with criteria and

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[3] A/68/189.

[4] At the intersessional meeting of 5-9 October 2015, it was proposed that this draft guideline be moved to the "Safety of space operations" section of the guidelines. The Working Group has, however, not yet taken a decision on this.

requirements attributable under international law, including the provisions of article IX of the 1967 Outer Space Treaty, and should make sure that such operations do not interfere with foreign space objects, unless such interference is expressly agreed to by the States or international intergovernmental organizations that exercise jurisdiction and/or control over them.

8.2 In undertaking space operations with a view to gathering information to acquire insight into objects, events and situations in near-Earth space orbit through required general surveillance and monitoring, which may presumably involve approaches at relatively short distances and fly-bys in close proximity compromising the safety and security of foreign space objects, States and international intergovernmental organizations should provide for safeguards to forestall adverse effects on foreign space objects, both physical and operational, by restricting discretion in the use of techniques and by selecting alternatives.

8.3 To avoid the development of tensions or situations in outer space that could necessitate appropriate responses, States and international intergovernmental organizations, by taking full cognizance of limitations derived from international law and related internationally recognized standards to be followed when assessing and/or directing actions in outer space, should, as a general rule, refrain from applying to foreign space objects methods and techniques that they themselves would not deem pertinent and/or acceptable as applied to their own space objects.

8.4 States and international intergovernmental organizations, especially those that have relevant capacities and practices, should annually file with the Office for Outer Space Affairs valid statements and, as necessary, supplements/updates thereto, containing, in a generalized form, their assessment of the situation in outer space from the perspective of overall considerations of maintaining outer space as an operationally safe, stable and conflict-free environment as well as characteristics (as detailed as they deem necessary) of the phenomena and events which influence the security of outer space and should be comprehensively considered in evaluating threats and hazards for space activities.

Guideline 9 [formerly guideline 43]

Implement policy aimed at precluding interference with the operation of foreign space objects through unauthorized access to their on-board hardware and software[5]

[*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 1967 Outer Space Treaty, should not directly or indirectly engage in, and/or associate themselves with, activities that support or assist any practice

[5] At the intersessional meeting of 5-9 October 2015, it was proposed that this draft guideline be moved to the “Safety of space operations” section of the guidelines. The Working Group has, however, not yet taken a decision on this.

whereby any instruments and/or software that are, in functional terms, originally intended or purposefully modified for unauthorized interference in the regular operation of hardware and/or for unauthorized access to 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 (users). Likewise, States and international intergovernmental organizations should require entities under their jurisdiction and/or control to provide guarantees (assurances) against any such practice on their part or that of their personnel or contractors (subcontractors) at any tier. 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 (user). It should be a common understanding that any practice to the contrary, irrespective of motives that presumably 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 as may be embedded in space objects could, if conceivably activated, negatively affect the operational capabilities and mission sustainment of the space objects accommodating them and, specifically, escalate the risks of failures and increase the incidents/accidents probability.

9.2 Considering that any practice addressed by this guideline and purporting to exert an effect on foreign space objects such as to lead, in particular, to the compromising of command transmissions would intrinsically be fraught with the denial of rights and interests of States and international intergovernmental organizations that exercise jurisdiction and/or control over said assets in outer space, such practices should be qualified as violative of, and/or prejudicial to, the principles and norms of international law, specifically those deriving from article IX of the 1967 Outer Space Treaty, as well as the established criteria for good-faith practices and commercial integrity.

9.3 States and international intergovernmental organizations should give appropriate consideration to ways and means of providing for such a state of affairs where the understanding recorded in this guideline would be reinforced, directly by them and by non-governmental entities under their jurisdiction and/or control, through practical actions at the institutional and technical levels. Such efforts should be undertaken with a view to creating the prerequisites for consolidating international regulation in the area addressed by drafting and adopting a separate high-level policy document (for example, in the form of an international charter).]

[*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 communication technology products. States should seek to prevent the proliferation of malicious information and communication technology tools and techniques and the use of harmful, hidden functions.]

