

# Ignitions for Global STM Rule-Making Processes - Legal Perspectives on Why Operators Have to Take Initiatives

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The discussion of Space Traffic Management (STM) has rapidly emerged over the past couple of years but policy decisions or concrete actions are yet to be ignited to date. From the beginning of discussions of the Draft International Code of Conduct for Space Activities (ICOC), a combination of a top-down approach engaging the political commitments of States and a bottom-up approach of technically affordable solutions have become essential for realizing sustainable space activities at a global level. These approaches are the logical conclusion of the need to establish common standards and safety regulations across the entirety of operations in outer space. However, after experiencing the multiple disappointments of top-down approaches, some began as bottom-up approaches but ended up as top-down, including the Draft Best Practice Guidelines for the Long-Term Sustainability of Space Activities at Committee on the Peaceful Uses of the Outer Space (COPUOS), ICOC, and the Report of the Group of Governmental Experts for Transparency and Confidence-Building Measures in Space Activities; therefore, methods of engaging actors must be carefully designed. At this point, considering from the actors' incentives, a bottom-up approach among civil operators towards global STM rule-making for safe space operations should be promoted. This paper will describe the main reason why the operators have to be the main players at this stage, based on

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the reluctance of States to regulate traffic in outer space. States are unlikely to regulate other traffic areas, apart from their incentive to maintain the order of the area, as they do not have sovereignty over any part of the area. Civil operators, on the other hand, will become liable for damages due to on-orbit accidents in the near future. The current evaluation standard of fault liability for on-orbit damage will change in the near future, due to the accumulation of cases involving the practical standards of operations. In these circumstances, those operators who do not conform to the stipulated standards will be deemed liable for damages. Therefore, at this stage, operators have incentives to take an important role in the *de facto* rule-making process by producing practical standards and guidelines. This process will help secure the future of space activities while forming standards of fault liability affordably.

**Keywords:** STM; rule-making process; industrial initiative

## 1. Introduction

A global regime for managing space traffic is needed because space operations are directly connected to other worldwide operations due to sharing common orbits. This is the characteristic nature of outer space activities. Therefore, to maintain space traffic properly, it will become necessary sooner or later to share some form of space activity norms among all spacecraft operators. Consequently, an international regime in the field is required during this phase of formulation. Namely, an international regime as defined by Krasner<sup>1</sup> of Space Traffic Management (STM) is already in place to date. An international regime can be defined as “sets of implicit or explicit principles, norms, rules, and decision-making procedures around which actors’ expectations converge in a given area of international relations.”<sup>2</sup> To date in the international sphere, the report to the United Nations General Assembly of the Group of Governmental Experts on Transparency and Confidence-Building Measures (TCBM) in Outer Space Activities<sup>3</sup> has described the measures required to establish TCBM across States to ensure sustainable space activities. Meanwhile, the draft International Code of Conduct for Outer Space Activities<sup>4</sup> signified

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1 Stephen D Krasner, *International Regimes*, Ithaca, Cornell University Press, 1983.

2 *Ibid* at 2.

3 *Report of the Group of Governmental Experts on Transparency and Confidence-Building Measures in Outer Space Activities*, UNGA, 68th Sess., A/68/189 (2013).

4 *Draft International Code of Conduct for Outer Space Activities*, European External Action Service (EEAS), European Union <online: [https://eeas.europa.eu/headquarters/headquarters-homepage/14715/eu-proposal-international-space-code-conduct-draft\\_en](https://eeas.europa.eu/headquarters/headquarters-homepage/14715/eu-proposal-international-space-code-conduct-draft_en)>, 2014.

the interests and possible direction of political commitment to sustainable space activities, although these negotiations derailed in 2015. However, the deliberation of the best practice guidelines for Long-Term Sustainability of the space activities (LTS guidelines) by the Scientific and Technical Sub Committee of the United Nations Committee on the Peaceful Uses of the Outer Space (COPUOS) adopted its first set of 21 guidelines in June 2019.<sup>5</sup> This was a landmark in guiding the principles, norms, and rules for sustainable space activities. These facts support the argument that an international STM regime formation is in process across the international community. Meanwhile, the domestic situations in several space powers, including national policies in the US as represented by the Space Policy Directive 3,<sup>6</sup> provides telling evidence of the formulation of STM principles or norms. Relevant European activities through the EU Space Surveillance & Tracking are also evidence of the preparation for its formulation. Industries are moving into establishing “Space Sustainable Ratings” using the framework of the World Economic Forum,<sup>7</sup> which indicates their consciousness of the need to establish certain standards or norms to ensure sustainable space activities. It seems that these movements are still fragmented and capricious, but their integration can be achieved by focusing on the key actors in space activities.

