

# Implementation of the UN COPUOS Space Sustainability Guidelines: Early Implementation Experiences and Next Steps in COPUOS

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Peter Martinez is the Executive Director of the Secure World Foundation. He has extensive experience in multilateral space diplomacy, space policy formulation, and space regulation, as well as capacity building in space science, technology, and workforce development. Before joining the Secure World Foundation, he chaired the UN COPUOS Working Group on the Long-Term Sustainability of Outer Space Activities and the South African Council for Space Affairs.

## Cover Imagery

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# IMPLEMENTATION OF THE UN COPUOS SPACE SUSTAINABILITY GUIDELINES: EARLY IMPLEMENTATION EXPERIENCES AND NEXT STEPS IN COPUOS

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## ABSTRACT

In 2019, the United Nations Committee on the Peaceful Uses of Outer Space (UN COPUOS) adopted a set of 21 guidelines for the long-term sustainability of outer space activities, the so-called “LTS Guidelines”. This paper describes the content of the LTS Guidelines and presents some of the early guideline implementation efforts reported by States in COPUOS. The paper then discusses the role of industry, civil society and academia in the implementation of the guidelines and concludes with some observations on the next phase of the LTS discussions in UN COPUOS.

## 1. INTRODUCTION

The rapidly increasing number of active satellites in orbit, the emergence of new kinds of space activities, a disturbing proliferation of counterspace capabilities, and the steady increase of orbital debris have given rise to concerns about the operational safety and security of space activities in the short term, and humanity’s ability to continue to use the near-Earth space environment for societal benefit in the longer term. This is an issue that has become more prominent on the agenda of the United Nations Committee for the Peaceful Uses of Outer Space (UN COPUOS) over the past 20 years. In 2010, following several years of debate among its member States, COPUOS established a Working Group on the Long-Term Sustainability of Outer Space Activities with a mandate to produce a report on the topic and a set of recommended best-practice guidelines for sustainable space activities. In June 2019, following an eight-year process, this body adopted 21 voluntary, non-binding consensus Guidelines for the Long-Term Sustainability of Outer Space Activities, the so-called “LTS Guidelines”.[1]

These guidelines will only achieve their intended purpose if they are implemented as widely as possible. Hence, since 2020, the focus of discussions in UN COPUOS has shifted from guideline development to guideline implementation. Successful LTS Guideline implementation relies on, as well as strengthens, international cooperation in space activities, which is a central pillar of COPUOS’ mandate. Implementation of the guidelines will also be strengthened by improved

coordination and information exchange among space actors from government, space agencies and the private sector regarding their experiences in the authorization, supervision, and sustainable conduct of space activities.

This paper describes the content of the LTS Guidelines in Section 2. The first part of Section 3 presents some of the early guideline implementation efforts reported by States in COPUOS. The second part of Section 3 discusses the role of industry, civil society and academia in the implementation of the LTS Guidelines. The paper concludes in Section 4 with a review of the next phase of the LTS discussions in UN COPUOS.

## 2. THE LTS GUIDELINES

The LTS Guidelines document opens with a politically significant preamble that sets the legal context for the guidelines, their application and implementation. This preamble includes a definition of space sustainability that reflects the common understanding reached by States during the negotiation of these guidelines. The definition reads as follows:

*The long-term sustainability of outer space activities is defined as the ability to maintain the conduct of space activities indefinitely into the future in a manner that realizes the objectives of equitable access to the benefits of the exploration and use of outer space for peaceful purposes, in order to meet the needs of the present generations while preserving the outer space environment for future generations.*

Readers familiar with the definition of sustainable development in the seminal “Brundtland report” *Our Common Future* [2], given as ‘development that meets the needs of the present without compromising the ability of future generations to meet their own needs’, will notice a parallel between that definition of sustainable development on Earth and the UN COPUOS definition of space sustainability quoted above. This was a deliberate choice, meant to highlight the connection between space sustainability and sustainable development on Earth.

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\* Former Chair of the UN COPUOS Working Group on the Long-Term Sustainability of Outer Space Activities (2010 – 2018).