Guideline 10 [formerly guideline 42]

Refrain from intentional modifications of the natural space environment[6]

10.1 States and international intergovernmental organizations should support a clear understanding that challenges associated with ensuring the safe and responsible conduct of space operations provide an imperative to focus on the avoidance and management of crisis situations that may be associated with a misuse of technologies and technical means of intentional modification of the natural space environment, thereby posing threats to, and/or causing vulnerabilities of, space systems. Acting to uphold, [as applicable] through participation and/or application, vigilant compliance [with] [by States parties to] 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, in furtherance of the aggregate concept characteristic of that Convention, prioritize those aspects and criteria that meet the safety needs of space operations. States and international intergovernmental organizations should agree that the use of environmental modification techniques for peaceful purposes, formally not hindered by the Convention, may, unless supported by criteria and procedures critical to safety, damage or harm the operational space objects in orbit and thus cause widespread and/or long-lasting, and/or severe effects under the Convention, in the sense that 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 this guideline, deliberate manipulation of natural processes shall mean intentional alteration of the characteristics of the space environment (electronic 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 engage in and/or allow entities under their jurisdiction and control to engage in the use of modification techniques that could impact the condition of the space environment in a way that would negatively (in addition to objective factors of the space environment) influence operational spacecraft and associated means of ground infrastructure to a degree either equivalent to or comparable to effects described in article I of the Convention. States and international intergovernmental organizations should be fully aware that such negative influence may lead to the incapacitation of operational spacecraft and associated means of ground infrastructure and, consequently, the increase in the number and frequency of collisions and the proliferation of small objects (particles) of space debris, interference in space radio links, failures in space objects' control processes, on-board equipment and navigation systems, and the distortion of radio signals used in technical means for measuring the trajectory parameters of space objects.

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[6] At the intersessional meeting in October 2015, it was proposed that this draft guideline be moved to the "Safety of space operations" section. The Working Group has, however, not yet taken a decision on this.

10.3 States and international intergovernmental organizations should give issues that form the substance of this guideline proper preventive and reactive regulation applicable to activities they or their related entities conduct or participate in, which would include:

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

(b) Designing and implementing administrative, operational and technological restraints, respectively, at the stage of establishing and throughout the implementation path of experiments or other types of activity involving any deliberate manipulation of natural processes in the context provided for in this 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 this guideline, so that the use of such manipulation techniques does not result in damaging phenomena.

10.4 Notwithstanding paragraph 2 of article III of the Convention and without prejudice to the procedures provided for in guideline 16 (“Share operational space weather data and forecasts”), should a fact 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 open for consultation and/or provision of information, if available, in the event of a request on the part of other States and international intergovernmental organizations interested in such consultations and/or information for good and valid reasons.

B. Safety of space operations

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

Guideline 11 [formerly guideline 20]

Provide contact information and exchange information on space objects and orbital events

11.1 States and international intergovernmental organizations should exchange regularly updated contact information for entities authorized to engage in appropriate information exchanges and/or responsible for spacecraft operations and conjunction assessment and should establish appropriate means to enable timely coordination to reduce the probability of, and facilitate effective responses to, orbital collisions, orbital break-ups and other events that might increase the probability of accidental collisions.

11.2 In order to enable information exchange in contingency situations, States and international intergovernmental organizations should designate, and make publicly available contact information for, entities with the authority and capability to engage in information exchanges, process incoming incident reports and forecasts and serve as contact points with regard to adopting precautionary and response measures, thus supporting crisis warning and management mechanisms.

11.3 States and international intergovernmental organizations should exchange relevant information on space objects, as mutually agreed, and information related to actual or potential situations in near-Earth space that may affect the safety and security of outer space operations.

11.4 The providing (transferring) entity is encouraged to ensure that such information exchanged is reliable, accurate and complete, to the extent practicable, and conclusively presumed as such by the providing (transferring) entity. Its time reference and period of applicability should be noted. This information should be exchanged in a timely manner to enable precautionary actions.

11.5 To implement this guideline, States and international intergovernmental organizations should, through a dedicated consultative process, consider and 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 to serve the purpose of ensuring unified record-keeping on objects and events in space.

