

Outer Space SARPs: A Step Towards Harmonization of National Regulations for the Enhancement of Sustainability of the Space Environment

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1. Introduction

The 1967 *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies*¹ (OST) laid the framework for international law in outer space. It has successfully guided the exploration and use of outer space for five decades. However, with the ever –growing use of outer space by national and commercial actors, two of its fundamental principles are now potentially coming into conflict and risk hindering the future uses and sustainability of outer space. These two fundamental principles are the *freedom of use* principle (Article I) and the *national activities* principle (Article VI). The second paragraph of Article I specifies, inter alia, that outer space “shall be free for exploration and use by all States without discrimination of any kind”. The only condition is, quite reasonably, that a State’s use of outer space should not infringe on another State’s right to do the same. This is captured in the *due regard* provision of Article IX of the OST. Within this parameter, a State has complete freedom to the peaceful use and exploration of outer space. Article VI specifies that the activities of non-governmental entities “shall require authorization and continuing supervision by the

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1 *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies*, opened for signature at London, Moscow and Washington on 27 January 1967, 610 UNTS 205, 18 UST 2410, TIAS 6347, 6 ILM 386 (entered into force on 10 October 1967) [OST].

appropriate State Party”, thereby giving individual States the responsibility to regulate activities in outer space

The mechanism by which most States chose to fulfil their Article VI responsibilities has been through a national licensing regime for the authorisation of the space activities of private actors. The requirement for authorization and supervision ensures that the State can fulfil its international responsibilities under the OST and international law in general. According to Article VI of the OST, the State bears international responsibility for all space activities (whether carried out by government agencies or by private actors).

The result is that outer space is an internationally shared domain with actors operating under a multitude of different national regulations. This arrangement works well in a vast domain that is not crowded. This was the case for most of the space age. Multiple States and their private actors were able to independently conduct space activities under their respective national regulations without infringing on the freedom of others.

However, now that outer space is becoming increasingly crowded, efforts are being made to develop and implement international guidelines for space activities that will protect the space environment for all to use. These efforts have, thus far, only yielded non-binding guidelines. This is unavoidable under current international law since the OST confers to States the right of freedom of use under national supervision.

2. Lack of Harmonization of National Regulations; a Risk to Safety and Sustainability

International law has no binding mechanism for regulating space activities. Notwithstanding the general obligation of due regard (OST article IX) and respect for other States’ freedom of use (OST article I), all activities are conducted under national regulations. The diversity of national regulations, current and potential, may be problematic for long-term sustainability of the space environment. For example, if commercial actors can benefit from a more favourable regulatory regime, requiring less attention to debris mitigation, in one specific State, then there will be incentive to move to that jurisdiction. Other States will be pressured to match that regime in order to retain the economic benefits of those space activities. This short-term incentive could spiral into a race to the bottom, where the ultimate casualty will be the outer space environment.

It is clear that activity in outer space has increased substantially over the past decades and promises to increase even more in the upcoming decades. The last few years have seen proposals for, and licensing of, several major projects involving very large constellations of Low Earth Orbit (LEO) satellites. Some are for remote sensing of the Earth’s surface, but the larger ones will be devoted to communications, providing worldwide broadband services for mobile users.

These large constellations will substantially alter the operating environment for users at their specified orbital altitudes but, according to Article VI of the OST, they require authorization from only a single State. The operating conditions imposed on the licensee will be at the discretion of the authorizing State, which is not obligated to impose any particular debris mitigation condition. The only binding conditions that the authorizing State must meet are those laid out in the OST, principally respect for the freedom of use of other States and due regard provisions for the activities of other State parties. However, these provisions are principles only and not specifically defined in any technical sense. Moreover, they are open to interpretation and have never been adjudicated by any international law body.

Regardless of how responsible most space actors wish to be, the increasing value of space services and capabilities are a driver for increasing the number of objects in Earth orbit. There is no binding international mechanism to control the numbers or standards by which they operate. Eventually, if this trend continues, safety of space missions and sustainability of the space environment will be increasingly threatened.

3. Soft Law Measures have been Insufficient

Over the past two decades progress has been made in efforts to reduce the growth and impact of orbital debris and to enhance the sustainability of the space environment. These efforts have resulted in non-binding guidelines; so called *soft law* measures.

The Inter-Agency Debris Committee (IADC) published initial guidelines for the mitigation of space debris in 2001. A revised version was issued in 2007.² That same year, the United Nations General Assembly adopted a slightly modified version of the IADC guidelines that was prepared by the Committee on the Peaceful Uses of Outer Space (UNCOPUOS)³. Although some States have implemented these guidelines in their national legislations for the purposes of authorizing space missions, the guidelines themselves remain non-binding and the number of objects in Earth orbit continues to grow. Hence, with no management of the orbits, the probabilistic risk of on-orbit collisions also continues to increase.

