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Long-term sustainability of outer space activities

Working Group on the Long-term Sustainability of Outer Space Activities: Guidelines Still Under Discussion

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

A. Policy and regulatory framework for space activities

Guideline 7

[*Two alternative formulations of guideline 7 are given below for consideration by delegations.*]

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

[*Alternative 1 for guideline 7*]

[7.1 States and international intergovernmental organizations conducting activities in outer space should provide for the observance of the principle that exploration and use of outer space should be carried out for the benefit and in the interests of all States. To that end, States and international intergovernmental organizations should commit in their legal systems and/or policy frameworks to conducting activities in the exploration and use of outer space, including the Moon and other celestial bodies, solely for peaceful purposes.

7.2 Without prejudice to a possible broader conceptual meaning that may, within the United Nations system and/or international treaties, be attributed to the activities in the exploration and use of outer space solely for peaceful purposes [and satisfy additional criteria], the conduct of activities in the exploration and use of outer space solely for peaceful purposes would not prevent the use of space technologies in the interests of activities and space applications such as monitoring, navigation, communication, data relay, geodesy and mapping [, which support national and international security]. Such [commitment to] [legal and policy frameworks for] upholding the conduct of activities in the exploration and use of outer space solely

* A/AC.105/C.1/L.363.

for peaceful purposes should be considered as commensurate with the need to contribute to [a regime of] transparency and confidence-building measures in outer space activities and to engage constructively in international dialogues, including discussion within the General Assembly, on possible challenges to space [security] [safety] and the sustainability of outer space activities. Insofar as States may have legitimate [security] interests in outer space, those interests should comply with applicable international law and should take into account the common interests of all humankind.

7.3 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. Accordingly, States are encouraged to work collectively to prevent threats to the [peace], safety and [security] [sustainability] that can compromise the long-term sustainability of outer space activities.]

[*Alternative 2 for guideline 7*]

[7.1 Failing to preserve outer space for peaceful purposes would be detrimental to the long-term sustainability of outer space activities. Therefore, States and international intergovernmental organizations conducting, authorizing or supervising outer space activities should firmly uphold the long-standing principle that the exploration and use of outer space is to be carried out in peace and for the benefit and in the interests of all countries for current and future generations. States and international intergovernmental organizations should commit in their national legal and/or policy frameworks to conducting activities of a peaceful nature in outer space.

7.2 States are encouraged to work collectively to [prevent threats][avoid risks] that can compromise the long-term sustainability of outer space activities. When doing so, States should [implement][consider] the recommendations of the report of the Group of Governmental Experts on Transparency and Confidence-Building Measures in Outer Space Activities.

7.3 States should refrain from conducting activities that may give rise to concerns by other States in relation to the shared aim of preserving the long-term sustainability of outer space activities.]

[*Alternative 3 for guideline 7*]

[7.1 States and international intergovernmental organizations should continuously address themselves to the issue of maintaining exclusively peaceful conditions in outer space and are encouraged to duly reflect allegiance to furthering this objective in policy statements. States and international intergovernmental organizations are also encouraged to foster and develop dialogues congenial to harmonizing perceptions [understanding] of the ways and means of maintaining outer space for peaceful purposes, considering appropriate facets of this task.]

B. Safety of space operations

Guideline 18 +19

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

[*Alternative 1 for Guideline 18+19*]

18.1 States and international intergovernmental organizations should [recognize that the [safety and security] [protection] of] [protect] terrestrial infrastructure that supports orbital systems is integral to ensuring the long-term sustainability of outer space activities. [[Taking into account applicable international law, including the Outer Space Treaty and the ITU Constitution and Convention and Radio Regulations,] States and international intergovernmental organizations should [provide for][take] measures[at the policy and regulatory levels] aimed at [avoiding

the use of radio frequencies and/or the conduct of activities that they have reason to believe may cause][reducing the risk of] potentially harmful interference with the terrestrial infrastructure supporting the [peaceful exploration and use of outer space] [operation of the orbital systems of other][by other] States and international intergovernmental organizations[, including infrastructure under the jurisdiction and/or control of another State or international intergovernmental organization].]