11.6 As part of identifying pragmatic approaches to improving the functionality and reaching the goal of reinforcing potentials for collaborative information sharing issues to be addressed, States and international intergovernmental organizations should consider the options to effectively accumulate and provide access to information on objects and events in outer space on a timely basis and to achieve consistency in the interpretation and use of the information as one of the means to support the activities of States and international intergovernmental organizations aimed at maintaining the safety of space operations. The options for consideration could include the possible establishment of a United Nations information platform as a core element of a distributed international information system for multilateral cooperation in sharing and disseminating multi-source information on objects and events in near-Earth space.

Guideline 12 [formerly guidelines 24 + 26]

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 [formerly guideline 21]

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 14 [formerly guideline 25]

Perform conjunction assessment during all orbital phases of controlled flight

14.1 States and international intergovernmental organizations should, through national mechanisms or international cooperation, perform conjunction assessment during all orbital phases of controlled flight. States should encourage entities under their respective jurisdiction and/or control that conduct space activities to perform such conjunction assessment.

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

14.3 Appropriate steps of the conjunction assessment process include improving the orbit determination of relevant space objects, screening current and

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

14.4 States and international intergovernmental organizations should develop and implement common approaches to conjunction assessment, including sharing information on the proper interpretation and usage of the conjunction information.

14.5 States and international intergovernmental organizations should assist spacecraft operators, including those of non-governmental entities, that are unable to perform conjunction assessments, to seek support, via State authorities, as necessary and in accordance with relevant applicable regulations, from appropriate around-the-clock conjunction assessment entities.

Guideline 15 [formerly guideline 41]

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 be urged to consider the pre-launch assessment of possible conjunctions and collisions of newly launched space objects with space objects already present in near-Earth orbit, as well as international coordination of planned on-orbit operations, as prospectively rewarding from the standpoint of managing the safety of space operations. States and international intergovernmental organizations should undertake efforts on a continuous basis and in a sufficiently consistent and integrated fashion to endorse the development and implementation, as technically feasible, of their long-term policy requirements designed to adequately address and accomplish this task. Conditions for the proactive engagement of States and international intergovernmental organizations in cooperative relationships and for the establishment, in the long term, of an appropriate operative information-sharing framework could include the development and use of a common international standard for representing and sharing appropriate information on the nominal flight trajectory of a launch vehicle during the insertion of spacecraft (payloads). [Notwithstanding bilateral or multilateral forms of cooperation as may be deemed feasible by relevant participants, States and international intergovernmental organizations should, when performing a pre-launch assessment of potential conjunctions and collisions of newly launched space objects with space objects already present in near-Earth orbit, duly avail themselves of the opportunities and benefits for the gathering and distribution of trajectory information on space objects already in outer space that are afforded by the centre for information on near-Earth space monitoring, under the auspices of the United Nations.]

15.2 In order to ensure the development of cooperative activities involving the sharing of detailed data and the elaboration of appropriate procedures for the purposes of the safety of space operations, States and international intergovernmental organizations should be encouraged to provide, where possible, pre-launch notifications containing information on planned dates and times of scheduled launches, types of launch vehicles and basic information on space objects planned for insertion into orbit with reference to the destination regions of

near-Earth outer space where newly launched objects are intended to be placed and/or basic parameters of nominal orbit for each object and the possible dispersion of their values. It should be the general understanding that recourse to pre-launch notifications featuring provision of both sets of information identified above could, as an internationally recognized practice, acquire a stable pattern and be sustained as a routine shared standard of action parallel to the enhancement of the space security regime, including, inter alia, transparency and confidence-building measures in outer space activities. Such a favourable combination of factors would serve to eliminate the motivational issues that may inhibit the formation of a comprehensive practice in this area. Special attention must be given to address, as an immediate task, the issue of placing into the practical implementation perspective a procedure for providing information on planned dates and time of scheduled launches, types of launch vehicles and basic information on space objects planned for insertion into orbit with reference to the destination regions of near-Earth outer space where newly launched objects are intended to be placed, as this would require significantly less effort for the new technical and associated procedures to be introduced and simultaneously provide a focused matching of solution to need and practical opportunity.