Since the IADC and UNCOPUOS Guidelines are non-binding, there is no mechanism for enforcement or, at a minimum, incentivizing compliance.

2 IADC *Space Debris Mitigation Guidelines*, Issued by Steering Group and Working Group 4, IADC-02-01, Revision 1, September 2007, online http://www.unoosa.org/documents/pdf/spacelaw/sd/IADC-2002-01-IADC-Space_Debris-Guidelines-Revision1.pdf.

3 *Report of the Committee on the Peaceful Uses of Outer Space*, UNCOPUS, 62nd Sess., Supp No 20, UN Doc A/62/20 (2007), Annex.

Thus, a large number of objects fail to comply with the UN debris mitigation guidelines for disposal.⁴

The UNCOPUOS forum continues to work diligently to address the problem of space debris and the sustainability of the outer space environment. However, is unlikely to be able to adequately solve this problem, since it operates on consensus-based decision-making, leaving no room for negotiations on a regime that would in any way limit the competitive operations of States in the space sector.

In 2018, UNCOPUOS adopted an initial set of 21 Guidelines for the long-term sustainability of outer space activities.⁵ These Guidelines are of a general nature and are voluntary. It is therefore doubtful if they will radically alter national behaviour. The Guidelines offer no definitive national incentive for States to comply, nor any repercussions for non-compliance. As such, States may continue to behave according to their own, generally short-term, national imperatives, which are not necessarily in line with long-term sustainability goals.

While the soft-law approach has been useful in the past, there are limits on the extent to which we can depend on this approach to protect the outer space environment. There is often nothing for States to gain by agreeing to a non-binding instrument, and some States even see non-binding instruments as limiting their freedom of action regarding future activities, without providing any direct national benefit. Thus, even non-binding instruments are seen as creating expectations and norms of behaviour, which can be limiting politically, if not legally. On the other hand, States often lose nothing by rejecting non-binding instruments. The recent failure of the International Code of Conduct is an example of difficulties faced by even non-binding measures.⁶

This paper argues for the development of a binding instrument for regulation of space activities. However it is clear that for States to be willing to take part in any new treaty arrangement, it would have to allow for sufficient flexibility with respect to developing technologies, and at the same time provide enough short-term gain and benefit for States Parties, while creating a disadvantage for those who do not comply. This is a difficult construct to

4 *Experts call for legislation and improved tracking to deal with orbital debris*, SpaceNews.com, online: <<http://spacenews.com/experts-call-for-legislation-and-improved-tracking-to-deal-with-orbital-debris/>>

5 *Guidelines for the Long-term Sustainability of Outer Space Activities*, Committee on the Peaceful Uses of Outer Space, Vienna, 20–29 June 2018, A/AC.105/2018/CRP.20. <http://www.unoosa.org/res/oosadoc/data/documents/2018/aac_1052018crp/aac_1052018crp_20_0_html/AC105_2018_CRP20E.pdf>

6 Draft International Code of Conduct for Outer Space Activities (31 March 2014): <http://www.eeas.europa.eu/non-proliferation-and-disarmament/pdf/space_code_conduct_draft_vers_31-march-2014_en.pdf>

imagine, however there are successful instruments in other international domains that provide excellent models.

4. International Safety Regulations in Other Domains (Maritime & Air) Leading to Harmonization of National Regulations

International governance measures, be they binding or not, can often be a force for harmonization of national regulations. The harmonization effect will be greater with a larger number of complying States. Hence, incentives for compliance (or alternatively, disincentives for non-compliance) are required to achieve a significant degree of harmonization.

It is informative to examine the governance models for two other international domains that have a much longer history of use than outer space. In the high seas and international airspace, States have managed to agree on treaties and mechanisms of international regulation for purposes of safety, applicable to civil traffic. As a consequence of these international agreements, a significant degree of harmonization of national regulations has been achieved throughout the globe. These regimes may be used as models for the international regulation of outer space for safety and sustainability.

4.1 International Regulations for the Safety of International Merchant Shipping

The International Maritime Organisation (IMO) is a specialised agency of the United Nations. Consisting of 174 member states, the IMO is responsible for the safety and security of shipping and the prevention of marine and atmospheric pollution by ships. The IMO's primary legal instrument is the *Convention on the International Maritime Organization*.⁷ The Assembly, composed of all IMO Member States, is the highest governing body. It is responsible for approving the work programme and budget; and determining financial arrangements and for electing the IMO Council. The IMO Council is the executive organ of the IMO and is responsible, under the Assembly, for supervising the work of the Organization. The Council is made up of 40 Member States, elected by the Assembly for two-year terms.

