

Implications of State Authorization and Continuous Supervision for Contemporary Space Activities

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Abstract

Outer Space is an international common area, where exploration and use are recognized as the rights of all countries (Art.1, Outer Space Treaty (OST)). States bear international responsibility for their national activities, including those carried out by non-governmental entities with the requirement of “authorization and continuing supervision by the appropriate State” (Art.6, OST). Due to the operational nature of space activities, it is physically and legally unrealistic to separate them by some territorial criteria. Hence, it is natural for safety operations and other common domains of traffic, such as aviation or maritime, to pursue a certain level of unification of national control, although concrete measures for realizing the OST requirements are entrusted to each State. Thus, establishing an international regime for space traffic management is becoming a critical issue in contemporary space governance. From this point of view, the implementation of Art. 6 of the OST must be revisited as a precedent since it is the sole and explicit requirement of international law for States when controlling their space activities. Practically, national legislation for implementing this requirement is lumbering, even within major space powers. Thus, it is only in this decade that national regulations have rapidly begun to emerge. Based on the analysis of several practical cases, focusing particularly on non-governmental space activities, this paper aims to present the possibility and boundary of effective “authorization and continuing supervision by the appropriate State” to retain effective control, for the safety and sustainability of space activities.

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1. Introduction

It is obvious that current space activities are expanding on their participation and contents. Commercial participation, not only of the players as operators, but also of indirect players, such as investors, is dramatically increasing. These players draw new-comer countries towards space activities, and add new perspectives to the space community, such as large constellations or on-orbit services for low earth orbit, cislunar, or deep space exploration, for leveraging commercial initiatives. These movements, coupled with the rise of new space powers, have also driven the global improvement of military presence in space.

Reflecting on this contemporary situation, it is easily recognizable that the importance of States as regulators is dramatically increasing. This paper focusses on the State responsibility to authorize and continuously supervise non-governmental national space activities, to highlight the requirements of international law. Another perspective for examining State responsibility is by looking into State practices. In our decade, the international community promoted new international norms of sustainable space activities, as well as transparency and confidence building measures (TCBMs). To date, certain international non-legally binding instruments, such as the Guidelines for the Long-term Sustainability of Outer Space Activities of the Committee on the Peaceful Uses of Outer Space (“LTS Guidelines”)¹ or the Report of the Group of Governmental Experts on Transparency and Confidence-Building Measures in Outer Space Activities,² were adopted. These can be recognized as the expression of new norms. To measure their effectiveness, it is necessary to examine their national implementations, as their sole effective means of realizing international norms.

By doing so, this paper aims to make it possible to recognize the challenges of State responsibility in contemporary space activities.

2. Requirements of International Law

States are required to authorize and continue to supervise their national non-governmental space activities, based on Art. VI of the OST.³ The treaty provision should be revisited as this supervision is required by “the appropriate State,” which is not defined anywhere in the Treaty. Therefore, it

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- 1 Guidelines for the Long-term Sustainability of Outer Space Activities of the Committee on the Peaceful Uses of Outer Space, UNGA, 74th Sess., A/74/20 (2019) Annex II [LTS Guidelines].
 - 2 *Report of the Group of Governmental Experts on Transparency and Confidence-Building Measures in Outer Space Activities*, UNGA, 68th Sess., A/68/189 (2013).
 - 3 *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies*, § 610 UNTS 205 (entered into force 10 October 1967) [OST].

is within the discretion of each State to regulate their own scope of such activities. The OST is not regulating the method of distribution or demarcation of such a scope among the relevant States.

The interpretation of the treaty has been relied on by each State practice, but the Legal Subcommittee of the UNCOPUOS decided to introduce recommendations of national legislation for the Member States, to contribute towards the harmonization of State practices. This is because the international community recognized the essential importance of a common understanding regarding the rights and obligations of the UN Space Treaties, to conduct each activity in outer space as an international common area. The Subcommittee established a dedicated working group for this task. They accumulated information of the current State practices of all Member States. They then extracted the essence of what States needed to do, within their jurisdiction as the Recommendations on National Legislation relevant to the Peaceful Exploration and Use of Outer Space.⁴

From these recommendations emerged the OST interpretation, with the following three points:

- (1) The scope of space activities that must be authorized and supervised should be the launch, return from space, operation of launch, re-entry site, and operation and control on orbit.⁵
- (2) The territorial scope should be the territory under jurisdiction and/or control of the State, and the space activities carried out by their citizens (which includes legal persons).⁶
- (3) The required authorization should be clearly established in the national regulatory framework, with conditions and procedures for granting, modifying, suspending, and revoking the authorization.⁷

Therefore, it is common practice for States to establishing licensing systems for authorizing and supervising commercial space activities. The scope of most of these systems are in line with the above three points. Table 1 shows the comparisons between equivalent elements of these points for the State practices of Japan, the US, and France.