15.3 [States and international intergovernmental organizations, acting in compliance with statutory tasks and responsibilities under their legislative and conventional regulations, should, through achievable and pragmatic steps, support and reinforce the potential for partnership with industry and ensure prerequisites for concerted activity on its part with a view to initiating and/or continuously proceeding with studying and exploring concepts of upgrading launch vehicle control systems that would permit the introduction of a procedure for making changes in flight programmes in order to ensure rapid response to unforeseen collision risks during an actual launch.] States and international intergovernmental organizations should undertake efforts to develop and use a standard format for the generation and pre-launch sharing of information on 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 encounters and coordinate planned in-orbit operations accordingly. The experience gained and methods developed should, accordingly, be summarized and should be sought to be institutionalized and, in due course, be 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 address the task of achieving, through appropriate mechanisms, commonality or convergence of the practices developed and to promote their use to meet the objectives of practical and effective safety measures.

Guideline 16 [formerly guidelines 27 + 29]

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 archival 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 [formerly guidelines 28 + 30]

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 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.

Guideline 18 [formerly guideline 35]

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

18.2 Such a comprehensive approach requires collective acceptance of responsibilities by States and international intergovernmental organizations to establish and pursue, within the framework of their information security (cybersecurity) doctrines and strategies and through active efforts at the international level, an information security policy that would appropriately address the need for, and modalities of, effective cooperation in preventing, identifying,

investigating and deterring malicious usage of information and communications technologies and/or any other activities incompatible with the task of mitigating vulnerabilities of, and precluding disruptions to, critical national, foreign and international information infrastructures, that may be directly associated with ensuring 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, establish liaisons and engage in practical interaction with each other in response to relevant real-time, emerging and potential threats and incidents in the segment under consideration.

18.3 Taking into account applicable international law, including the principles of the Outer Space Treaty and the relevant provisions of the ITU Constitution, 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 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. States and international intergovernmental organizations should provide, at the policy level, for the exclusion of any other actions that could impair or adversely affect the serviceability of terrestrial infrastructure under foreign jurisdiction and/or control. To facilitate communications 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 Additionally, States and international intergovernmental organizations should strengthen the security and resilience of their own terrestrial infrastructure that supports the operation of orbital systems. States and international intergovernmental organizations party to the establishment and/or operation of a given terrestrial infrastructure that supports the operation of orbital systems are encouraged to cooperate to strengthen the security and resilience of that terrestrial 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 In considering appropriate measures for the protection and the resilience of terrestrial infrastructure and information infrastructure used for the operation of and 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 supported services.

18.6 By way of implementing this guideline, States and international intergovernmental organizations should provide for a regulation which ensures that methods and procedures used to support resilience of terrestrial infrastructure are consistent with and do not prejudice responsibilities to preclude any action that could impair or adversely affect the operation of terrestrial and information infrastructures under foreign jurisdiction and/or control.

Guideline 19 [formerly guideline 37]

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. States and international intergovernmental organizations, therefore, 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 principles of the Outer Space Treaty and the relevant provisions of the ITU Constitution, 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 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 communications 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 Additionally, States and international intergovernmental organizations should strengthen the security and resilience of their own terrestrial infrastructure that supports the operation of orbital systems. States and international intergovernmental organizations party to the establishment and/or operation of a given terrestrial infrastructure that supports the operation of orbital systems are encouraged to cooperate to strengthen the security and resilience of that terrestrial 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 In considering appropriate measures for the protection and the resilience of terrestrial infrastructure and information infrastructure used for the operation of and 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 supported services.

Guideline 20 [formerly guideline 34]

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 execution of, or involvement in, operations for active removal of [known] space debris, functioning space objects and/or non-functioning space objects, should, in the process of making their judgements with regard to 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 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 reckon with the overriding task associated with the preclusion of any actions or omissions that could create vulnerability of, a threat to, and/or result in the loss of other State-, international intergovernmental organization- or foreign entity-owned or operated orbital systems, complexes and means, including operational malfunction, degradation or loss of integrity thereof, in part or whole, and thus impair or circumscribe rights and interests of the said States, international intergovernmental organizations or foreign entities. It should be commonly understood that any active removal operations:

(a) Rule out coercive technological impacts on the above-mentioned space assets in the absence of appropriately authenticated prior concurrence of, and authority explicitly conferred by, the State (including the State of registry), international intergovernmental organization and/or entity concerned;

(b) May not lead to any jurisdiction and/or control functions irregularities with regard to such foreign assets.