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

18.3 [[When considering appropriate measures for the protection[and improvement] of [and] [improving] the resilience of terrestrial infrastructure that supports the operation of space systems,] States and international intergovernmental organizations should [provide for regulation that] ensure[s] that the methods and procedures used to support the resilience of terrestrial infrastructure preclude any action that could impair or adversely affect the operation of terrestrial and information infrastructures [under the jurisdiction and/or control of] [supporting the peaceful exploration and use of outer space by] other States or international intergovernmental organizations.]

18.4 [States and international intergovernmental organizations should establish [and pursue, both internally and through active efforts at the international level, an] [national] information security [policy that would appropriately address] [policies to promote] effective [domestic and international] cooperation in preventing, identifying, investigating and deterring malicious usage of information and communications technology and/or any other activities that may endanger or disrupt critical national, foreign and international information infrastructure [that may be] directly involved in ensuring the safe and secure operation of orbital systems[under national or foreign jurisdiction].]

18.5 States and international intergovernmental organizations should, [whenever needed and/or as requested] [as needed], [liaise and engage in practical interaction with each other in response to relevant real-time, emerging and] [cooperate to prevent and respond to] potential [threats] [risks] and incidents that may affect the terrestrial infrastructure that supports the operation of orbital systems. To facilitate communication regarding such [threats] [risks], States and international intergovernmental organizations should designate points of contact [and determine policies and procedures] [for information exchanges].

[*Alternative 2 for Guideline 18+19*]

[18.1 States and international intergovernmental organizations should recognize that the safety and security of terrestrial infrastructure, including related information infrastructure, that supports the operation of, and data transmission to and from, orbital systems is integral to ensuring the long-term sustainability of outer space activities and the safety of space operations, both, in domestic and international contexts. Considering this, and having due regard for the principles and norms of international law, including the Outer Space Treaty, in particular its Articles VI and IX, the ITU Constitution,, Convention and Radio Regulations, States and international intergovernmental organizations should provide for measures at policy and regulatory level aimed at avoiding the use of radio frequencies and/or the conduct of any other activities, specifically with regard to the use of information and communications

technologies, that they have reason to believe may cause potentially harmful interference to such terrestrial infrastructure.

18.2 States and international intergovernmental organizations should strengthen, and should advise non-governmental entities under their jurisdiction and control to strengthen, the security and resilience of their respective and/or joint (shared) terrestrial infrastructure that supports the operation of, and data transmission to and from, orbital systems. States and international intergovernmental organizations involved in the establishment and/or operation of a particular terrestrial infrastructure are encouraged to cooperate, as feasible and agreed, to strengthen the security and resilience of that infrastructure. Such efforts may include information exchanges among the designated entities of the States and international intergovernmental organizations and non-governmental entities responsible for specific terrestrial infrastructure, in accordance with relevant applicable regulations and/or arrangements, regarding effective practices for withstanding and recovering from accidents and incidents. Considering a more general context, States and international intergovernmental organizations are encouraged to be receptive to requests, communicated through designated entities, to liaise and engage in practical interaction with each other in response to accidents, incidents, and/or real-time, emerging and potential threats affecting the terrestrial infrastructure, in particular, when a relation to malicious usage of information and communications technologies is found or reasonably assumed. To facilitate communication regarding such accidents, incidents and/or threats, States and international intergovernmental organizations should, acting through designated entities, provide for an agreed formal process and setting for information exchanges, subject to the observance of statutory requirements.

18.3 Given the general goals and the substantial interests to which regulation of safety and security of terrestrial infrastructure that supports the operation of, and data transmission to and from, orbital systems is committed, States and international intergovernmental organizations are encouraged to embrace both, commitment to avoid harmful interference to the operation of terrestrial infrastructure outside their jurisdiction and/or control, and contingency responses, as those are based on reliable, accurate and complete information about the source and nature of the harmful interference, are in line with international law, and may, as relevant to a given situation, include consultations and coordination procedures.

