

IAC-20-E3.4.1

## UN COPUOS Guidelines for the Long-Term Sustainability of Outer Space Activities: Early implementation experiences and next steps in COPUOS

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### Abstract

In June 2019 the United Nations Committee on the Peaceful Uses of Outer Space (UN COPUOS) adopted 21 voluntary, non-binding consensus Guidelines for the Long-Term Sustainability (LTS) of Outer Space Activities and a politically significant context-setting preamble to these (and future) LTS Guidelines. With the adoption of these 21 LTS Guidelines, the focus of discussions in UN COPUOS has shifted from guideline development to guideline implementation. Successful LTS guideline implementation will both rely on and strengthen international cooperation in space activities. 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 conduct of space activities. This paper presents some of the early guideline implementation efforts reported by States in COPUOS, the challenges they are encountering, and the lessons learnt from some recent “teachable moments”. The paper concludes with some observations on the second phase of the LTS discussions in UN COPUOS.

**Keywords:** space sustainability, UN COPUOS, soft law

### 1. Introduction

In 2019, following an eight-year process, the United Nations Committee on the Peaceful Uses of Outer Space (UN COPUOS) adopted, by absolute consensus of all its then 92 member States, a set of twenty-one guidelines for the long-term sustainability of outer space activities, or so-called “LTS Guidelines”. 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 LTS Guidelines are based on a substantial body of knowledge, as well as the experiences of States, international intergovernmental organizations and relevant national and international non-governmental entities. The full text of the guidelines is available in UN document A/74/20, Annex II.[1] Readers interested in a description of the process and challenges of negotiating these guidelines are referred to the paper by Martinez. [2]

The guidelines are relevant to both governmental and non-governmental entities. They are also relevant to all space activities, whether planned or ongoing, as practicable, and to all phases of a space mission, including launch, operation and 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 while allowing for flexibility in adapting such practices and frameworks to specific national circumstances. They are also intended to support States and international intergovernmental organizations in developing their space capabilities in a manner that avoids causing harm to the outer space environment and the safety of space operations.

Now that we have these guidelines, they will only achieve their intended effect if they are implemented by the widest possible number of actors. In this paper we will report some of the early implementation efforts and experiences of States as they begin to give effect to these LTS Guidelines at national level.

### 2. Implementation of the LTS Guidelines

The first point to note about implementation of the LTS Guidelines is that they are voluntary and not legally binding under international law. The existing United Nations treaties and principles on outer space provide the fundamental legal framework for these guidelines. However, *non-binding* does not mean *non-legal*, in the sense that States may choose to incorporate elements of the guidelines in their national legislation,

as has been the case with the UN COPUOS space debris mitigation guidelines.

The second point is that, although the guidelines are contained in a UN that is directed at States, the guidelines will only achieve the desired effect if they are implemented by *all* space actors, not just governmental space actors. This is especially important in view of the fact that private sector space actors now greatly outnumber the governmental actors, and this situation will become more and more pronounced with each passing year.

With these two points in mind, we now examine some of the preliminary steps towards implementation of the LTS Guidelines being taken by governments and the private sector.

### 2.1 Governments and intergovernmental space actors

The first step toward guideline implementation is raising awareness of space sustainability concerns and socializing the LTS Guidelines as a means to promote responsible behaviour among space actors. There are a number of pragmatic steps that governments can take to socialize and implement these guidelines. At national level, States could promote awareness of the guidelines to their domestic space community and express commitment to the implementation of the guidelines at national level.

Regulators could include guideline implementation in their considerations and processes concerned with the authorization and ongoing supervision of national space activities under the jurisdiction and/or control of that State. Bear in mind that *non-binding* does not mean *non-legal*, because States can choose to implement elements of these guidelines in their national legislation.

At the international level, States could use guideline implementation and the sharing of implementation experiences as tools to socialize the implementation of the guidelines in the international space community. Indeed, a number of States have already started voluntarily reporting on their national implementation of the agreed guidelines, or have signalled their intent to do so in the near future.