[20.3 It should be presumed that this guideline equally applies to any operation in outer space that involves any kind of physical impact on a space object.]

Guideline 21 [formerly guideline 44]

Establish procedures and requirements for the safe conduct, in extreme cases, of operations resulting in the destruction of in-orbit space objects[7]

[*Two alternative formulations of guideline 21 are given below for consideration by delegations*]

[*Alternative 1*]

[21.1 States and international intergovernmental organizations, while [fully adhering to] [taking into consideration] the Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space, in particular as regards the need to avoid intentional destruction of on-orbit spacecraft, are entitled to preserve options and pursue solutions that could provide for such destruction of space objects under their jurisdiction and/or control when alternatives to such operations would persuasively have far more negative consequences (as may presumably be warranted, for instance, in the context of international efforts to counter an asteroid hazard). Notwithstanding the concept outlined above, it should be generally understood that, as part of ensuring the long-term sustainability of outer space activities and preserving outer space as a safe, stable and conflict-free environment, the intentional destruction of space objects in near-Earth orbits is to be avoided. In

[7] At the intersessional meeting of 5-9 October 2015, it was suggested that language on non-interference would be more appropriate in the preambular text of the guidelines document.

this connection, every hypothetical case where a State or international intergovernmental organization faces an absolute need to perform an operation leading to the destruction of a space object under its jurisdiction and/or control (i.e., when circumstances of its flight afford no other technical option but such destruction) should be duly substantiated, with the destruction operation compellingly described as an unavoidable measure to avert immediate or potential serious threat to human life, the environment or property in outer space or, in case of the predicted entry of a space object into the Earth's atmosphere, on the ground, in the air or at sea. Furthermore, any operation that could result, through mechanical impact or the use of other means, in direct or indirect damage to or destruction of space objects under foreign jurisdiction (foreign control) should not be contemplated unless explicitly agreed to by the States/international intergovernmental organizations that exercise jurisdiction and control over such space objects.

21.2 Well in advance of proceeding, on legitimate grounds, with the operation for the destruction of an in-orbit space object, States and international intergovernmental organizations should take care to ensure adherence to a procedure for reporting on the circumstances of such operations that should provide for the basic elements outlined below. States and international intergovernmental organizations should, through the Office for Outer Space Affairs as well as other relevant channels when necessary, keep the international community appropriately informed of the circumstances that warrant such an operation and additionally inform it, as necessary, on how the evolving situation is assessed. It should be a general principle that the greater the probability of forecasted side effects from an operation, the more nuanced should be the information made available internationally 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 near real-time mode should be properly considered. When developing sets of decisions that presume and substantiate an operation for the destruction of a space object, States and international intergovernmental organizations should provide for safety assurance measures that would include warranted and substantive safeguards, to the extent that such measures are deemed practicable and satisfactory.]

[*Alternative 2*]

[21.1 Intentional destruction of any on-orbit spacecraft and launch vehicle orbital stages or other harmful activities that generate long-lived debris should be avoided. When intentional break-ups are determined to be necessary, States should inform[, directly or through relevant international organizations,] other potentially affected States of their plans, including measures that will be taken to ensure that intentional destruction is conducted at sufficiently low altitudes to limit the orbital lifetime of resulting fragments. All actions should be carried out in conformity with the Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space, endorsed by the General Assembly in its resolution 62/217, entitled "International cooperation in the peaceful uses of outer space".]

Guideline 22 [formerly guideline 45]

Develop criteria and procedures for the active removal of space objects and, under exceptional circumstances, 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 at the stage of designing and implementing relevant operations, States and international intergovernmental organizations should align such activities with the provisions of this guideline which supplies and reinforces major criteria for supporting individual and common interests as they should be understood in the context under consideration, including when procedures under the Registration Convention have not been effectuated with regard to objects launched into outer space. States and international intergovernmental organizations should ensure completeness of regulation of the said operations on the basis of a fully integrated approach in order to avoid any loose, random or abusive practices [unless otherwise justified by relevant principles of international law].