During the emerging stage of an international regime, it is the key actors who drive the discussion and rule-making process. Sometimes they are pro-active, and sometimes they are unconscious but faithful to their incentives. However, the only common element is that the key actors retain control of the emerging regime’s success and failure. The role of researchers as outside players in this context is to enable the key actors to recognize their roles or incentives to re-rail the emerging regime on a growth curve.

This paper aims to shed light on the normative or regulative aspects of the international STM regime, or at least its emerging configuration, by focusing on the key players of the rule-making process.

## 2. Key Actors Formulating Global STM Norms

Space activities actors have expanded in number over the past decade. This is demonstrated not only by the growing number of COPUOS Member States but also by the emerging market of new space industries around the world. US activities marked an epoch-making commercial turn due to the launch of

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5 *Guidelines for the Long-term Sustainability of Outer Space Activities of the Committee on the Peaceful Uses of Outer Space*, United Nations Committee on the Peaceful Uses of Outer Space, Sixty-second session, 3 July 2019 [*LTS Guidelines*].

6 President of the United States of America, *Space Policy Directive-3 - National Space Traffic Management Policy*, The White House, 2018.

7 Jeff Foust, “Consortium to develop ‘space sustainability’ rating system”, *SpaceNews*, 7 May 2019.

Space X and Orbital Sciences in the 2010s which has accelerated global commercial space activities. The space market is expected to expand from \$350 million to \$1 trillion by 2040.<sup>8</sup> Newcomers in the launch market include not only Space X and Northrop Grumman (merger of Orbital Sciences) but also Blue Origin, Rocket Lab, Vector Space System, Virgin Orbit and more.<sup>9</sup> Furthermore, the plans for low earth orbit large constellations (LLC) have made significant progress with regulatory approvals, marketing, and successful demonstration launches. The Space X Starlink project received approval from the US Federal Communications Commission for servicing and operating more than 10,000 satellites. Kepler Communications, Telesat Canada, LeoSat, OneWeb, and even Amazon are entering into the LLC service market. Telesat Canada, Space X, and Hongyan had already successfully launched their demonstration satellites by 2019.<sup>10</sup> The explosive pace of the expansion of space activities will result in a structural transformation in the characteristics of actors involved.

In the traditional structure, the strong States were the space powers that designed, executed, and regulated space activities. Space agencies acted as their agents. Depending on the nations, some played a governmental role or had a regulatory role. What was obvious in that structure was that space industries were always followers of the States or space agencies in policy and rule-making processes. Obviously, they were center stage during the formation of technical standards and practices, due to their capabilities and knowledge of manufacturing or operating in real business terms. This included balancing international competitive circumstances with social welfare such as environmental protection. However, at the same time, the industries, especially in the non-western societies, were always behind the States in rule-making discussions, although their technical standards and practices were shaping the *de facto* standards of the rules.

The significant difference between the traditional and the transformed structure is the appearance of commercial launch industries and commercial spacecraft operators with a certain distance from the States. It is true that commercial operators have existed since the 1980s, including the launch industries of Ariespace of Europe, ULA of the US, Mitsubishi Heavy Industry of Japan, and space based remote sensing industries such as Digital Globe of the US. However, those industries have been more or less supported by governments, no matter their objectives, and moreover, their major clients have been their governments. In the recent market, newcomer commercial

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8 Morgan Stanley, 'Space: Investing in the Final Frontier', 2 July 2019, <online: <https://www.morganstanley.com/ideas/midyear-2019-global-markets-outlook>>.

9 Office of Commercial Space Transportation Administration Federal Aviation, *The Annual Compendium of Commercial Space Transportation: 2018*, 2018, pp. 16–18.