Table 1. UN COPUOS Guidelines for the Long-Term Sustainability of Outer Space Activities. The full text of the guidelines appears in Annex II of UN document A/74/20. [1]

<i>A. Policy and regulatory framework for space activities</i>		
Guideline	A.1	Adopt, revise and amend, as necessary, national regulatory frameworks for outer space activities
Guideline	A.2	Consider a number of elements when developing, revising or amending, as necessary, national regulatory frameworks for outer space activities
Guideline	A.3	Supervise national space activities
Guideline	A.4	Ensure the equitable, rational and efficient use of the radio frequency spectrum and the various orbital regions used by satellites
Guideline	A.5	Enhance the practice of registering space objects
<i>B. Safety of space operations</i>		
Guideline	B.1	Provide updated contact information and share information on space objects and orbital events
Guideline	B.2	Improve accuracy of orbital data on space objects and enhance the practice and utility of sharing orbital information on space objects
Guideline	B.3	Promote the collection, sharing and dissemination of space debris monitoring information
Guideline	B.4	Perform conjunction assessment during all orbital phases of controlled flight
Guideline	B.5	Develop practical approaches for pre-launch conjunction assessment
Guideline	B.6	Share operational space weather data and forecasts
Guideline	B.7	Develop space weather models and tools and collect established practices on the mitigation of space weather effects
Guideline	B.8	Design and operation of space objects regardless of their physical and operational characteristics
Guideline	B.9	Take measures to address risks associated with the uncontrolled re-entry of space objects
Guideline	B.10	Observe measures of precaution when using sources of laser beams passing through outer space
<i>C. International cooperation, capacity-building and awareness</i>		
Guideline	C.1	Promote and facilitate international cooperation in support of the long-term sustainability of outer space activities
Guideline	C.2	Share experience related to the long-term sustainability of outer space activities and develop new procedures, as appropriate, for information exchange
Guideline	C.3	Promote and support capacity-building
Guideline	C.4	Raise awareness of space activities
<i>D. Scientific and technical research and development</i>		
Guideline	D.1	Promote and support research into and the development of ways to support sustainable exploration and use of outer space
Guideline	D.2	Investigate and consider new measures to manage the space debris population in the long term

The 21 LTS Guidelines take the form of short action-oriented statements (guideline titles), which are then supplemented with more detailed guidance in the paragraphs that follow. Tab. 1 lists the titles of the LTS Guidelines. The full text of the guidelines is available in UN document A/74/20, Annex II. [1] These guidelines comprise a collection of internationally recognized minimum measures for ensuring the long-term sustainability of outer space activities and for enhancing the safety of space operations. They address the policy, regulatory, operational, safety, scientific, technical, international cooperation, and capacity-building aspects of space activities.

The guidelines are relevant to all space activities, by both governmental and non-governmental entities, whether planned or ongoing, and to all phases of space activities, from mission design, to launch and operations, to final end-of-life disposal.

The LTS Guidelines are intended to support the development of national and international practices and safety frameworks for conducting outer space activities sustainably while allowing for flexibility in adapting such practices and frameworks to specific national circumstances. They are also intended to support States in developing their space capabilities in a manner that enhances the safety of space operations and avoids degrading the space environment.

### **3. IMPLEMENTATION OF THE GUIDELINES**

The LTS Guidelines will only achieve their intended purpose if they are implemented by the greatest possible number of space actors. Given that States have the international responsibility for space activities conducted by entities under their jurisdiction and/or control, this means in practice that States must socialize and implement the guidelines at the national level. In this section, we will discuss some of the early implementation efforts and experiences of States as they begin to give effect to these guidelines at the national level. We will also discuss the role of non-State actors from industry, academia and civil society in socializing and implementing these guidelines.

#### **3.1. Early implementation experiences of States**

The LTS Guidelines are voluntary and not legally binding under international law. However, they are politically binding on all the States that adopted them by consensus. Hence States may choose to incorporate elements of the LTS Guidelines in their national legislation, thus making them binding on their national actors. This is similar to the way in which the UN COPUOS space debris mitigation guidelines (which preceded the LTS Guidelines) have been implemented

into the national regulatory frameworks of a growing number of States.

The first step in implementation is for States to promote awareness of the guidelines to their national space community and to express a commitment to the implementation of the guidelines at national level.

When it comes to the modality of implementation, the LTS Guidelines are not prescriptive about the form of implementation. This lack of specificity was intentional in order to accommodate the different levels of space capabilities among States and to accommodate the many ways in which space activities are governed in different States.

Implementation is voluntary and must be consistent with national needs, conditions, and capabilities. Given the broad scope of the guidelines, there is a need to “unpack” what guideline implementation means in different national contexts.

The inherent flexibility to allow for implementation in different contexts potentially creates uncertainty and inconsistency in implementation. It can also lead to a lack of common understanding on what constitutes implementation and result in inhomogeneous implementation of the guidelines.