Some delegations to COPUOS have started to report their implementation experiences during the sessions of the Committee. These include: revision of relevant domestic legislation; improved and/or enhanced registration of space objects; implementation of national space policy directives; enhancing national capabilities in space situational awareness and debris monitoring.

An example of this sort of voluntary reporting is the conference room paper by the delegation of the United Kingdom to the 57th session of the COPUOS Scientific and Technical Subcommittee in February 2020.[3] In this paper, the UK delegation outlined their national experiences with regard to implementing the LTS Guidelines. The paper presents a helpful template for reporting information on:

- a) The approach adopted by a member State on implementing individual LTS Guidelines;
- b) Progress made against the adopted implementation approach and future national activities envisaged; and
- c) Lessons learnt and practices discovered during implementation, alongside any legal or technical support requirements identified.

The elements identified in the UK paper provide a helpful basis for compiling information on LTS guideline implementation practices and experiences, and it will also serve as helpful guidance for States that are not quite sure how to go about implementing the guidelines. In this regard, the third element, namely capacity building, is an important issue to be addressed.

There are a number of challenges that States will confront when implementing these guidelines. The first is that the scope of the guidelines is very broad, as they address policy, regulatory, operational, scientific and technical aspects of space activities. Implementation will be consistent with national needs, conditions and capabilities.

Also, the exact form implementation is not prescribed, leaving it up to each country to determine its own modalities for implementation. This is intentional, to allow for the very different levels of space activities in different countries and the different ways in which space activities are conducted and governed in different States. This inherent flexibility to allow for implementation in different contexts can also lead to uncertainty or inconsistency in implementation. For this reason, it is important to “unpack” what guideline implementation means in different contexts. It has been suggested that some sort of guidebook for implementation that captures implementation practices would be a helpful reference for States.

It is clear that implementation of the guidelines is very difficult without a governance framework. Indeed, the first five of the twenty-one guidelines address the policy and regulatory aspects of space activities. With regard to enhancing or updating of national regulatory frameworks, established space nations have more experience and implementation capacity, but also more

“legacy” legal systems and institutional inertia. On the other hand, emerging space nations often lack experience and/or capacity in the regulation of space activities, but they can be more agile in adopting new space legislation that reflects current best practice. A common thread is the importance of “future proofing” legislation, so that it does not get outpaced by technological or commercial developments.

Effective guideline implementation will also require greater cooperation among regulators of different States. This is to avoid regulatory lacunae across different jurisdictions that lead to “regulation shopping” and also chain-of-custody issues where space activities are conducted across multiple jurisdictions. Two examples of such chain-of-custody issues that raise concerns for space sustainability have already occurred. The first was the unauthorized launch of multiple unlicensed and untrackable small satellites by Swarm Technologies Inc in January 2018 in defiance of a ruling by the Federal Communications Commission, for which the company was subsequently fined \$900,000.[4] Another example was the undocumented introduction of microscopic tardigrades onto the Israeli Beresheet lunar mission, which subsequently crashed on the lunar surface in April 2019.[5] These events point to the need for improved coordination among national regulatory authorities responsible for the authorization and ongoing supervision of space activities.

Developing countries and emerging space nations face particular implementation challenges. These nations may not have sufficient capacity in government or sufficient experience in the regulation of space activities to support effective guideline implementation. There may also be a general lack of awareness among policy makers of space sustainability issues in general and the LTS Guidelines in particular. One cannot assume that, just because a country participated in the LTS discussions in COPUOS, that the subject matter and the guidelines have been fully assimilated into that country’s governance framework for space activities. This is especially the case in emerging space countries that may not have a well-developed space governance framework, and where there may be unclear or overlapping mandates in government entities responsible for different aspects of space activities.