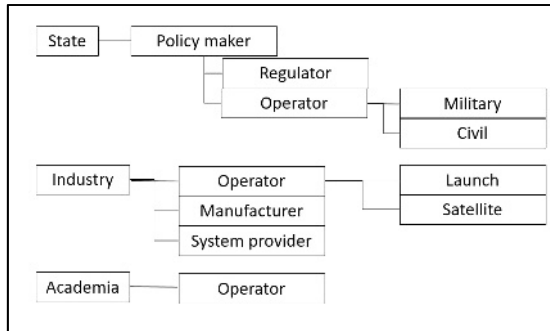
10 Jessica West, ed, *Space Security Index 2019*, 16th ed., Waterloo, Ontario, Project Ploughshares, 2019, pp. 78–89.

launchers include SpaceX, Blue Origin, Orbital ATK, Spaceflight Industries, Virgin Galactic, and Rocket Lab, as well as satellite remote sensing service providers such as Planet or Axelspace, or communication providers with constellation satellites such as OneWeb, O3b, Iridium, and SpaceX. These commercial players are not relying on governmental procurement but seeking global commercial markets as their clients. This will transform the commercial industry from a reactive actor to a pro-active one in policy and rule-making discussions about global space activities.

The role of States has been affected slightly but not dramatically by this evolution since the basic structure of the international community has remained State oriented. Namely, States remain policymakers, regulators, military operators, and civil operators of certain key national space assets. The multiple faces of States have to be emphasized at this point as the underlying reason for the complexity of this matter. However, States as operators of space systems have comparatively simpler motivations for space activities than commercial operators, although their various missions include protecting their national security space assets and providing robust space-based infrastructure. In other words, the main interest of State operators is the support of smooth and safe operations. This interest is common to commercial operators, but State operators seek safe operations at any cost, as most operate unique space assets compared to commercial operators. Space assets are a form of social infrastructure and also unique assets but commercial operators need to ensure delivering value to their shareholders from those assets. Consequently, protecting their space assets is merely driven by profit which differs from State operators. Therefore, States seek safety from an operators' perspective but also as regulators. States as policymakers combine industry promotion with safety regulation and try to keep their balance at the same time. The regulations in place are the result of balancing those incentives, thus every safety regulation is not necessarily a direct result of safety needs.

Another actor in space activities which is both traditional and recently emerging is academia. Academia as an educator and provider of talented engineers has recently played the role of a small operator similar to commercial operators. Nowadays, CubeSat deployment from the International Space Station, or the launch of upper stage vehicles has enlarged the capacity of universities to launch and operate their own satellites for education and research. Consequently, some academic institutions have started to offer educational packages to non-space faring nations as a form of social development cooperation. Some of them began as spin-out ventures for the commercial operator CubeSat. Academics are not taking a direct role as policy advisors or in lobby groups to States involved in space activities but seek to influence States' policymaking.

**Fig 1. Actors in space activities**



It is important to recognize the individual roles of actors in space activities based on their fundamental motivations since these motivations influence actors' active or inactive approaches to certain policies. The international community is constituted by sovereign States who behave in a gentlemanly manner on the surface but are driven by selfish motives in reality. Their statements in the international sphere are balanced results of their mixed internal motivations. Industry is unlikely to unify their voices due to their different motivations, so that their statements in the international sphere appear to reflect the different dimensions of their incentives. Academics move more in the international sphere than in domestic society as required by their background. They need to guard their voices as neutral. Therefore, it is crucial to understand actors' roles according to their fundamental motivations to detect the direction of the silent majority of actors.

Based on the analysis above, some actors play the role of gatekeepers of the safety of space activities as well as managing space traffic. These actors are the operators of launch activities and satellites, both State and commercial. The launch operators maintain access to space as they set the criteria by their acceptance of payloads. If the launch operators align to a common payload acceptance standard, it simply forms a common standard for launching spacecraft. If the satellite operators gather for similar purposes, it constitutes a common standard for space operations. Consequently, the launch operators and spacecraft operators are the two major gatekeepers formulating common standards for space operations, namely the *de facto* STM norms. It is true that the legitimate function of producing and enforcing regulations are placed on States. However, the norms formulated by the gatekeepers serve as *de facto* standards since they can refuse to do business with non-complying entities.

