PEACE IN SPACE: BUILDING ON THE OUTER SPACE TREATY

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The Committee on Peaceful Uses of Outer Space (COPUOS) was established by the General Assembly in 1959. Today, it gathers 67 member states and addresses the applications of outer space such as scientific research, exploration, monitoring of the health of our planet, communications, navigation, etc. Its terms of reference include the promotion of international cooperation and developing an adequate legal framework for the use of outer space. As is well known, this mandate has been fulfilled by the development of the Outer Space Treaty of 1967, the main pillar of international law relative to outer space activities, complemented by four other treaties in the following years, all of them produced by COPUOS and transmitted for approval to the General Assembly before their signature and ratification—for the first four treaties—by most major space-faring nations. They are recalled below:

- 1967—Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (the Outer Space Treaty, which entered into force the same year);
- 1968—Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects launched into Outer Space (entered into force the same year);
- 1972—Convention on International Liability for Damage Caused by Space Objects (entered into force the same year);
- 1975—Convention on Registration of Objects Launched into Outer Space (entered into force in 1976); and
- 1979—Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (entered into force in 1984 but signed and ratified by only 13 countries).

In addition to these international treaties, COPUOS has addressed other issues over the years which led to the development of "Declarations" which were submitted for approval by the General Assembly, seeking whenever

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possible unanimous approval. These texts do not carry the same legal weight as international treaties but do carry political weight as they seek to encourage a practice resulting from in-depth consultation among member states of COPUOS. They are listed below:

- Declaration on Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space (1963), the principles of which were later incorporated into the Outer Space Treaty;
- Principles Governing the Use by States of Artificial Earth Satellites for International Direct Television Broadcasting (1982);
- Principles Relating to Remote Sensing of the Earth from Outer Space (1986);
- Principles Relevant to the Use of Nuclear Power Sources in Outer Space (1992); and
- Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of All States, Taking into Particular Account the Needs of Developing Countries (1996).

COPUOS also elaborates for approval by the General Assembly a number of resolutions which reinforce and clarify certain aspects of the international legal framework for space activities:

- Resolution 1721 (XVI) B of December 1961 on the Registration of Satellite Launches; and
- Resolution 59/115 of 10 December 2004 on the notion of "Launching State".

It is to be noted that its activity in this respect has accelerated recently. In 2007, two additional resolutions are foreseen to be presented to the General Assembly—one on Space Debris Mitigation Guidelines and one on Registration of Space Objects.

Recent achievements

The Space Debris Mitigation Guidelines adopted in February 2007 by the Scientific and Technical Subcommittee during its forty-fourth session are an excellent example of recent COPUOS work to develop a consensus-based code of conduct aimed at minimizing the production of space debris and the risk of collisions in outer space. In view of the demonstration by China of

the destruction of one of its meteorological satellites in a heliosynchronous orbit by a ground-based missile, and the consequent generation of a large amount of debris, it is worthwhile to recall that the Space Debris Mitigation Guidelines (reproduced in the annex) include guideline number 4 which states very clearly, "Avoid intentional destruction and other harmful activities", with the following additional comment: "Recognizing that an increased risk of collision could pose a threat to space operations, the intentional destruction of any on-orbit spacecraft and launch vehicle orbital stages or other harmful activities that generate long-lived debris should be avoided. When intentional break-ups are necessary, they should be conducted at sufficiently low altitude to limit the lifetime of resulting fragments." It is hoped that the adoption of these guidelines by the UN General Assembly will discourage experiments such as the Chinese test of 11 January 2007.

Another illustration of this pragmatic approach adopted by COPUOS is the work plan for developing safety standards for nuclear power sources in outer space. The Working Group on the Use of Nuclear Power Sources in Outer Space of the COPUOS Scientific and Technical Subcommittee has established, in cooperation with the International Atomic Energy Agency (IAEA), a three-year work plan with the objective of adopting a joint COPUOS–IAEA safety framework by 2010. The working group started in 2006 with a technical workshop organized jointly with the IAEA, followed by extensive inter-session consultations within the working group and with the IAEA. The work achieved so far, and the three-year work plan adopted, are good illustrations of how new standards relating to outer space activities and their future safety can be elaborated by relying on actual technical and operational experience, rather that by a purely academic and theoretical approaches.

Future directions

Although there are proposals to consolidate the five space-related treaties, there is no consensus within COPUOS to reopen the Outer Space Treaty of 1967, nor to develop new international conventions relating to outer space activities. For many member states of COPUOS, the priority should be to encourage ratification of these treaties where a large consensus exists, these being the first four treaties (the "Moon Treaty" has been ratified by only 13 states). Beyond the international conventions framework, there is within COPUOS a shared feeling that bottom-up, technically-based guidelines and recommendations are powerful means to develop rules-

based behaviour and keep outer space as safe as possible. The principles that would eventually be adopted following such an approach would be based on technical and operational considerations, not on a delicate political balancing act, as was the case during the Cold War. However, this bottom-up approach remains firmly based on the Outer Space Treaty of 1967 in that it maintains the founding principles of freedom of space exploration and utilization (article 1) and of non-appropriation of outer space and celestial bodies (article 2).

