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**Committee on the Peaceful  
Uses of Outer Space**  
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**Long-term sustainability of Outer Space Activities: Proposal  
to adopt a First Set of Guidelines together with a renewed  
Workplan for the Working Group on the Long-term  
Sustainability of Outer Space Activities**

**Proposal by United Arab Emirates**

**A. Background**

1. At its fifty-fourth session in 2010, the Committee on the Peaceful Uses of Outer Space welcomed the establishment of the Working Group on the Long-term Sustainability of Outer Space Activities at its fifty-third session in 2010 (A/AC.105/L.277) and adopted its terms of reference and methods of work at its fifty-fourth session in 2011 (A/66/20, annex II).
2. At its fifty-seventh session in 2014, the Committee agreed that it would, at its fifty-ninth session in 2016:
  - (a) Address, if necessary, any outstanding issues in the Working Group report and the set of guidelines;
  - (b) Consider and agree on the form in which the guidelines will be presented to the General Assembly;
  - (c) Consider topics for future discussion on the long-term sustainability of outer space activities (A/69/20, para. 199).

**B. Proposal**

3. The United Arab Emirates (UAE) delegation is of the view that the different draft guidelines developed by the Working Group are at different stages of maturity and consider that, while a number of proposed guidelines require further



consideration, it is possible for the Committee to adopt at its fifty-ninth session a first set of guidelines.

4. The UAE delegation is also of the view that this first set of guidelines should be complemented by a second set of guidelines to be elaborated by the Working Group in the framework of a renewed two-year workplan that prioritizes the consideration of the remaining draft guidelines as contained in document A/AC.105/L.301, with a view that the first and second set can be jointly submitted for adoption to the General Assembly at its 73rd session in 2018.

5. Annexed are the draft guidelines that the above-mentioned delegation consider ready for adoption by the Committee as a first set at its fifty-ninth session, without prejudice to the inclusion of preambular text and additional draft guidelines that have reached consensus by the conclusion of the fifty-ninth session of the Committee, and possible minor amendments required for consistency reasons or otherwise.

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**Annex<sup>1</sup>****Context of the guidelines for the long-term sustainability of outer space activities****A. Background**

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

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.<sup>2</sup>

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<sup>1</sup> The text of the draft guidelines is as contained in document A/AC.105/L.301 circulated in May 2016.

<sup>2</sup> Report of the Group of Governmental Experts on Transparency and Confidence-Building Measures in Outer Space Activities (A/68/189).

## **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 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 evolvment 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.

**Guidelines 5, 6, 7, 8, 9, and 10 [text yet to be discussed]**

## **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 [text yet to be discussed]**

**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 [text yet to be discussed]**

**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.

**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.

**Guidelines 20, 21, and 22 [text yet to be discussed]****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 [text yet to be discussed]**

**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.

**Guideline 29 [text yet to be discussed]**

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