### 3. Achievements of Top-Down Approaches

Since the beginning of the deliberation of the Long-Term Sustainability of Outer Space Activities (LTS) at the UNCOPUOS, or the consideration of the draft International Code of Conduct of Space Activities (ICOC) by the European Union, the combination of bottom-up and top-down approach has been essential for realizing sustainable space activities. The bottom-up approach refers to the approach that is technically required to realize sustainable space activities. The main actors that discuss and formulate the bottom-up approach are the operators and safety providers, such as providers of SSA systems or safety assurance tools in current space activities. The LTS at the UNCOPUOS initiated these considerations based on a bottom-up approach, by listening to experts' voices using an expert group structure.<sup>11</sup> Although LTS guidelines were scrutinized by most of the States due to its long term deliberation in COPUOS during the latter half of its discussions, the initial draft of the best practice guidelines, the main achievement of LTS, was drafted using a bottom-up approach. On the other hand, a top-down approach signifies a political commitment to establishing norms. This approach is expected to be negotiated and agreed initially by States' representatives with certain political commitments. The ICOC approach was recognized as a top-down approach because it involved diplomatic structures from the beginning. During the early years of the consideration of the two draft documents, it was said that the LTS would provide bottom-up technical guidelines for all operators to maintain sustainable space activities, and ICOC would agree to the top-down political commitment required to secure legitimacy and accountability from a regulatory perspective.<sup>12</sup>

Since the ICOC negotiations failed in 2015 and the 21 LTS guidelines were adopted in 2019, the LTS guidelines today have accumulated characteristics of both bottom-up and top-down approaches. This does not mean that the LTS guidelines were intended to include political considerations, but the eight years of deliberations at UNCOPUOS inevitably attracted the attention of relevant member States' authorities. Since the LTS guidelines' drafting process originated from the inputs of expert groups, it retains the characteristics of a bottom-up approach (at least it does not undermine the emphasis of the principle expert groups). With a simple addition, this attracted the interest of States too. Consequently, the current LTS guidelines

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11 Yu Takeuchi, 'Law and policy for space situational awareness towards Space Traffic Management - A Japanese perspective', *Journal of Space Safety Engineering*, Vol. 6, No. 2, 2019, pp. 132–133.

12 See Michael J Listner, 'The International Code of Conduct: Comments on changes in the latest draft and post-mortem thoughts', *The Space Review*, October 2015; Jack M Beard, 'Soft Law's Failure on the Horizon: The International Code of Conduct for Outer Space Activities', *University of Pennsylvania Journal of International Law*, Vol. 38, No. 2, 2017, p. 90.

will serve as the foundation of further discussions for sustainable space activities, of both top-down and bottom-up approaches, because it retains the following three characteristics simultaneously. (1) It was drafted by four expert groups in 2010 to 2014; (2) it was thoroughly deliberated at UNCOPUOS-STSC for eight years (2010-2019); and (3) it gained political consensus through adoption at the UN General Assembly (A/74/20, 2019). Fortunately, it has already been decided that UNCOPUOS will continue its deliberation of the remaining draft guidelines, which will reinforce the LTS guidelines further in a complete manner.

#### **4. Rationales of Bottom-up Approaches**

Since the LTS guidelines retain the character of both bottom-up and top-down approaches, the main field of rule-making activities for STM will be at UNCOPUOS and its surrounding events connected to the LTS guidelines. Since the emphasis has shifted from drafting the 21 guidelines to implementing them, the stress is now on their national implementation. This section demonstrates the rationale that the key actors at this stage must be operators of launchers and spacecraft rather than States because States are inherently reluctant to regulate space traffic.<sup>13</sup>

##### **4.1. Operators as the Systems' End-users**

In the near future of unmanaged traffic in outer space, if the world fails to agree on an international STM regime, the worst affected actors will be the operators. If the current expansion of space business continues without any traffic management rules in place, the risks to operations will expand at the same pace. The LLC will cover certain orbit areas with hundreds or thousands of small satellites which make it technically difficult for other spacecraft crossing that row on the ascending phase to go into operational orbit, or during the descending phase of de-orbiting at its end-of-life operation. If the LLC rows appear without any rules governing conjunction operations, the operators who wish to pass through that row will have to act responsibly to operate both types of spacecraft safely; thus operators may be required to introduce certain high-end analysis technologies to conduct such activities. It is true that the technology targeting keyholes for small satellites on a certain orbit exist to date, mainly for military purposes, and it is also true that it may politically and commercially irrational to require all operators have those capabilities. We should be reminded at this point that the launch and spacecraft operators are the end-users of the entire space system, including social systems such as regulations or norms; therefore they

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13 Takeuchi, *supra* note 11 at pp. 134–135; Yu Takeuchi, 'STM in the Nature of International Space Law', paper presented at *5th Space Traffic Management Conference*, Austin, Texas, 2019.



must recognize the advantage of participating in rule-making discussions about an international STM regime and the tremendous disadvantages of not doing so.