18.4 Should States and international intergovernmental organizations developing information security policies and guidance identify reciprocity of interests in, and opportunities for, assisting each other, through timely provision of information and/or otherwise, in preventing, identifying and investigating cases of malicious usage of information and communications technologies, as such interaction could be coherent and synergistic with the tasks of ensuring the safety and security of terrestrial infrastructure that supports the operation of and data transmission to and from, orbital systems, those States and international intergovernmental organizations are encouraged to keep the channels of communication open and, if necessary, engage in appropriate consultations to discuss and develop policy principles to guide potential cooperation.]

Guideline 20+21+part of 22

Observe procedures for preparing and conducting operations on active removal [and intentional destruction] of space objects

20.1 States and international intergovernmental organizations considering or initiating, either individually or collectively, the execution of, or involvement in, operations aimed at active removal or intentional destruction of space objects,[controlled, owned, and/or operated under their jurisdiction] either functioning or non-functioning, should review and implement requirements and measures aimed at identifying space objects planned for removal or destruction, and identifying, analysing, evaluating and preventing risks, as well as employing means

and methods that would [make such operations safe][ensure, to the greatest extent practicable, that removal or destruction of such objects is carried out in a manner that contributes to the long-term sustainability of outer space activities].

20.2 When deciding on risk mitigation methods and choosing tools and techniques to implement [such] active removal or intentional destruction operations, States and international intergovernmental organizations should align their actions with the task of preventing any actions or omissions that could make vulnerable or threaten space objects controlled, owned and/or operated outside their jurisdiction, and/or result in the loss, operational malfunction, degradation or loss of integrity of such objects, and thus impair or circumscribe the rights and interests associated with such space objects. Active removal and intentional destruction operations, should be contemplated, [designed][planned] and implemented so as to avoid negative effects on the above-mentioned space objects, unless agreed to in advance of such operations by the authorities exercising jurisdiction and control over the said space objects and the holders of proprietary or other vested rights with respect to them, or any irregularities in the exercise of the said functions and rights.

20.3 States and international intergovernmental organizations contemplating [such] operations on active removal or intentional destruction should be encouraged to provide information on such operations at the international level in advance, through the Office for Outer Space Affairs and/or other appropriate channels[, if safety considerations warrant such information provision]. The degree to which the international community is to be informed about the technical aspects of the method chosen for implementing the operation is to be determined at the discretion of the States and/or international intergovernmental organizations that [jointly] plan and conduct such operations. It should be a general principle that the greater the probability of side effects from such an operation, the more detailed should be the information made available at different stages of the operation's preparation and implementation. Where practicable, organizing the provision of information in an expeditious reactive mode or in a near-real-time mode should be considered.

20.4 States and international intergovernmental organizations should avoid any intentional destruction operations that could generate [long-lived][long-term] debris, with the understanding that, under certain exceptional circumstances, such operations may need to be considered because the alternatives would have far more negative consequences. The need to proceed with such operations may, for instance, be correlated with the need to avert an immediate or potential serious [threat][risks] to human life, the environment or property in outer space or on the ground, in the air or at sea in the case of re-entry of the space object.

20.5 States and international intergovernmental organizations should proceed on the understanding that securing legitimate grounds for operations for active removal or intentional destruction depends on whether the specific space object (whether or not it is registered in compliance with the Registration Convention or General Assembly resolution 1721 B (XVI) of 1961) planned for active removal or intentional destruction, and a specific physical object in orbit that is presumed to be or is associated with that space object, are in fact one and the same physical body. In this regard, positive identification of the object should be considered as the determining factor when deciding whether to proceed with the operation. Accordingly, until the origin and status of a specific physical object are determined in a sufficiently precise way, the object should not be regarded as an immediate target for active removal or an intentional destruction operation. States and international intergovernmental organizations should consistently seek to establish and maintain procedures and mechanisms that would make it possible to effectively address and satisfy individual and common needs in the identification of objects in orbit. Other States and international intergovernmental organizations, if requested, should, as feasible, provide information and analytical support for such operations. In addition to the provision of valid near-Earth space monitoring information and the results of space situational analysis (if such results are available), such support may include assistance in identifying relevant space objects through analysis of the relevant

monitoring or information archives and making the results of such analysis available for general access and use.