The Maritime Safety Committee (MSC) deals with all matters related to maritime safety and maritime security that fall within the scope of the IMO, covering both passenger and cargo ships. The MSC is primarily responsible for updating the *International Convention for the Safety of Life At Sea* (SOLAS).⁸ The SOLAS includes multiple annexes that prescribe safety regulations for passenger and merchant ships. The MSC is responsible for the

⁷ *Convention on the International Maritime Organization*, originally called *Convention on the Intergovernmental Consultative Maritime Organization*, signed at Geneva 6 March 1948, entered into force on 17 March 1958.

⁸ International Maritime Organization (IMO), *International Convention for the Safety of Life At Sea*, 1 November 1974, 1184 UNTS 3. [SOLAS]

content and updates to the safety annexes. The IMO Member States approve the updates using a tacit approval procedure. The proposed MSC updates are distributed to the Member States and automatically become effective on a specified date unless a certain number of the Members object. The SOLAS convention requires signatory flag states to ensure that ships flagged by them comply with the standards set out in the SOLAS.

Flag states implement the SOLAS standards through national regulations. The implementation of these common standards provides a mechanism for the harmonisation of merchant ship safety regulations for all States of registration.

4.2 Regulation of International Civil Aviation

The regulation of international civil aviation is governed by the *Convention on International Civil Aviation of 1944*, (Chicago Convention).⁹ The Chicago Convention is a comprehensive treaty that addresses many issues including the foundation of ICAO (International Civil Aviation Organization). A key characteristic of the Treaty that may be applicable to outer space governance is the concept of Standards and Recommended Practices (SARPs). In a manner analogous to the IMO SOLAS convention, the SARPs and their management by ICAO, assures, as much as possible, the safety of international civil aviation. State Parties have incentive to comply with the mandated SARPs in order to ensure that they are full participants in the global international civil aviation business.

The Chicago Convention specifies that States Parties are to adhere to the uniform standards and recommended practices for international civil aviation (art 37). In return, States Party shall agree to recognize aviation licenses and airworthiness certificates issued by other States, provided that they meet or exceed the mandated standards (art 33). This amounts to relinquishing one aspect of the otherwise unfettered sovereign control and regulation over a State's own sovereign air territory. But in order to have their own licenses and certificates recognized, a State must adhere to uniform standards and recommended practices (SARPs).

The Chicago Convention forces its State Parties into striking a bargain with each other: some limits on independent control over sovereign airspace, in return for access to the sovereign airspace of other States. This bargain is dependent upon compliance with the SARPs. The long-term goal of ensuring safety and international standardization of the civil aviation industry is secured due to the short-term incentive of States wishing to participate in an international regime which grants them access to other States' airspace and guarantees recognition of their own licensing procedures.

⁹ *Convention on International Civil Aviation*, opened for signature on 7 December 1944, 15 UNTS 295, (entered into force on 4 April 1947) [*Chicago Convention*].

Although the Chicago Convention SARPs do not apply for uniquely national flights, the incentive for States to comply with the international standards has driven the national standards to be essentially equivalent. Thus, through the mechanism of international SARPs, national regulations for civil aviation are effectively harmonized across most nations.

The management regime of the aviation SARPs bears significant similarity to that of the IMO SOLAS regime. The SARPs are developed by experts (Air Navigation Commission), coordinated with States Parties and accepted by a representative body (the Council) and not the entirety of the States Parties (the Assembly). The members of the Air Navigation Commission are selected for their expertise, and not as representatives of their State of origin.¹⁰

The SARPs are not in themselves part of the Chicago Convention treaty, rather they are contained in Annexes to the treaty and can be regularly updated by the ICAO Council. This procedure does not require the unanimous approval of State Parties nor does it require formal ratification by any State.¹¹

States are not compelled to implement the aviation SARPs. However, non-compliance will jeopardize their participation in international civil aviation. Hence, States are incentivized to comply. This compliance is fulfilled through national regulations for civil aviation, leading to global harmonization of national standards.

The space environment shares some attributes with the international aviation environment in the sense that it is a highly technical environment where advances and new applications are continually being brought forward. These advances enable the performance of certain activities differently and more efficiently than in the past, and also enable new types of activities that had not been envisioned a decade or two ago. Hence any international regulatory scheme has to be flexible in order to keep pace.

