6 February 2023

English only

Committee on the Peaceful Uses of Outer Space
Scientific and Technical Subcommittee
Sixtieth session
Vienna, 6–17 February 2023
Item 12 of the provisional agenda*
Long-term sustainability of outer space activities

Information and views for consideration by the Working Group on the Long-term Sustainability of Outer Space Activities: National Space Society

The present conference room paper was prepared by the Secretariat on the basis of information received from the National Space Society. The information was reproduced in the form it was received.

* A/AC.105/C.1/L.405.

National Space Society

Information and Views for Consideration by the Working Group on the Long-term Sustainability of Outer Space Activities.

I. Introduction

It is clear to the National Space Society (NSS) that there is an urgent need to preserve and protect outer space for future generations. The NSS has focused much of its policy and advocacy work on orbital debris and related issues in its vision for a space environment that can be maintained into the long term. To expand access to current space applications and foster the development of novel technologies, space activities must be sustainable.

A holistic approach must be taken to properly address the critical aspects of space infrastructure and work toward space sustainability. Orbital debris, on-orbit servicing (OOS), space situational awareness (SSA), and space traffic management (STM) must be considered in concert to ensure the sustainability of Earth's orbital environment, cislunar space, and surfaces and orbits of other celestial bodies.

II. Challenges

Implementing the Long-term Sustainability Guidelines (LTS Guidelines) will become more challenging as space technology develops, and efforts to sustain our outer space environment need to adapt quickly.

The first major challenge in driving adherence to the LTS Guidelines is the fact that they will have a tangible impact only after implementation by most, if not all, State actors. Several States have already amended or adopted new national regulations to conform to the Guidelines. However, more States must follow suit and build regulatory frameworks to fully enable space sustainability best practices.

Moreover, if a State has greater "technical and other relevant capabilities" at its disposal, the "greater the emphasis that State should place on implementing the guidelines to the extent feasible and practicable." On the other hand, "States without such capabilities are encouraged to take steps to develop their own capacity to implement the guidelines," but are also encouraged to collaborate internationally. The nature of this international collaboration must be determined and further defined for effective cooperative implementation.

The second challenge is determining the nature of the "Policy and Regulatory Framework for Space Activities" (Guideline A.1). Laying an appropriate regulatory framework encompasses Guidelines across all categories: safety of space operations, international cooperation, increased awareness, and scientific and development practices that promote the sustainable and safe use of outer space.

LTS Guideline Implementation should be consistent with international law's applicable principles and norms. For example, the work by the United Nations Office of Outer Space Affairs (UNOOSA) on raising global awareness of long-term space sustainability's importance was crucial in confirming, in a comprehensive manner, an appropriate legal framework is essential. UNOOSA issued a stakeholder report based on interviews with States and intergovernmental organizations focusing on their experiences with implementing the Guidelines. This stakeholder report states that "legal certainty is one of the best incentives

a Member State can offer to its space sector." In other words, implementing the Guidelines would not be optimal without adopting an appropriate legal framework.

Moreover, in the particular case of orbital debris removal, there needs to be an international framework of regulations similar to the Law of the Sea that allows for salvage operations of derelict space objects by entities that are not necessarily of the same State as the historic owner of the space debris object. Allowing entities with superior debris removal capabilities to engage in such debris removal operations is in the best interest of all space-faring nations.

The third challenge lies within the broad scope of the Guidelines, which leaves much room for interpretation. This breadth allows actors with vastly different technical capabilities to vary implementation. As such, the value of the Guidelines as an international standard and a tool for coordination could be diluted without rigorously defined norms and behaviors.

Next, private sector involvement and subsequent adherence to the Guidelines is recommended, but a challenge lies in determining the most effective way to accomplish this. In general, most satellites are owned and operated by private entities, with more in the future to be launched as mega-constellations. However, the Guidelines only mention the private sector as part of its recommendation for States to exchange experience, knowledge, and technology to facilitate international cooperation. The NSS suggests examining methods for implementing the Guidelines through the lens of a commercial space company and associated effects on cost, business/risk management, and insurance/liability.

Additionally, the LTS Guidelines do not account for a broader scope of activities such as space resource utilization, lunar activity, human settlement, or environmental impacts on Earth or other celestial bodies. The nature of these activities is difficult to anticipate at this time, as they are nascent pursuits. These activities should be researched further, and the scope of the Guidelines expanded to account for them.

Furthermore, the Guidelines do not account for a future in which many large-scale deployments and operations of space infrastructure, whether in earth orbit, on a celestial surface, or in deep space, will be developed and owned by a multitude of States and/or the private entities domiciled within multiple State jurisdictions. Selecting one State to be the responsible party with respect to long-term sustainability regulations may be arbitrary and unreasonable. Some form of joint or joint and several responsibility may be desirable in the future if we are to encourage and support the kind of multi-national collaborative space efforts that may be required to fund large-scale space infrastructure, settlements, and missions.

III. Current Efforts

Efforts to implement the Guidelines are already underway. Guideline A.1. encourages States to "[a]dopt, revise and amend" their relevant "national regulatory frameworks" to ensure and enhance the long-term sustainability of outer space activities. Some States are currently creating and putting these national frameworks in place (or revising them appropriately as new STM data are gathered). These strategies align with Guideline A.1. and "ensure the effective application of relevant, generally accepted international norms, standards, and practices for the safe conduct of outer space activities."

For example, the intent of several of the Guidelines appears in the United States Federal Communications Commission satellite licensing regulatory requirements. In particular, the intent is reflected through the process of how SmallSats and small businesses address space sustainability.