Guideline 22

Develop procedures for outer space activities involving non-registered objects

22.1 [As part of responding to challenges associated with developing practical approaches and measures aimed at facilitating and promoting space environment remediation activities or any other outer space activities involving or affecting space objects, their component parts as well as their launch vehicles and parts thereof, which have not been subjected to registration under the Registration Convention or General Assembly resolution 1721 B (XVI) of 1961, due to varying established practices of applying the said Convention and resolution,] States and international intergovernmental organizations are encouraged to consider using the following guidance [with respect to non-registered objects]:

(a) Non-registration of space objects, their component parts as well as their launch vehicles and parts thereof, including those that have not been capable ab initio of performing their assigned functions, or have lost the capability to do so, should not in itself be construed as grounds for considering such objects to be devoid of title, taking into account, inter alia, the requirements of the Convention on International Liability for Damage Caused by Space Objects. The absence of specific information on those objects, either in a particular registration entry or as a reference in registration entries for other objects, should not be considered as a reason for divesting jurisdiction and control over such objects and/or terminating interests in, or vested rights to, them;

(b) Due consideration for the practical observations contained in subparagraph (a) above should not decrease the motivation of States and international intergovernmental organizations with regard to developing, as appropriate, policies that would be instrumental for the ascertainment by the launching State, and/or the international intergovernmental organization that has accepted the relevant rights and obligations, of the status of non-registered objects. Such policies should provide for the possibility of States and/or international intergovernmental organizations waiving, in whole or in part, the authority they exercise with respect to such objects so as to make it possible to develop a framework for taking decisions on space environment remediation activities;

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

22.2 In defining the particular status of fragments resulting from break-ups of space objects or other events, consideration should be given to the fact that, for objective reasons irrespective of their linear dimensions, those fragments may not be easily susceptible to registration owing to the very nature of their origin, their physical condition and the complexity of determining and regularly updating the parameters of their orbital motion. The degree of reliability with which each particular fragment can be correlated with another identified space object that may be the object of its origin and/or with an event that led to its appearance in orbit, should be evaluated with all due diligence in order to assess the feasibility of registration of such fragments. States and international intergovernmental organizations wishing to register fragments that they regard as having relevance to space objects previously registered by them should direct to the Office for Outer Space Affairs confirmation of their intention to register such fragments, accompanied by information on planned applications and requests to have such information included in a relevant information resource of the Office. A reasonably limited period of time should be allotted for the

receipt from other States and/or international intergovernmental organizations of objections to such registration, given that the relevance of the orbital information decreases steadily unless it is updated.

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

Guideline 8

Implement operational and technological measures for the safe conduct of close proximity space operations

8.1 States and international intergovernmental organizations should ensure, and advise entities under their jurisdiction and/or control, to ensure, that close-proximity space operations that involve space objects with respect to which they exercise jurisdiction and control, or proprietary or other vested rights are carried out in conformity with international law and appropriately meet risk-tolerance and safety criteria. States and international intergovernmental organizations or entities undertaking close-proximity space operations that involve or may involve space objects other than those with respect to which they exercise jurisdiction and control, or proprietary or other vested rights should provide for, and advise their related entities to provide for, precautionary measures aimed at precluding events that may compromise safety and security of such space objects. Operations which may entail technical or operational impacts on such space objects may be undertaken only with the express agreement of the authorities that exercise jurisdiction and control over the said space objects and the holders of proprietary or other vested rights with respect to them.

8.2 States and international intergovernmental organizations are encouraged to share, from time to time, with the Committee on the Peaceful Uses of Outer Space their assessment of the situation in outer space from the perspective of safety of space operations. They are also encouraged to share analyses of events which might affect the safety of space operations.

8.3 To further enhance the safety of space operations and enhance confidence-building in outer space activities, States and international intergovernmental organizations should be open to discussing and identifying possible approaches that could lead to the development of viable internationally approved safety criteria for close-proximity operations as a prerequisite to addressing further standard-setting practices in this area.