In June 2007, during its fiftieth plenary session, COPUOS will address, among many other agenda items, its future role and activities. One suggestion I will put forward as chairman of the committee is to develop "rules of the road" for the long-term safety of space operations. The recommended approach will be to rely heavily on the actual operational experience of the principal actors, commercial operators and government agencies, and try to develop—from the analysis of current space traffic requirements and how they may evolve in the future—a consensus-based set of rules and recommended practices. It is too early to know if the committee will take up this suggestion, but if it does it would be an indication that it is ready to play fully the role that the General Assembly has assigned to it—to help formulate a global framework for the safe and secure use of outer space, not only for the space-faring nations, but for all nations to benefit from space technology.

Now, let us be clear, COPUOS does not address the "military uses of outer space" nor the issue of "weapons deployment in space"—which are addressed at the Conference on Disarmament—but these issues are understood by member state delegations to COPUOS as they may impact the safety of all activities in outer space. Notwithstanding the above, non-aggressive military uses of outer space are considered as peaceful activities and are within the purview of COPUOS. This is in line with a well known fact: most space systems and applications are dual use, for example the Global Positioning System, mobile communications satellite systems, meteorological satellites, many high-resolution Earth imaging satellites, and so forth. Only a few military satellite systems do not have an equivalent in the civilian world, such as, for example, early warning satellites, and, obviously, anti-satellite weapons.

Because we all share the use of the same environment, namely outer space, and because the technologies we rely on are often identical, I believe that

COPUOS and the prevention of an arms race in outer space (PAROS) agenda item of the Conference on Disarmament would benefit from a much more active exchange of information on their activities. Each body has its own terms of reference, which I do not suggest to modify, and both report to the UN General Assembly—COPUOS via the Fourth Committee and the Conference on Disarmament via the First Committee. It is up to the General Assembly to decide if this reporting on space issues through two different committees could not be improved.

In the meantime, regular exchanges of information between the two bodies are useful, I would even say indispensable. This conference is an excellent opportunity to facilitate this communication.

Let me conclude that in my current position as Chairman of COPUOS, I am committed to facilitate and encourage such communication.

ANNEX

Space debris mitigation guidelines of the Scientific and Technical Subcommittee of the Committee on the Peaceful Uses of Outer Space

1. Background

Since the Committee on the Peaceful Uses of Outer Space published its Technical Report on Space Debris in 1999, it has been a common understanding that the current space debris environment poses a risk to spacecraft in Earth orbit. For the purpose of this document, space debris is defined as all man-made objects, including fragments and elements thereof, in Earth orbit or re-entering the atmosphere, that are non-functional. As the population of debris continues to grow, the probability of collisions that could lead to potential damage will consequently increase. In addition, there is also the risk of damage on the ground, if debris survives Earth's atmospheric re-entry. The prompt implementation of appropriate debris mitigation measures is therefore considered a prudent and necessary step towards preserving the outer space environment for future generations.

Historically, the primary sources of space debris in Earth orbits have been (a) accidental and intentional break-ups which produce long-lived debris and (b) debris released intentionally during the operation of launch vehicle orbital stages and spacecraft. In the future, fragments generated by collisions are expected to be a significant source of space debris.

Space debris mitigation measures can be divided into two broad categories: those that curtail the generation of potentially harmful space debris in the near term; and those that limit their generation over the longer term. The former involves the curtailment of the production of mission-related space debris and the avoidance of break-ups. The latter concerns end-of-life procedures that remove decommissioned spacecraft and launch vehicle orbital stages from regions populated by operational spacecraft.

2. Rationale

The implementation of space debris mitigation measures is recommended since some space debris has the potential to damage spacecraft, leading to

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loss of mission, or loss of life in the case of manned spacecraft. For manned flight orbits, space debris mitigation measures are highly relevant due to crew safety implications.

A set of mitigation guidelines has been developed by the Inter-Agency Space Debris Coordination Committee (IADC), reflecting the fundamental mitigation elements of a series of existing practices, standards, codes and handbooks developed by a number of national and international organizations. The Committee on the Peaceful Uses of Outer Space acknowledges the benefit of a set of high-level qualitative guidelines, having wider acceptance among the global space community. The Working Group on Space Debris was therefore established (by the Scientific and Technical Subcommittee of the Committee) to develop a set of recommended guidelines based on the technical content and the basic definitions of the IADC space debris mitigation guidelines, taking into consideration the United Nations treaties and principles on outer space.