5. Proposal for Outer Space SARPs

A lesson to be learned from the history of discussions on debris mitigation and code of conduct on outer space is that States perceive little or no short-term national incentive to agree to any binding, or non-binding, instrument that may impose limits on their freedom of action. Issues such as space debris and space traffic management may not appear to policy makers as immediate threats to their national interest. However, they threaten the collective interest in the long term. The question that remains unanswered is: *How to incentivize States to accept a new binding space governance instrument that may potentially hamper their short-term use of space but will benefit their long-term interests by enhancing the sustainability of the space environment?*

¹⁰ *Ibid* art. 56

¹¹ *Ibid* art. 54(l).

This paper proposes an international governance regime of Outer Space SARP that will provide short-term national incentives to States. It is based on the Chicago convention model and its objectives will be to:

1. Provide standardised regulations and norms for outer space activities that will enhance the sustainability of the space environment;
2. Provide incentives for States to adhere to those standards; and
3. Lead to harmonization of national regulations for space activities.

A new international convention would need to be negotiated in order to put this type of regime in place. Alternatively, the regime could be adopted as an additional protocol to the OST. The new convention would not need to be expansive. It would simply establish, for example, a few key principles, such as:

1. States agree to jointly develop Standards and Recommended Practices (SARPs) for safety of space operations and the sustainability of the outer space environment.
2. The cooperation of States in the peaceful exploration and use of outer space may be made dependent on adherence to the agreed Outer Space SARPs
3. A governance structure is defined such as: (1) an assembly of all States Parties, (2) a governing council composed of a subset of States, and (3) one of more committees of experts responsible for developing and modifying the SARPs.
4. A mechanism for adopting the SARPs.

6. Potential Subjects of Outer Space SARPs

The Outer Space SARPs will focus on the safety and sustainability of space activities. SARPs will be beneficial in a number of areas, some of which are already the subjects of national and international attention. An initial set of SARP's, which would be detailed in Technical Annexes and could include the following subject areas, some of which already have been the subject of considerable analysis and discussion:

1. **Space Debris Mitigation Standards**
The existing IADC Debris Mitigation Standards are a good example of the technical considerations that might be included in the Outer Space SARPs. The standards promote safety of space operations and sustainability of the outer space environment. The primary difference between the existing guidelines and the SARPs are the potential negative consequences associated with non-compliant States. The ITU has adopted the guidelines for allocation of frequencies for geostationary

orbital slots.¹² Although non-binding, a significant level of compliance has been achieved. This is a good example of the anticipated effect of future Outer Space SARPs.

2. Space Traffic Management

Space traffic Management is a topic of increasing interest within the space community. At this point the focus is mostly on Space Situational Awareness (tracking of space objects), but eventually the number of space objects may increase to a point where an international regime for managing use of orbits may be required.

3. Orbital Servicing

Safety of space operations and debris mitigation are prime concerns in conducting orbital servicing missions. The technology is emerging and such missions may become common in the future. A DARPA-led initiative (CONFERS) is working to develop non-binding technical and operational standards for such missions.¹³ Eventually, internationally agreed standards will be required.

4. Active Debris Removal

Standards for debris removal may eventually be required, not only for safety but also for the issues of rights for access and salvage, as well as liability.

5. Passenger Services & Spaceports

If international space flights, or passenger services, are to be implemented, then international safety regulations will be desirable. At present, the passenger (space tourism) initiatives are only subject to national regulations.

6. Registration Requirements for Space Objects

Although the Registration Convention imposes obligations to States of registry, the requirements are not stringent and there is no consequence

12 *Environmental protection of the geostationary-satellite orbit*, ITU Recommendation ITU-R S.1003.2 (12/2010), online <http://www.unoosa.org/documents/pdf/spacelaw/sd/ITU-recommendation.pdf>.

13 *The Consortium for Execution of Rendezvous and Servicing Operations (CONFERS) is an industry-led initiative with initial seed funding provided by the Defense Advanced Research Projects Agency (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 OOS and RPO*, online: <<https://www.satelliteconfers.org/about-us/>>

for non-compliance.¹⁴ With increasing numbers of space objects, a more rigorous registration requirements may promote sustainability of the space environment.

Communities of experts, or expert working groups, as would be defined in the proposed convention, should be responsible for the technical content of the SARPs. The SARPs should focus on the universal interests of safety and sustainability. The SARPs should not promote the national interest of any particular nation. Thus the body (or bodies) responsible for the SARPs should not be composed of national representatives, but persons nominated for their technical expertise. The Air Navigation Commission of ICAO is an excellent model of a group of experts dedicated to the safety of civil aviation.¹⁵ National interest can be incorporated in the mechanism (or voting formula) for adopting the SARPs.