4 UNGA, 68th Sess., A/RES/68/74 (2013) [National Legislation Recommendations].

5 Ibid, OP.1.

6 Ibid, OP.2.

7 Ibid, OP.3.

Table 1: Scope of Licensing Systems

		Scope for Activities	Scope of Applicants	Regulatory Framework
National Legislation Recommendations		<ul style="list-style-type: none"> - Launch. - Return from space. - Operation of launch and re-entry site. - Operation and control on orbit. 	<ul style="list-style-type: none"> - Territory under jurisdiction and/or control of the State. - Activities carried out by State's citizens (including legal persons). 	Clearly established in the national regulatory framework, with conditions and procedures for granting, modifying, suspending, and revoking the authorization.
Japan	Source	Space Activities Act (Law No. 76 of 2016)		
		<ul style="list-style-type: none"> - Launch (Chapter 2) includes the operation of the launch site (Japanese re-entry site is not expected). - Control of Spacecraft (Chapter 3) includes reentry assessment as the termination of control. 	<ul style="list-style-type: none"> - Launch and Control from Japanese territory (Art. 4 and 20). 	Conditions and procedures (Chapter 2 and 3) with governmental supervision conditions (Chapter 4) and penal provisions (Chapter 8).
US	Source	14 CFR Chapter III		
		<ul style="list-style-type: none"> - Operate a launch site. - Launch and reentry of a reusable launch vehicle (RLV). - Operate a reentry site. - Reenter non-RLV. - Experimental launch and reentry of reusable suborbital rocket (413.1). 	<ul style="list-style-type: none"> - Launch, operation, and reentry within US territory. - Launch, operation, and reentry outside of US territory by US citizens, entities under US law, and foreign entities with US citizen's controlling interest (413.3). 	License application procedures (413), and conditions (414-460) with governmental supervision conditions and penalties (404-406).

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France	Source	Loi n°2008-518 du 3 juin 2008 relative aux opérations spatiales		
		<ul style="list-style-type: none"> - Launch. - Return from space. - Operation and control on orbit (Art. 2). 	<ul style="list-style-type: none"> - Launch and reentry within French jurisdiction. - Launch and reentry outside of French jurisdiction, by French entities. - French nationals or entities procuring launch or operating spacecraft (Art. 2). 	Conditions (Chapter 2) and procedures (Chapter 3) with penal provisions (Chapter 4).

It is no exaggeration to say that authorization and continuous supervision is implemented in States by a common method, in terms of its formulation.

The recommendations continue interpreting as follows:

- (4) The conditions of authorization should consider the safe manner of space activities, the methods of minimizing risks to persons, environment, or property, and those activities that do not lead to the harmful interference with other space activities, particularly with the Space Debris Mitigation Guidelines of COPUOS, adopted in 2007.⁸
- (5) Continuing supervision should be ensured in the event of the transfer of ownership or control of a space object in orbit. The national regulations should provide information regarding these status changes.⁹

It is necessary to focus on (4) above, because this is the sole recommendation mentioning the conditions of authorization, which is the substance of State practice reflecting the reality of the implementation of international law. This recommendation (by stating the necessity to consider a safe manner, and the method of minimizing risks to persons, environment, or property) also contains an implication that the conditions of authorization are variable. This is because the recommended considerations are based on certain developing norms. *Inter alia*, the recommendation specifically mentioned the Space Debris Mitigation Guidelines of COPUOS “in particular,” which means that references to the recommendations need to be understood broadly, with multiple other documents, not only as a single document. By doing so, they can pave the way for transferring new international documents, depending on the circumstances, towards consideration of the national legislation.

⁸ Ibid, OP.4.

⁹ Ibid, OP.8.

Therefore, it can be said that the international community is recognizing how the conditions of authorization potentially cover a broad range of international norms. There is no consensus regarding their interpretation level and the accurate scope of its coverage.

The international law requirements for “authorization and continuing supervision” of space activity, which resulted from the aforementioned analysis, contain two markers: the formulation of authorization and the conditions of authorization. In terms of formulation, most States are in line with the requirements, but the conditions remain a challenge for them, as there is no consensus of common practice.