#### 4.2. Legal Effects

Operators may also be negatively affected in legal terms. Although the Liability Convention<sup>14</sup> set up an absolute liability system for ground damage and fault liability for on-orbit damage, liability for on-orbit damage will be regulated by a fault liability principle based on civil cases in most jurisdictions. It should be recognized that the Liability Convention only regulates legal relations between States based on international law, whereas most of the legal relations between operators will not be applicable within international law but the civil legislation of the relevant jurisdiction. That jurisdiction would be selected based on multiple criteria determining the location of the act, the closest relevant place of the act, or other principles of the appropriate jurisdiction. In current practice, this makes it difficult to seek the liability of the causing operator, since few measures can provide evidence of fault. Firstly, fault usually requires a duty of care, and this duty is assessed based on certain standards or standardized practices in the specific business field. If those standards are controversial or unstable between field players, it makes difficult to attribute fault to one party. This situation establishes a threshold requiring damaging operators to take liability for on-orbit damage, which in a way protects damaging operators.<sup>15</sup>

*However, it must be recognized that the key to overcoming this threshold is the application of standards to the damaging operator. If the main players in a business field formulate a standard or standardized practices for safe operations, it may result in new attributions of liability to the damaging operator or non-compliant operations. The discussion of this game-changing situational shift is happening right now during the formulation of the international STM regime, inter alia with the implementation of the LTS guidelines. The LTS guidelines are the primary foundation of international standards for sustainable space activities to date, and also the foundation of the emerging international STM regime, since the global space community recognizes these guidelines as the base of all principles, norms and/or rules for sustainable space activities, implicitly or explicitly. Therefore, the fate of*

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14 *Convention on the International Liability for Damage Caused by Space Objects*, 29 March 1972, 961 UNTS 187, 24 UST 2389, 10 ILM 965 (entered into force 1 September 1972) [*Liability Convention*].

15 Ram S Jakhu, 'Iridium Cosmos Collision and Its Implications for Space Operations', in Kai-Uwe Schrogl et al (eds.), *Yearbook on Space Policy 2008/2009*, Vienna, Springer Vienna, 2010. P. 254; Setsuko Aoki, "The Implications of the Cosmos 2251-Iridium 33 Collision: A State with 'Genuine Link' Matters, not a Launching State" (Japanese), *Kokusaiho Gaiko Zassi (Journal of International Law and Diplomacy)*, Vol. 110, No. 2, 2011, p. 157.

*the operators' near future liability standards depends upon the implementation of those guidelines, and thus the form of the international STM regime. A crucial stage has been reached for space operators in the determination of their future operations and business.*

#### **4.3. Possible Operators Actions**

It is generally expected that rule-making is a primary role of States. However, it is also a general expectation that incentives motivate actors' actions. Since States have only a few incentives to regulate the traffic in outer space, but operators have many incentives for implementing standardized practices in this area of operations, it will be worth the operators committing themselves to the rule-making process and formulation of an international STM regime. The primary field that may incentivize them will be the national implementation of the 21 LTS guidelines, although the guidelines themselves merely make recommendations to States. Even more, these may turn into concrete standards in the process of national implementation or their interpretation. Therefore, operators should reflect the interests of their operations based on their actual experiences of operations nationally. It is also important to harmonize operators' opinions and practices internationally. These harmonized practices will reinforce national implementation as well as the standards determining liability in the near future.

#### **5. Conclusions**

During international regime formulation various actors, conscious or not, participate in the process. The key actors who have to track the formulation need the strength to lead it. This strength could arise from future incentives that avoid negatives, and space operators are the actors in this category. Based on their incentives, they may become stronger than States as key actors in the formulation of the international STM regime and have adequate rationales for proactively participating in the rule-making discussions of STM that are emerging in the policy sphere right at this very moment. Several operators, mainly in the US, are already participating in the discussions but very few from other parts of the world. It is time for all space operators to contribute to the formulation of an international STM regime to realize sustainable space activities.

#### **Acknowledgments**

The author acknowledges his supervisor, Prof. Setsuko Aoki of Keio University and the Keio University Doctoral Student Grant-in-Aid Program, as well as the Japan Space Forum for supporting this study. The author would also like to thank Enago for the English language review.