For these reasons, capacity-building has been identified as a priority area for successful implementation of the LTS Guidelines. Developing countries may need support of more experienced actors to implement the guidelines. This is where voluntary reporting, such as the UK example given above, are helpful.

As more States, particularly those with well-established space sectors, report their implementation of the LTS Guidelines in COPUOS, this creates a kind of social pressure in the community of States for others to do likewise to demonstrate that they, too, are responsible space actors. This is how international norms become established, and prominent norms can become the established customary practice of States, which is one of the sources of international space law.

## 2.2 *Commercial space actors*

The private sector is rapidly growing in size and importance. The private sector also has a tremendous amount of operational experience in the safe conduct of space activities and in dealing with the effects of space weather on space operations, and other on-orbit operational issues. This was amply demonstrated by the effective industry coordination that took place during the Galaxy-15 “zombie sat” episode in 2010.[6]

It is safe to say that the established major space actors are very well aware of the risks posed by debris and irresponsible behaviour in orbit and are motivated by their own commercial self-interest and also a sense of social responsibility to be good citizens in orbit. A number of private sector actors are taking the lead to demonstrate their commitment to responsible space operations.

The private sector is also doing a lot of work to develop technologies for close-proximity operations in orbit, such as on-orbit servicing, refuelling and other life-extension interventions, and also end-of-life disposal. These are all technologies that will underpin the future growth of the space economy.

The private sector is already thinking beyond the scope of the LTS Guidelines to develop standards for commercial close-proximity operations in orbit, something which is not addressed by the 21 already adopted LTS Guidelines. The ability to conduct cooperative on-orbit close proximity operations (such as inspections or on-orbit servicing) will enable the growth of the orbital space economy. However, the lack of clear, widely accepted technical and safety standards for 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 with initial seed funding provided by DARPA that aims to leverage 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. The consortium currently comprises industry 25 members and 10 observers from different countries. In February 2019, the Consortium approved its first Design and Operational Practices to enhance the operational safety and success of rendezvous and proximity operations and on-orbit satellite servicing.[7] The Consortium also submitted a formal request to Subcommittee 14 of the International Organization for Standardization (ISO) to add a new work item on satellite servicing and begin discussions of an initial draft standard based on the CONFERS principles and practices. The development and codification of standards for commercial rendezvous and close-proximity operations and on-orbit satellite servicing could pave the way for UN COPUOS to discuss and adopt best-practice international guidelines on these topics in the future.

The number of new space start-up companies has been increasing exponentially over the past few years, and the investment in these companies is increasing as well. Also, the sources of investment in space start-ups is becoming more geographically diverse than in previous years.

According to a 2020 study by Bryce Space and Technology, space industry start-ups attracted \$5.7 billion in financing in 2019, a 62% increase over the \$3.5 billion record set in 2018.[8] About 71% of this \$3.5 billion was venture capital. More than 60% of the start-up space investment activity in the last 20 years occurred in the last five years. Eighty percent of the money start-ups raised in the last five years came from seed funding and venture capital. While investors took stakes in 135 space start-ups around the world, four of the largest ventures – SpaceX, Blue Origin, OneWeb and Virgin Galactic — attracted nearly 70% of the total financing according to the Bryce study. The full impact of the COVID-19 pandemic on the space start-up sector remains to be seen, but it may prove to be a compounding crisis that triggers events linked to two concerns for space sustainability. The first has to do with the rate of growth itself and the second has to do with the venture capital mindset that accompanies such growth.

Turning to the first concern, there is a real danger that we are seeing a space investment bubble that is growing at an unsustainable rate and that it will burst at some point. The COVID-19 pandemic may provide the impulse for this. What happens if ambitious space

projects with large space infrastructures go bankrupt half-way through deployment, leaving large numbers of satellites essentially abandoned in space? Or, what if there are one or two spectacular failures and the venture capital community suddenly gets cold feet and withdraws from the sector, leaving a vast number of small companies with assets in space floundering?