3. State Practices within National Legislation

Based on the international law requirements, State practices of authorization and continuing supervision should be recognized and examined by its conditions of authorization. Therefore, this section will compare the practices of Japan and the US to articulate the gaps of State practices among the space faring nations who retained independent launch capabilities. It should be noted that the States with independent launch capabilities may serve as the focal point for formulating certain international standard practices, not only for the launch activities, but for all space activities since they are in the position of controlling this content for accessing space, through regulating launch activities. Therefore, authorizing and continuously supervising the practices of these States could form the baseline for guiding worldwide space activities.

3.1. Japan

The official implementation of the Japanese Space Activities Act,¹⁰ in this regard, establishes as follows:

17. *Removal of an orbital stage of a launch vehicle from protected regions*
 - Where possible, the orbital stage of a launch vehicle that completed the launching into an orbit passing through a low earth orbit region (...up to...2,000km...) or an orbit that may interfere with a low earth orbit region must be transferred into an orbit for which the orbital life is shorter *or must be disposed of by a reentry* in a way to prevent damage to the ground, by controlling its position, attitude and conditions.

10 *Act on Launching of Spacecraft, etc. and Control of Spacecraft* (Japanese Act No. 76 of 2016).

- Where possible, eternal or periodic *crossing of* the orbital stage of a launch vehicle and the *geosynchronous orbit* region (geostationary earth orbit altitude of 35,786km \pm 200km and latitude within \pm 15 degrees) is to be avoided.¹¹
4. Establishment of organizational structures for the implementation of the control of spacecraft (...)
- Details of termination measures
 - The applicant provides measures for the *controlled reentry* (e.g. trajectory, landing point) while ensuring the safety of an expected point of landing or water landing.
 - The applicant provides measures to *elevate the spacecraft to the altitude* that would not have any adverse effect on the control of other spacecraft.
 - The applicant provides measures to put the spacecraft into the orbit around a celestial body other than the Earth or guide it to *fall to the celestial body*, without any risk of significantly deteriorating the environment of the celestial body.
 - The applicant provides measures to *vent residual energy*, including residual propellant and electricity, which may cause break-up of the spacecraft or to prevent the breakup.
 - Upon the termination of the control of the spacecraft, the following measures are to be taken for the protected regions:
 - *Efforts must be made* so that the spacecraft will be removed from the low earth orbit region *within 25 years* from the termination of the control.
 - The spacecraft is to be removed from the geosynchronous orbit *immediately*.¹²

These implementations (emphasis on underlined statements) were established in line with the National Legislation Recommendations as the original interpretation of the international law. The above substances are stated in the Space Debris Mitigation Guidelines of COPUOS.¹³ However, the Review Standards introduced certain unclear standards, as stated in the National Legislation Recommendations. One such example is in the emphasized

11 Cabinet Office National Space Policy Secretariat, *Review Standards and Standard Period of Time for Process Relating to Procedures under the Act on Launching of Spacecraft, etc. and Control of Spacecraft*, November 15, 2017, pp. 7-8 (emphasis by the author).

12 Ibid, pp. 14-17 (emphasis by the author).

13 *Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space*, UNGA, 62nd Sess., A/62/20 (2008) Annex.

statements listed below. These elements are not yet stated in the Space Debris Mitigation Guidelines of COPUOS:

- Configuration of spacecraft
 1. Prevention of unintended release of objects (...)
 2. *Prevention of interference with the control of other spacecraft upon separation or docking (...)*
 3. Prevention of break-up in case of anomalies (...)
 4. Prevention of damage to the public upon reentry into Earth (...)
 5. Prevention of deterioration of the Earth's environment due to substances derived from other celestial bodies (...)
 6. Prevention of contamination of environment of other celestial bodies (...)
- Control plan and sufficient ability to execute the control plan
 1. *Prevention of interference with the control of other spacecraft upon separation or docking (...)*
 2. *Prevention of break-up in case of anomalies (...)*
 3. *Prevention of collision with another spacecraft, etc. (...)*¹⁴

These requirements of State practice need to be thoroughly examined, whether they are based on the common interpretation of international law or the original interpretation of the State. In the latter case, international harmonization of the interpretation needs to be considered; otherwise, the diversity of interpretation may lead to the capricious understanding of the requirements of international law, which will negatively impact safety operations. When looking at the non-governmental operator's viewpoint, certain voluntary implementation of international norms that are based on the original interpretation of that State may create capriciously regulated circumstances within that country, and create an incentive of draining overseas. Such a situation may lead to "license shopping" of space activities, which will bring about negative consequences to the sustainability of space activities.