National regulators should include guideline implementation in their considerations and processes for the authorization and ongoing supervision of space activities under their jurisdiction and/or control.

At the regional and global level, States are sharing their implementation experiences in COPUOS as tools to socialize the implementation of the guidelines in the international space community. Some delegations to COPUOS have started to report their implementation experiences during the sessions of the Committee. National implementation measures reported in COPUOS include: the revision of relevant domestic legislation; improved and/or enhanced registration of space objects; implementation of national space policy directives; and the enhancement of national capabilities in space situational awareness and debris monitoring.

The early implementation experiences reported by various States are instructive and worth recounting here. The first category of implementation experiences relates to the sorts of challenges faced by States with different levels of space capabilities as they go about adapting or amending their national regulatory frameworks to implement the guidelines. Established space-capable nations have more experience and implementation capacity, but also more “legacy” legal frameworks and institutional inertia, which can

complicate guideline implementation. On the other hand, emerging space nations lack regulatory experience and/or capacity, but they can be more agile in adopting new space legislation that reflects current best practice. A common thread running through the implementation experiences of States, regardless of their level of development, is the importance of “future proofing” legislation.

Another recurrent theme for implementation has to do with the technical capacity of countries at different levels of development to implement the guidelines. Developing countries may need the support of more experienced space actors to implement the guidelines from a technical and operational perspective. Several States have pointed to the need for capacity building efforts to support guideline implementation. Several COPUOS delegates have suggested that it would be helpful to compile the implementation experiences of different States into a sort of guidebook for LTS Guideline implementation.

### 3.2. The role of commercial space actors

Although the LTS Guidelines are directed at States, and States are responsible for overseeing their implementation, the vast majority of active satellites in space nowadays are owned and operated by commercial sector actors. These actors are rapidly accumulating a vast amount of operational experience in the safe conduct of space activities and in dealing with a range of contingency situations in orbit.

Commercial space actors are well aware of the risks posed by space debris and irresponsible behaviours in orbit, and they are motivated by their own commercial self-interest and also by a sense of social responsibility to be good citizens in orbit. Several private sector actors are taking the lead to demonstrate their commitment to responsible space operations. An example of this is the release of the *Satellite Orbital Safety Best Practices* reference guide published by Iridium, One Web and SpaceX in partnership with the AIAA in September 2022.[3]

While the advent of very large satellite constellations has raised concerns about orbital congestion, it has also potentially created a market opportunity to develop commercial capabilities to enhance space sustainability. The private sector is doing a lot of work to develop technologies to support various close-proximity operations in orbit, such as on-orbit servicing, refuelling and other life-extension interventions, and also for safe end-of-life disposal. These are all technologies that will underpin the future growth of the space economy.

However, the lack of clear, widely accepted technical and safety standards for the safe and responsible performance of such operations involving commercial satellites could lead to mishaps that would put the long-term sustainability of space activities at risk and this remains a major obstacle to the development of a satellite servicing industry. The Consortium for Execution of Rendezvous and Servicing Operations (CONFERS) is an industry-led initiative that is leveraging best practices from government and industry to research, develop, and publish non-binding, consensus-derived technical and operations standards for on-orbit servicing and rendezvous and proximity operations. In 2019, the Consortium developed a set of design and operational practices to enhance the operational safety of rendezvous and proximity operations and on-orbit satellite servicing. CONFERS subsequently submitted these principles and practices to the International Organization for Standardization (ISO) as the basis for a new international standard for such activities, ISO 24330. [4]

Another example of the space community acting collectively to promote space safety and space sustainability is the Space Safety Coalition, an ad hoc coalition of companies, organizations, and other government and industry stakeholders that actively promotes responsible space activities through the adoption of relevant international standards, guidelines, and recommended practices. In particular, the members of the coalition commit themselves to implementing the guidance contained in the coalition’s document *Best Practices for the Sustainability of Space Operations*, which is supported by 35 endorsees.[5] These best practices include adherence to the LTS Guidelines.

In October 2019, the Satellite Industry Association (SIA), a trade association based in the United States, adopted a set of *Principles of Space Safety for the Commercial Satellite Industry* to promote safe flight operations for satellites, human spacecraft and other space missions. The very first of these principles calls on SIA members to “collaborate with national space agencies and regulatory entities to implement, through appropriate mechanisms, the UN Committee on the Peaceful Uses of Outer Space Guidelines for the Long-Term Sustainability of Space Activities.” [6]

Information exchange is a common thread running through the LTS Guidelines. This includes the exchange of operator contact information, and exchange of information on space object trajectories and manoeuvres. Industry bodies such as the Space Data Association are supporting the controlled, reliable and efficient sharing of data critical to the safety and integrity of the space environment.