22.2 States and international intergovernmental organizations should proceed from the understanding that securing legitimate grounds for operations for active removal/intentional destruction is directly contingent on the reliability achieved in establishing that a specific space object (whether or not registered in the Register of Objects Launched into Outer Space) planned for removal/destruction and a specific physical object in orbit that is presumed to be/is associated with such space object represent one and the same physical body. Positive identification of the object to be actively removed or intentionally destroyed should be perceived as the determining (decisive) factor in the process of deciding to proceed with the operation. Accordingly, until the origin and status of a specific physical object are determined in a sufficiently convincing and precise way, that object should not be regarded as an immediate (established) target for active removal/intentional destruction operation. States and international intergovernmental organizations should consistently seek to concert their efforts aimed at establishing and maintaining 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/intentional destruction should be preceded by 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 States and/or international intergovernmental organizations that plan and conduct such operations, with 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, in addition, through other relevant channels. Such operations should be secured informationally and technically 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 informational and analytical support for such operations. Apart from the provision of valid near-Earth space monitoring information and the results of space situational analysis (if such results are available), such support may also include assistance in identifying relevant space

objects on the basis of analysis of the accessible monitoring-information archives and posting of the results of such analysis for general access and use.

22.4 Considering specific features that characterize the development of the practice of applying the Registration Convention and are conditioned by differing views on the function of registration of all component parts of space objects and/or launch vehicles which either do not, ab initio, possess (due to their technologically inherent features) the ability to operate independently or else turn out to be incapable (due to contingencies) of sustained operational capabilities for the mission-specified time period, States and international intergovernmental organizations should, by way of 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 from the following understanding:

(a) The body of rules governing the title to, and status of, a space object, as established under international law, should be understood to be based on the interaction of factors that relate to the precise and operationally conditioned 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 or else have lost the capability to perform their assigned functions, as applied to cases where States and international intergovernmental organizations do not perform the dedicated registration of such component parts and objects, and of other factors that in any case have continued relevance and, in the light of the rights and obligations provided for in articles VII and VIII of the 1967 Outer Space Treaty, should not be dispensed with;

(b) The fact of non-registration of component parts of objects and, when relevant, objects as described in subparagraph (a) above that result from a space launch or contingencies 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 1972 Convention on International Liability for Damage Caused by Space Objects; and the absence of specific information on the said component parts and objects either in the registration information or as a reference to registration entries should not serve to substantiate the divesting of jurisdiction and control over such component parts or objects;

(c) Full concurrence with the practical observations contained in subparagraphs (a) and (b) above should not decrease the motivation on the part of States and international intergovernmental organizations with regard to identifying and configuring, as appropriate, pragmatic and feasible policies that would be instrumental for the ascertainment by the launching State, and/or the international intergovernmental organization that has accepted 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, with the possible outcome being voluntary decisions on the part of the said States and/or international intergovernmental organizations to waive, 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/international intergovernmental organizations in entering into potential 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/prioritized task.

22.5 By way of defining the particular features of the status of fragments (irrespective of their linear dimensions) resulting from break-ups of space objects for whatever reason or from the conduct of technological operations in orbit, consideration should be given to the fact that, for objective reasons, they may not be subject to registration due 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 assumed to 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 which 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 intention to perform registration of such fragments, accompanied by information on planned applications and requests to have such information posted on a relevant information resource of the Office. It should be presumed in this context that a strictly limited period of time is to 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. In case the requests encounter motivated objections they are to be recalled, 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 the allowance for States and international intergovernmental organizations, to provide consistently with their authority and responsibilities in accordance with, and by implication of, the relevant principles and norms of the 1967 Outer Space Treaty, for options that would envisage adjustments to the status of space objects under their jurisdiction and control (including objects that originated from such space objects) which 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 maintaining, as technically feasible, exact and necessary correlation with their liabilities under international law. The

decisions planned for adoption and actually adopted should be explicit as to the context in which specific rights to exercise functions involved in determining the treatment of such objects would either be conferred (assigned) 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 1967 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 criteria should be designed and leveraged to further define liabilities and allocate respective duties 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.