3.2. The United States

The US law should be recognized as providing far beyond the National Legislation Recommendations, compared to other jurisdictions. This provides the rationale to compare it with Japanese practices. The U.S. Government Orbital Debris Mitigation Standard Practices (ODMSP), updated in November 2019, set forth guidance for the US National Regulations,

14 *Id.*, pp. 14-17. (emphasis by the author).

although the document itself is non-binding.¹⁵ For instance, ODMSP instructs the US governmental operators regarding post-mission disposal, as follows:

4-1. Disposal for final mission orbits: A spacecraft or upper stage may be disposed of by one of the following methods:

a. Direct reentry or heliocentric, Earth-escape: Maneuver to remove the structure from Earth orbit at the end of mission into (1) a reentry trajectory or (2) a heliocentric, Earth-escape orbit. These are the preferred disposal options. For direct reentry, the risk of human casualty from surviving components with impact kinetic energies *greater than 15 joules should be less than 0.0001 (1 in 10,000)*. Design-for-demise and other measures, including reusability and targeted reentry away from landmasses, to further reduce reentry human casualty risk should be considered.

(...)

c. Storage between LEO and GEO:

(...) the program should

(1) limit the postmission orbital lifetime to as short as practicable but *no more than 200 years*, (2) limit the time spent by the structure in the LEO zone, the GEO zone, and between 20,182 +/- 300 km to 25 years or less per zone; and (3) *limit the probability of collisions with debris 10 cm and larger to less than 0.001 (1 in 1,000) during orbital lifetime*. To limit human casualty risk from the reentry of the structure, surviving components with impact kinetic energies *greater than 15 joules should have less than 7 m2 total debris casualty area or less than 0.0001 (1 in 10,000) human casualty risk*.

f. Direct retrieval: Retrieve the structure and remove it from orbit preferably at completion of mission, but no more than *5 years after completion of mission*.¹⁶

4-2. Reliability of disposal: The probability of successful postmission disposal *should be no less than 0.9 with a goal of 0.99 or better*.

The emphasized statements consist of the elements that are not yet stated in the Space Debris Mitigation Guidelines of COPUOS. Therefore, they fall beyond the National Legislation Recommendations, and are merely examples. The abovementioned standards, set by ODMSP, are reflected in the US Regulations in 47 CFR 5.64 (b), 25.114 (b), and 25.121, and in 14 CFR 450.101 (b).

15 The US authoritative rules follow the ODMSP in its Proposed Rulemakings, such as the “Streamlined Launch and Reentry Licensing Requirements” (FAA-2019-0229) and the “Mitigation of Orbital Debris in the New Space Age” (FCC 20-54, FRS 16848).

16 ODMSP 4-1.

Here it seems that States are motivated to develop their regulations beyond the original understanding of international law, despite the potential economic disadvantage of placing self-regulation ahead of international regulations. The reason for this is a simple consensus within the domestic space community, or evidence of genuine concern to the sustainability of space activities. Either way, it should be noted that capricious practices of the States with independent launch capabilities may create regulatory loopholes, resulting in the jeopardization of sustainable space activities.

4. Conclusions

It is crucial for outer space operations to be based on certain harmonized rules among the States, as it is an international common area. The leading principle is the requirement of international law as “authorization and continuing supervision by the appropriate State” of Art. 6 of the OST. However, the importance lies in its harmonized interpretation.

The license system is a typical national regulation that is effective in controlling the activities within a particular jurisdiction. However, its effects do not vary towards activities in other jurisdictions (except for extraterritorial legislation, made possible by limited superpowers). This limitation becomes an issue for modern practice of on-orbit transactions or contracted operations of a spacecraft, due to the uncontrolled area that the spacecraft is operating in. Furthermore, space activities can possibly be conducted in a State without a license system, or even without OST ratification. International law is certainly a tool to regulate the activities beyond the national jurisdiction. However, it is also limited to inter-State regulation. The challenge of State control required by Art.6 of the OST creates effective control to operators in practice.

Furthermore, as we are living in the emerging era of several international norms, such as the LTS Guidelines, it is necessary to encourage every State to implement these in a harmonized manner within their jurisdiction. From these terms, international collaboration has become a key issue.

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