These various industry initiatives will lead to best practices for LTS Guideline implementation and also to new standards and practices that could form the basis for discussion of future LTS Guidelines in COPUOS.

### **3.3. The role of academic and civil society entities**

Several aspects of the LTS Guidelines require research and scholarship to support effective guideline implementation, to monitor compliance with the guidelines, and to evaluate the aggregate results of guideline implementation. This includes not only the scientific and technical aspects, but also the policy and regulatory aspects as well. Indeed, two of the LTS Guidelines call for the promotion of research on ways to manage the debris population and on ways to support the sustainable exploration and use of outer space.

For example, it would be very valuable to model the effects on the space environment of different approaches to guideline implementation and/or different levels of compliance by various groups of space actors. Other examples of such work include the efforts by several academic institutions to define the concept of orbital carrying capacity and the contributions of several academic institutions to the development of a Space Sustainability Rating.[7] Legal questions that could benefit from scholarship include the clarification of some of the concepts mentioned in the preamble and guidelines (as well as in the space treaties), such as what constitutes “due regard”.

Think tanks also have an important role to play in the implementation of the LTS Guidelines. These entities bridge the space between government, industry, and academia to support evidence-based policy formulation. In this regard, think-tanks can support governments and national regulators to “unpack” the LTS Guidelines from an implementation perspective. For example, LTS Guideline A.5 on enhancing registration practice, seems straightforward, but it is actually quite complex to implement from a regulatory perspective. Think tanks could assist national regulators to work through various possible scenarios for implementing this guideline. Another guideline that seems straightforward to implement is Guideline B.1 on the provision of updated contact information and sharing of information on orbital events, which is meant to support improved coordination among operators, especially in contingency situations. However, this can be difficult to achieve in practice simply because of a lack of common, established channels and protocols for the rapid exchange of information in such contingency situations. For an

example illustrating the need for such channels and protocols we can point to the challenges in coordination experienced by the operators of the One Web and SpaceX Starlink constellations in early April 2021, when a OneWeb satellite that was ascending through the Starlink constellation’s operational orbital shell was at risk of a collision with one of the Starlink satellites.[8] The way in which these two operators responded to this contingency situation is both an encouraging example of inter-operator cooperation and a cautionary tale about the importance of coordination and the need for clear rules for space traffic, such as right-of way.

## **4. LTS 2.0 – THE NEXT STEPS IN COPUOS**

While the LTS Guidelines represent a significant step forward by the international community to promote space sustainability, this is just a first step, and much more work needs to be done. Implementation of the already adopted LTS Guidelines is important, but so is keeping abreast of the developments in the space arena that impact on the safety and sustainability of space activities.

At its 62nd session in June 2019, when it adopted the LTS Guidelines, COPUOS also decided to start the next phase of the LTS discussions – LTS 2.0. Pursuant to that decision, a new working group was established with a 5-year mandate to:

- a) Identify and study challenges for the long-term sustainability of outer space activities and to consider possible new guidelines.
- b) Share experiences, practices and lessons learned from voluntary national implementation of the already adopted LTS Guidelines.
- c) Raise awareness and build capacity to implement the guidelines, particularly among emerging space nations and developing countries.

The working group will need to strike an appropriate balance between discussing implementation of the already adopted guidelines, and discussing emerging topics that could be the basis for proposals for new LTS guidelines. Such topics might include issues arising from on-orbit servicing or the placement and operation of very large constellations in Earth orbit. Industry initiatives, such as CONFERS and the Space Safety Coalition discussed earlier in Section 3.2, may help to identify elements of future international standards and guidelines.

In discharging its mandate, the LTS 2.0 working group will have to deal with the challenge of operating under the consensus decision-making rule of COPUOS in a committee that at the time of this writing (May 2023) has 102 member States and is increasing in size each year. As the Committee’s membership increases, so too

will the diversity of the priorities, views and space capabilities of its member States. Moreover, the working methods of COPUOS were defined at a time when States were the only space actors. The Committee remains to this day a forum of States. However, given that most active satellites are now commercial satellites, COPUOS will have to explore methods of work that allow it to incorporate inputs from private sector entities in its discussions if it is to remain relevant as the preeminent international forum for the progressive development and codification of space law.

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