C. International cooperation, capacity-building and awareness

Guidelines [...] to [...] provide guidance on international cooperation measures aimed at promoting the long-term sustainability of outer space activities for Governments and relevant international intergovernmental organizations authorizing or conducting space activities. The guidance includes measures to promote technical cooperation and capacity-building to improve the ability of developing countries to establish their own national capacities, in accordance with national legislation, 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. In particular, sharing of such experience can enhance the safety of space activities and benefit all users of outer space.

Guideline 23 [formerly guidelines 16 + 18]

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 on a mutually acceptable basis, without infringing intellectual property rights and in accordance with relevant international non-proliferation obligations and national legislation and regulations.

[*Two alternative formulations for paragraphs 23.2-23.4 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 cooperation in the long-term sustainability of space activities on a mutually acceptable basis. In this context, particular attention

should be given to the benefits for and interests of developing countries and countries with incipient space programmes. States are free to determine all aspects of participation in the exploration and use of outer space on a mutually acceptable basis. The terms of such cooperative 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 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 concerned should establish appropriate legal and administrative regulations relating to cooperation in cases where such controlled items are exported or imported, and seek to forge collaborative relationships based on mutual benefits and equal advantages with regard to safeguarding controlled items. States should ensure, by means of agreements or other arrangements which are properly institutionalized under national legislation, the safety and security of imported controlled items while they are in the territory of the importing State. In particular, States should enter into consultations to reach agreement in relation to:

(a) Post-sale monitoring and verification to ascertain that controlled items are not at risk of unauthorized use or 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*]

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

aspects of participation in the exploration and use of outer space on a mutually acceptable basis. The terms of such cooperative ventures, for example through contracts and other legally binding mechanisms, should be fair and reasonable.

23.3 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.

23.4 States concerned should establish stronger legal and administrative regulation relating to such 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, institutionalized appropriately under their national legislation.]

23.5 [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 [formerly guidelines 1 + 2]

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 experience and expertise 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. In further developing their information-sharing procedures, States and international intergovernmental organizations could take note of effective data-sharing mechanisms applied by non-governmental entities.

24.2 The experience 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 experience and expertise in order to facilitate and enhance the development of guidelines, rules, regulations and practices to enhance the long-term sustainability of space activities.

Guideline 25 [formerly guidelines 17 + 19 + 31]

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 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 the countries in crisis.

Guideline 26 [formerly guidelines 7 + 8 + 15]

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 an Internet 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 [...] to [...] 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.

Guideline 27 [formerly guidelines 3 + 5]

Promote and support research on 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 and 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.

Guideline 28 [formerly guideline 36]

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.

E. Implementation and updating

Guideline […] provides guidance to States and international intergovernmental organizations on the implementation of these guidelines for the long-term sustainability of outer space activities. Guidance is also provided for sharing information on the implementation of these guidelines and for their updating to incorporate advances in scientific and technical knowledge.

Guideline 29 [formerly guideline 46]

Establish normative and organizational frameworks for ensuring effective and sustained implementation of the guidelines and subsequent activity on their review and enhancement

[*Two alternative formulations for guideline 29 are given below for consideration by delegations*.]

[*Alternative 1*]

[29.1 States and international intergovernmental organizations should, acting in a dedicated fashion, establish a regulatory framework that would lead to, and sustain, [effective implementation of] the guidelines and, specifically, put in place relevant regulations, processes and compliance review arrangements. It should be commonly understood that the guidelines, while being subject to voluntary implementation, are to be perceived in direct relation to, and as a functional augmentation of, the principles and norms of international law, and that their operation should be supported [at the policy level]. The guidelines should, through a manifest process, be officially attributed the status of a standard-setting document establishing internationally recognized conditions for ensuring the safety of space