7. Harmonization of National Regulations and Benefits

In order to ensure the cooperation of other States, nations would be incentivised to adhere to the SARPs. International cooperation is critical for the space programmes of most States and for most commercial operators. Cooperation includes technology transfer, launch services, ground station support and, potentially, access to markets. Many States already have national laws regulating these activities. National laws could easily be amended to include adherence to Outer Space SARPs as an additional condition of cooperation.¹⁶

While the SARPs may focus on the long term global benefit (debris mitigation and sustainability), individual States will have a short-term national incentive of ensuring the cooperation necessary for their space programmes. Thus to ensure adherence to the Outer Space SARPs, States would be incentivized to align their national regulations with the SARPs. This will lead, inevitably, to the harmonization of national regulations, as it has in civil aviation and merchant shipping.

Upon first glance, the proposal to make cooperation subject to compliance with the Outer Space SARPs may seem to violate the intent of Article I of the

14 *Convention on Registration of Objects Launched into Outer Space*, opened for signature on 14 January 1975, 1023 UNTS 15, 28 UST 695, TIAS 8480, 14 ILM 43, entered into force on 15 September 1976. [Registration Convention]

15 International Civil Aviation Organization "Making an ICAO Standard" (1 November 2011), online: <<http://www.icao.int/safety/airnavigation/pages/standard.aspx>>.

16 Doucet, G., Steer, C., *The Use of Space Technology Export Controls as a Bargaining Solution for Sustainability: A Chicago Convention Model of Space Governance*, 2017 Proceedings of the Annual Institute of Space Law Colloquium, online <<https://ssrn.com/abstract=3031085>>.

OST (that outer space “shall be free for exploration and use by all States without discrimination of any kind [...]”) While this freedom is universal, it should not be read to be absolute. Not only must all activities be in accordance with international law, but in order to guarantee continued freedom of access and use, all States must consider how to mitigate space debris and minimise any further congestion in the long term. Otherwise, their use will infringe on other State’s reciprocal right to freedom of use. Therefore a regime that incentivizes States to act in a manner that will promote the sustainability of the space environment for all is consistent with Article I. Further, it protects all States interests in the exploration of outer space.

7.1 Benefits of Harmonization

Several benefits will be derived from harmonization of national space regulations:

1. Safety of space operations and sustainability of the space environment will be enhanced. Debris mitigation measures will be standardized and compliance will increase from the current level.
2. Emerging problems will be easier to solve. For example Space Traffic Management (STM) is increasingly discussed as an emerging issue. However, there is no mechanism to implement any STM measure at the international level. The United States Space Policy Directive 3 acknowledges the challenges and provides useful guidance.¹⁷ Although it promotes international engagement and cooperation, it is nonetheless a U.S. national policy. Eventually, and international cooperation on STM will be required. An Outer Space SARP regime would be an ideal mechanism for internationally harmonized STM standards.
3. Harmonization will create a level playing field for commercial operators. Under the current situation of disparate national regimes, commercial entities are motivated to seek the jurisdiction offering the most beneficial terms. Often the most beneficial jurisdictions, from the commercial operator’s point of view, are those that impose the least onerous conditions for safety or debris mitigation. As the commercial entities gain more and more national economic leverage, this risks to spiral into a *race for the bottom* with disastrous consequences for the long-term sustainability of the outer space environment.

¹⁷ *Space Policy Directive-3, National Space Traffic Management Policy*, Presidential Memoranda, issued on June 18 2018, White House, online <https://www.whitehouse.gov/presidential-actions/space-policy-directive-3-national-space-traffic-management-policy/>.

4. Harmonization may lead to transferability of licenses and authorizations. Acceptance of Outer Space SARPs will result in authorizations and licenses for space activities being granted under similar criteria and imposing similar obligations. Therefore, it is reasonable to foresee that, eventually, licenses for space operators may be transferred among jurisdictions. This will greatly benefit international commercial ventures that have to secure multiple licences from different jurisdictions, often under different conditions. It will be an economic driver for commercial space services.

8. Conclusion

The outer space environment continues to accumulate objects, a trend that is projected to grow substantially as technology and economic opportunity enable new and innovative space applications. The soft law approaches of the past several decades has proved to be insufficient to protect the space environment in the long term. This paper proposes a novel governance regime of Outer Space SARPs; a model inspired by the highly successful Chicago Convention of civil aviation. The regime of Outer Space SARPs would enhance the long term outlook for the sustainability of the outer space environment by providing short-term national incentives for adherence by State Parties. The regime would also promote the harmonization of national space regulations, levelling the playing field for commercial operators and potentially simplifying international transfer of license and authorizations.