The second concern is related to the venture capital mindset of failing quickly, testing prototypes in the market and generating sales as soon as possible. These may be good approaches to high-tech start-ups on the ground, but they could be potentially disastrous for space sustainability.

One often hears of how disruptive technologies are changing the paradigm of commercial space activities, but space sustainability is much more susceptible to disruptive investment models than their underlying technologies *per se*. This is why it is so important to raise the awareness of aspiring space actors (and this includes people who invest in space activities) that they are entering a fragile domain where an irresponsible action by even one small actor could have terrible, irreversible and long-lasting consequences for all other users of a given orbital regime. This inevitably means that adopting measures to support space sustainability will impact a company's financial bottom-line, and could mean the difference between profitability and loss for a lean start-up company. This is why it is so important to have regulations that level the playing fields for all commercial space actors.

The idea of environmental stewardship being good for business has to be firmly established in the space domain. Commercial space actors have started to self-organize in this regard. Since the adoption of the COPUOS LTS Guidelines, we have already observed the emergence of 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*. [9]

These best practices are orbit-regime-agnostic and are generally applicable to all spacecraft, regardless of their physical size, orbital regime or constellation size, and directly address many aspects of the twenty-one consensus LTS Guidelines adopted by COPUOS in June 2019. In this regard, the Space Safety Coalition represents an important step in industry commitment to ensuring the sustainability of the space domain.

In October 2019, the Satellite Industry Association, a trade association based in the United States, adopted a set of Principles of Space Safety, drafted to help protect freedom of use and long-term access to space by ensuring safe flight operations for satellites, human spacecraft and other space missions.[10]

Information exchange is a common thread running through the guidelines, whether it be exchange of operator contact information, or the 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 which could form the basis for future LTS Guidelines in COPUOS.

### **3. LTS 2.0 – Next Steps in COPUOS**

While the 21 consensus LTS Guidelines represent a significant step forward to promote space sustainability, COPUOS Member States agree that the work of COPUOS on this issue is far from over. Building on the lessons learnt from the LTS discussions, the Committee has initiated a new phase of the LTS discussions in COPUOS – LTS 2.0.

At its 62nd session in June 2019, the Committee noted that it should continue to serve as the principal forum for continued institutionalized dialogue on issues related to the implementation and review of the guidelines. The Committee also decided to establish, under a five-year workplan, a working group under the Scientific and Technical Subcommittee to continue the LTS discussions in COPUOS. The Committee decided that this new working group would be guided by the following framework:

- a) Identifying and studying challenges and considering possible new guidelines for the long-term sustainability of outer space activities. This work could also take into consideration draft guidelines that were discussed, but for which consensus could not be reached during the term of the first LTS Working Group.[11]
- b) Sharing experiences, practices and lessons learned from voluntary national implementation of the 21 already adopted guidelines.
- c) Raising awareness and building capacity, in particular among emerging space nations and developing countries, to implement the guidelines.

In taking these discussions forward, COPUOS will have to deal with the challenge of preserving the consensus decision-making rule in a committee that is steadily increasing in size. When the Committee began its work on LTS in 2010 there were 70 member States. As of September 2020, COPUOS has 95 member States. As the Committee membership increases, so too does the diversity of space capabilities, views and priorities represented by the member States. These trends will make it ever more challenging to reach consensus in the Committee. As COPUOS takes this work forward, it will have to explore new methods of work, including ways of incorporating input from non-governmental organizations and the private sector.

Lastly, COPUOS will also need to discuss the ways by which the already agreed guidelines may be revised and updated in future, and also a process by which new topics for guidelines could be proposed for consideration by States. This is in keeping with the view of a number of member States that these guidelines should become a “living document” that is updated from time to time. Indeed, one may identify topics not included among the already agreed guidelines or the remaining unagreed draft guidelines, which could be addressed by COPUOS under the general context of LTS in future. Perhaps issues arising from on-orbit servicing or the placement and operation of large-scale constellations in Earth orbit could be the subjects of such future discussions and one or more possible draft guidelines. In this regard, industry initiatives such as CONFERS and the Space Safety Coalition discussed earlier may help to identify elements of future international standards and guidelines.