Guideline 10

[*Version 1 for Guideline 10*]

Implement measures for the safe conduct of activities involving intentional modification of the natural space environment

[10.1 When planning and conducting, consistently with the international law, experiments and/or activities involving technologies or techniques that could potentially result in intentional modification of the natural space environment, States and international intergovernmental organizations should be aware of the need to preclude uses of such technologies (techniques) that may jeopardize or harm space objects and affect radio wave propagation through the ionosphere, as well as compromise space systems' mission benefits.

10.2 Space environmental modification technologies and techniques are to be associated with the intentional alteration of characteristics of the space environment (such as electron concentration and temperature of the ionosphere, density and chemical composition of the upper atmosphere, intensity of electromagnetic emissions and characteristics of radiation belts). The use of space environment modification technologies (techniques) for peaceful purposes should be supported by relevant safety criteria and procedures so as to forestall actions that may harm operational space objects and/or produce far more hazardous effects resulting in fragmentation of space objects. The selection of safety-critical parameters characterizing the state of the natural space environment and the setting of acceptable thresholds for their values in case of the use of space environment modification technologies (techniques) should be based on the appropriate assessment of possible effects on the space environment due to the use of such technologies (techniques), inter alia, in comparison with variations of the selected parameters due to natural processes.

10.3 The understanding should be that the use of modification technologies (techniques) should not result in effects on the space objects that would be more severe than those due to natural phenomena. In deciding on the use of space environment modification technologies (techniques) States and international intergovernmental organizations are encouraged to consider, inter alia, the attitudes characteristic of the Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques of 5 October 1978.]

[*Version 2 for Guideline 10*]

Avoid negative side effects in connection with the use of natural space environment modification techniques for peaceful purposes

10.1 [Notwithstanding/Considering] the concept of, and the principles and norms derived from the Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques of 5 October 1978,]States and international intergovernmental organizations, when planning and conducting, consistently with the international law, activities involving the use of space environment modification techniques for peaceful purposes (such as local gas and plasma outbursts for purposes of deorbiting space debris, injection of charged particle beams with the purpose of conducting scientific experiments in the ionosphere), should keep themselves fully aware of the need to avoid known, presumed or accidental risks to space objects which may affect radio wave propagation through the ionosphere as well as compromise space systems mission benefits.

10.2 The use of space environment modification techniques for peaceful purposes should be supported by relevant precautionary safety [criteria and safety control applications][measures]. The selection of safety-critical parameters characterizing the state of the natural space environment and the setting of acceptable thresholds for their values in case of the use of space environment modification techniques for peaceful purposes should be based on the appropriate assessment of their possible effects on the space environment due to the use of such techniques, inter alia, in comparison with variations of the selected parameters due to natural processes. The understanding should be that the use of modification techniques should not result in effects on the space objects that would be more severe than those due to natural phenomena.

Guideline 9

[Alternative 1 for the title]

Raise awareness of the need to exclude the use of information and communications technology products compromising safety and security of space objects and related equipment

[Alternative 2 for the title]

Consider measures to address the issue of precluding malicious use of information and communications technology to compromise the safety and security of space objects and related equipment

9.1 States and international intergovernmental organizations should seek to prevent the proliferation of malicious information and communications tools and techniques and harmful hidden functions in software, as such techniques and functions may, if embedded in space objects and/or related equipment, compromise the operational status and mission performance of space objects, and the ability to operate these space objects with assurance.

9.2 States and international intergovernmental organizations should take steps to ensure the integrity of the supply chain so that end users can have confidence in the security of information and communications technology products to be used aboard space objects and/or as part of related equipment. Regardless of the regulatory oversight that States and international intergovernmental organizations may appropriately choose to provide, the general understanding should be that manufacturers and suppliers of space objects and/or related equipment should see to it that good-faith practices and commercial integrity are honoured, and the established safety and security assurance processes are followed. Manufacturers and suppliers should be open to giving recipients and/or end-user assurances of the absence of harmful hidden functions on space objects and/or related equipment they provide.