operations and, in general, the long-term sustainability of outer space activities. Proceeding from such an understanding, States and international intergovernmental organizations should establish a means of effectively administering existing and, if necessary, leveraging new [safety/]security procedures, to meet operational requirements uniquely associated with the guidelines. [Under such] approaches in safety/security affairs as they relate to outer space activities, States are encouraged to secure such a state of affairs whereby they would take account of national security considerations, in the context of pertinent national policy objectives, proportionally to the purposes and tasks of applying the guidelines and in appropriate correlation with the requirements of international cooperation provided for by the guidelines. Decision-making tasks and concepts should be designed so that the understanding outlined above is diligently upheld. Likewise, international intergovernmental organizations should associate their own policies with this understanding and, acting through conventional regulations and engagement with member States, endeavour to ensure that the concept underlying their actions duly correlates with the above understanding.

29.2 The United Nations should be regarded by States and international intergovernmental organizations as the principal venue for continued institutionalized dialogue on issues related to facilitating practical success in the efficient and comprehensive implementation of the guidelines, and the United Nations itself should, acting in this capacity through the Committee on the Peaceful Uses of Outer Space and the Office for Outer Space Affairs, sustain a dedicated policy process and provide for an adaptable decision-making platform in this domain. The Committee should, as necessary, develop sets of solutions, in particular, in the format of agreed understandings (either regulatory or interpretative) that could, following applicable procedures, be formally attached to the guidelines. States and international intergovernmental organizations are strongly encouraged to introduce and support the practice of providing [the Office for Outer Space Affairs] with annual reports, time-framed for the sessions of the Committee, containing assessments of the status of implementation of guidelines. In such reports, States and international intergovernmental organizations should corroborate, with the support of credible estimates and indicators, their perception that current (as of the date of the reports) outer space activities (in general and/or in specific aspects) are safe[, stable] and conflict-free in all major [operational] aspects, thus affirming positive motivations with regard to the implementation of the guidelines. If warranted, such reports should also identify phenomena in outer space and/or developments in outer space activities that appear to be at variance with the guidelines and, hence, would possibly necessitate special consideration by the Committee at its immediate session. In addition, exigency notifications may be filed with the Office referencing occurrences (their plausible attributes and origin) causing particular concerns in the context of implementation of the guidelines pertaining to the safety of space operations and containing an appeal to the Office to mediate in requesting clarification of those occurrences from those States and/or international intergovernmental organizations which may have a relation to such occurrences. As part of projecting an open posture towards information exchanges benefiting effective implementation of the guidelines, specifically, as they relate to safety of space operations, States and international intergovernmental organizations should not neglect reporting to the Office on events that result from their own actions (or omissions to act) or actions (or failure to act) on the part of

non-governmental entities under their jurisdiction and control and may be deemed essentially important in practical terms.]

[*Alternative 2*]

[29.1 States and international intergovernmental organizations engaged in or intending to engage in space activities should establish an implementing framework that results in the rigorous, consistent, and comprehensive adherence to the guidelines. This framework should reflect the fact that, although voluntary in nature, these guidelines serve to augment the principles and norms of international law, and should be reflected in wider national and international policies accordingly. [States are encouraged to implement the guidelines presented above to the greatest extent practicable and in accordance with their national law.

29.2 Consistent with national security considerations, regulatory measures should be established which identify clear requirements for implementation of the guidelines and demonstration of their associated compliance in a transparent manner. In this respect, States and international intergovernmental organizations should provide regular status reports to the Committee on the Peaceful Uses of Outer Space, which include their experience in applying such measures and, consistent with their responsibilities under the existing outer space treaties, conventions, principles and resolutions, work within the Committee on the Peaceful Uses of Outer Space to address concerns raised in the implementation of the guidelines which pertain to the safety of space operations.]

29.3 The guidelines presented above 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 for which the current state of scientific and technical knowledge, or the levels of experience gained, are not yet adequate to provide a sound basis for recommending a guideline. 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 open questions. As the conduct of space activities evolves, which it is doing rapidly, and as more knowledge is gained, the guidelines should be reviewed and revised periodically to ensure that they continue to provide effective guidance to States and to all entities engaged in space activities to promote the long-term sustainability of outer space activities.]