The second example of current efforts to implement the Guidelines pertains to technical capabilities. Several technical efforts are underway, including on-orbit activities, ground tracking, and monitoring of space traffic. Guideline A.3. drives States to implement "technical competencies required to conduct the outer space activities safely and responsibly and to enable the entity to comply with the relevant governmental and intergovernmental regulatory frameworks, requirements, policies and processes," establishing long-term space sustainability. Some private industry actors are currently voluntarily implementing "responsible space initiatives," and are working with governments and other commercial entities to advance space situational awareness technology. Some companies are working to develop satellite constellations that minimize the risk of on-orbit collision/conjunction.

Guideline D.2. encourages States to "[i]nvestigate and consider new measures to manage the space debris population in the long term." Some current efforts to manage space debris include extending the operational lifetime of a spacecraft (with OOS or other mission-extending initiatives), "novel techniques to prevent collision with… debris" and other space objects, and "advanced measures" for post-mission disposal" (such as the use of dragsails).

Guideline B.4. advises that "States should encourage entities, including spacecraft operators and conjunction assessment service providers under their jurisdiction and/or control to perform conjunction assessments through national mechanisms, when applicable." Further, States should "promote techniques and the investigation of new methods to improve such accuracy" and should coordinate both among themselves and internationally to share and disseminate orbital debris data and "space debris monitoring information." Examples of mechanisms and techniques could include the development of a domestic space object tracking database.

Work is currently in progress to build such a database. The data acquired can be used and shared to guide "develop[ment] and implement[ation]" of appropriate "approaches to and methods for conjunction assessment during all orbital phases of controlled flight." Together with the pre-launch guidelines on making spacecraft more trackable, a space object database would ideally become as comprehensive as possible.

IV. Recommendations

In light of the above-referenced challenges and current efforts, the NSS makes the following recommendations for the development and implementation of the Guidelines.

a. The NSS suggests the LTS Working Group propose the adoption of a "Model Law," following, *mutatis mutandis*, the example of the Model Law on International Commercial Arbitration adopted by the United Nations Commission on International Trade Law (UNCITRAL), to ensure the adoption of uniform, comprehensive, and globally compatible legal frameworks.
b. The Guidelines are voluntary and not legally binding under international law. However, that does not mean national regulatory frameworks should also be voluntary. The NSS suggests national regulatory framework should be enacted and continuously updated for oversight of space activity to ensure space sustainability practices are implemented.
c. States' regulations should not be drafted in such a way that they could become a barrier to future space activity that facilitates space environment sustainability. Such regulations should be "efficient in terms of limiting the cost for compliance (e.g., in terms of money, time or risk)… ." The NSS recommends ensuring national regulatory framework is neither overly burdensome nor prohibitive and reviewing the impact of regulations on commercial actors.

d. A vital aspect of the Guidelines is efficient and practical access to spectrum frequency bands. Recognition of possible future issues relating to spectrum access may be vital to maintaining LTS Guideline ideals. Guideline A.4 addresses the recommendations to which each State should aspire when it comes to spectrum access and equity and would be categorized alongside Outer Space Treaty (OST) Article VI. Guideline A.4 specifies that "…States and international IGOs should consider the requirements for space-based Earth observation systems and other space-based systems and services in support of sustainable development on Earth." This coincides with Article VI's emphasis on the State's responsibility for the actions of those within the State that utilize radiofrequency spectrum for their launches and operations.
    i. The NSS suggests that the Guidelines address possible consequences of harmful radiofrequency interference resulting from spectrum conflict. This would be a valuable addition to the Guidelines because it would emphasize the extent of spectrum interference's impact on launches and other spacecraft. For example, if a satellite's connection with its agency is interrupted by another satellite or passing craft, the potential for collisions and the creation of more space debris increases significantly.
    ii. The NSS recommends thoroughly discussing possible consequences of spectrum interference, including all appropriate stakeholders. Such a discussion may motivate developing countries, agencies, and IGOs in the burgeoning space industry to continue operating currently orbiting craft, or use more caution when launching new craft.
e. The Guidelines recommend that States "[d]evelop practical approaches for pre-launch… assessment" and share that information to encourage further research into long-term space sustainability. The NSS suggests a pre-launch assessment of a manufacturer or owner/operator's spacecraft as part of a national regulatory framework could consist of a review of "design approaches that increase the trackability of space objects" and whether the entity "implement[s] applicable international and national space debris mitigation standards and/or guidelines."
f. The Guidelines recognize the importance of small objects in space activity, especially due to their accessibility to developing and "emerging spacefaring" countries. The NSS recommends incorporating the Guidelines into national regulatory framework that pertains to launching and operating "small-size space objects that are difficult to track… in a way that promotes the long-term sustainability of outer space activities."

V. Conclusion

The existing regulatory framework is not apt to ensure the long-term sustainability of outer space, given the ever-expanding number of actors poised to engage in space activity. The Guidelines should be updated to better "support the development of… frameworks for conducting outer space activities" while allowing flexibility for States to adopt such practices and frameworks to their current capabilities.

In the coming years, space activity will include work beyond Earth's orbit and on surfaces of other celestial bodies, including recycling solid propellant/defunct rocket stages and cislunar metal processing for service vehicles/satellites. These future activities are resource-intensive, and long-term lunar surface environmental impacts must be considered, including the use of lunar ice.

The impact of other lunar activities, including resource utilization and human settlement, should be assessed and incorporated into the Guidelines, especially those which are commercial in nature and not solely for purposes of research and science. The international community must remember that just as we care for the environment here on Earth, we must ensure the space environment is sustained for generations to come.