3. Application

Member States and international organizations should voluntarily take measures, through national mechanisms or through their own applicable mechanisms, to ensure that these guidelines are implemented, to the greatest extent feasible, through space debris mitigation practices and procedures.

These guidelines are applicable to mission planning and operation of newly designed spacecraft and orbital stages and, if possible, to existing ones. They are not legally binding under international law.

It is also recognized that exceptions to the implementation of individual guidelines or elements thereof may be justified, for example, by the provisions of the United Nations treaties and principles on outer space.

4. Space debris mitigation guidelines

The following guidelines should be considered for the mission planning, design, manufacture and operational (launch, mission and disposal) phases of spacecraft and launch vehicle orbital stages:

Guideline 1: Limit debris released during normal operations

Space systems should be designed not to release debris during normal operations. If this is not feasible, the effect of any release of debris on the outer space environment should be minimized.

During the early decades of the space age, launch vehicle and spacecraft designers permitted the intentional release of numerous mission-related objects into Earth orbit, including, among other things, sensor covers, separation mechanisms and deployment articles. Dedicated design efforts, prompted by the recognition of the threat posed by such objects, have proved effective in reducing this source of space debris.

Guideline 2: Minimize the potential for break-ups during operational phases

Spacecraft and launch vehicle orbital stages should be designed to avoid failure modes which may lead to accidental break-ups. In cases where a condition leading to such a failure is detected, disposal and passivation measures should be planned and executed to avoid break-ups.

Historically, some break-ups have been caused by space system malfunctions, such as catastrophic failures of propulsion and power systems. By incorporating potential break-up scenarios in failure mode analysis, the probability of these catastrophic events can be reduced.

Guideline 3: Limit the probability of accidental collision in orbit

In developing the design and mission profile of spacecraft and launch vehicle stages, the probability of accidental collision with known objects during the system's launch phase and orbital lifetime should be estimated and limited. If available orbital data indicate a potential collision, adjustment of the launch time or an on-orbit avoidance manoeuvre should be considered.

Some accidental collisions have already been identified. Numerous studies indicate that, as the number and mass of space debris increase, the primary source of new space debris is likely to be from collisions. Collision avoidance procedures have already been adopted by some Member States and international organizations.

Guideline 4: Avoid intentional destruction and other harmful activities

Recognizing that an increased risk of collision could pose a threat to space operations, the intentional destruction of any on-orbit spacecraft and launch vehicle orbital stages or other harmful activities that generate long-lived debris should be avoided.

When intentional break-ups are necessary, they should be conducted at sufficiently low altitudes to limit the orbital lifetime of resulting fragments.

Guideline 5: Minimize potential for post-mission break-ups resulting from stored energy

In order to limit the risk to other spacecraft and launch vehicle orbital stages from accidental break-ups, all on-board sources of stored energy should be depleted or made safe when they are no longer required for mission operations or post-mission disposal.

By far the largest percentage of the catalogued space debris population originated from the fragmentation of spacecraft and launch vehicle orbital stages. The majority of those break-ups were unintentional, many arising from the abandonment of spacecraft and launch vehicle orbital stages with significant amounts of stored energy. The most effective mitigation measures have been the passivation of spacecraft and launch vehicle orbital stages at the end of their mission. Passivation requires the removal of all forms of stored energy, including residual propellants and compressed fluids and the discharge of electrical storage devices.

Guideline 6: Limit the long-term presence of spacecraft and launch vehicle orbital stages in the low Earth orbit (LEO) region after the end of their mission

Spacecraft and launch vehicle orbital stages that have terminated their operational phases in orbits that pass through the 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.

When making determinations regarding potential solutions for removing objects from LEO, due consideration should be given to ensure that debris that survives to reach the surface of the Earth does not pose an undue risk

to people or property, including through environmental pollution caused by hazardous substances.

Guideline 7: Limit the long-term interference of spacecraft and launch vehicle orbital stages with the geosynchronous Earth orbit (GEO) region after the end of their mission

Spacecraft and launch vehicle orbital stages that have terminated their operational phases in orbits that pass through the 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.

5. Updates

Research by Member States and international organizations in the area of space debris should continue in a spirit of international cooperation to maximize the benefits of space debris mitigation initiatives. This document will be reviewed and may be revised, as warranted, in the light of new findings.

6. Reference

The reference version of the IADC space debris mitigation guidelines at the time of the publication of this document is contained in the annex to document A/AC.105/C.1/L.260.

For more in-depth descriptions and recommendations pertaining to space debris mitigation measures, Member States and international organizations may refer to the latest version of the IADC space debris mitigation guidelines and other supporting documents, which can be found on the IADC website (www.iadc-online.org).