### **4. Conclusion**

The adoption of the LTS Guidelines by COPUOS in 2019 was an important step forward for the international community in the sense that there is now a much wider appreciation among UN member States of the urgency of addressing this issue. To be sure, the LTS Guidelines hardly represent the cutting-edge of what it is technically possible to do in terms of promoting space sustainability. However, the importance of the guidelines is that they codify, for the first time, an internationally accepted set of best practices for space sustainability. These practices have been agreed by 92 States, which includes all spacefaring countries and the vast majority of other countries that rely on space.

This is significant because space sustainability is essentially a global challenge that can only be addressed successfully if all countries act collectively. The challenges of space sustainability are inherently

multilateral challenges that are most effectively addressed through multilateral space diplomacy in the forum of COPUOS, where the international community has the opportunity to work together to find ways to expand access to the benefits of space activities to more nations, but also to ensure that the space environment is preserved and protected for use by future generations.

## References

- [1] Report of the 62<sup>nd</sup> session of the Committee on the Peaceful Uses of Outer Space (12 -21 June 2019), UN General Assembly document A/74/20, Annex II. Available at [https://www.unoosa.org/res/oosadoc/data/documents/2019/a/a7420\\_0\\_html/V1906077.pdf](https://www.unoosa.org/res/oosadoc/data/documents/2019/a/a7420_0_html/V1906077.pdf)
- [2] Martinez, P., “Development of an international compendium of guidelines for the long-term sustainability of outer space activities,” *Space Policy*, Vol. 43, February 2018, pp 13-17.
- [3] “Voluntary Implementation of the Guidelines for the Long-term Sustainability of Outer Space Activities and Proposed Reporting Approach by the United Kingdom”. UN COPUOS document A/AC.105/C.1/2020/CRP.15.
- [4] See the Reuters report <https://www.reuters.com/article/us-usa-satellite-fine/fcc-fines-swarm-900000-for-unauthorized-satellite-launch-idUSKCN1OJ2WT> (Last accessed Sep 8, 2020).
- [5] See the Space Review article <https://www.thespacereview.com/article/3783/1> (Last accessed Sep 8, 2020).
- [6] Weeden, B., “Dealing with Galaxy 15: Zombiesats and on-orbit servicing,” in *The Space Review*, Edition of 24 May 2010, accessed at <http://thespacereview.com/article/1634/1>
- [7] More information about CONFERS, the Consortium for Execution of Rendezvous and Servicing Operations, as well as the CONFERS Recommended Design and Operational Practices is available on their website at <https://www.satelliteconfers.org>.
- [8] Bryce Space and Technology, “Start-up Space Update on Investment in Commercial Space Ventures 2020”. Available online at: [https://www.brycetech.com/reports/report-documents/Bryce\\_Start\\_Up\\_Space\\_2020.pdf](https://www.brycetech.com/reports/report-documents/Bryce_Start_Up_Space_2020.pdf)
- [9] More information about the Space Safety Coalition, as well as the text of the Coalition’s *Best Practices for the Sustainability of Space Operations*, can be found on their website <https://spacesafety.org>.
- [10] Satellite Industry Association, *Principles of Space Safety for the Commercial Satellite Industry*. Available online at: [https://sia.org/space\\_safety/](https://sia.org/space_safety/)
- [11] In addition to the 21 agreed guidelines, the Working Group also held discussions on another seven draft guidelines, but was not able to achieve consensus on those during its mandate. The progress made in the discussions of those draft guidelines will help to inform the direction of future LTS discussions in COPUOS. The full texts of the as-yet unagreed draft guidelines are contained in UN document A/AC.105/C.1/L.367.