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Private Space Activities: Issues of International Law

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CHAPTER I

INTRODUCTION

SUMMARY: 1.1. Background of the study – 1.2. Research questions and objectives – 1.3. Outline – 1.4. Methodology.

1.1. BACKGROUND OF THE STUDY

When the first international norms on space activities were drafted in the 1960s and 1970s, humans were standing on the brink of a new world, or worlds, far beyond anything ever reached for[1].

They knew that the missions carried out in that period were just the beginning, and that the future of space technology was going to unveil new opportunities, transforming mere abstract speculations into reality[2].

For that reason, the early law of outer space included rules and principles that were made to last: the wording used in the first United Nations (UN) General Assembly Resolutions [3] and in the five UN space treaties [4] was purposely broad, the definitions were consciously vague, the rights and obligations of States were open enough to cover possible new conducts and events.

As a result, the original international framework of space law has survived fifty years of progress, arriving unaltered until today. Its greatest virtue has proved to be its adaptability.

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[1] M. Lachs, *The law of outer space* (ed. by T. Masson-Zwaan), Martinus Nijhoff Publishers, 2010, p. xvii.

[2] See P. Jessup, *Controls for Outer Space and the Antarctic Analogy*, Columbia University Press, 1959, p. 199.

[3] UNGA Res. 1148 (XII) of 14 November 1957; UNGA Res. 1348 (XIII) of 13 December 1958; UNGA Res. 1721 A and B (XVI) of 20 December 1961; UNGA Res. 1962 (XVIII) of 13 December 1963.

[4] *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies* (OST), 610 UNTS 205, 1967; *Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space* (Rescue Agreement), 672 UNTS 119, 1968; *Convention on International Liability for Damage Caused by Space Objects* (Liability Convention), 961 UNTS 187, 1972; *Convention on Registration of Objects Launched into Outer Space* (Registration Convention), 1023 UNTS 15, 1976; *Agreement Governing the Activities of States on the Moon and Other Celestial Bodies* (Moon Agreement), 1363 UNTS 3, 1984.

However, the power to adapt has its limits and the incessant evolution of space activities is inexorably unveiling them.

From a technological perspective, the essence of space operations has not radically changed.

Looking at the things that were done during the first three decades of space exploration (from 1957 to 1987), it appears that the main space activities were: satellite services, rocket launches, orbital stations, human spaceflight, and activities on other celestial bodies.

That is still true today, only the same activities are performed in a more advanced manner.

Of course, some aspects have progressed to new levels of technology, such as in the case of the miniaturisation of satellites[5] and of the re-usability of launchers[6].

However, there has not been a real revolution in space technology since that period. There were predictions of disruptive innovations and events: mining asteroids, human settlements on the Moon, regular suborbital flights, catastrophic chain collisions in orbit, and even space wars.

None of that has happened yet.

But if not the technology, then what is challenging the adaptability of space law?

Taking into consideration the same three decades mentioned above, it can be noticed that outer space in that period was a field of operations only for a handful of States, with the United States of America (USA) and the Union of Soviet Socialist Republics (USSR) dominating the scene.

As for the other members of the international community, they simply did not have space capabilities, nor interest in investing in their own space programs.

Moreover, in that period the operations in Earth orbit and beyond were put in place by governmental agencies or, in rare cases, by the industry under a public contract.

[5] See J. Behrens and others, *Exploring Trends in the Global Small Satellite Ecosystem*, in New Space, Vol. 7, No. 3, 2019, p. 126.

[6] See the reusable rockets developed by companies such as SpaceX, Blue Origin and Rocket Lab as well as the one recently tested by China, as reported at the following link: https://english.www.gov.cn/news/202409/27/content_WS66f6b0a5c6d0868f4e8eb53f.html. (This and all the other links of the Thesis were last accessed in March 2025).

In other terms, the use and exploration of outer space was a prerogative of the public sector, and the few satellite services offered with commercial space systems were primarily government-sponsored or -funded[7].

Put shortly, only the most industrially advanced States were active in space and the private space sector was not able to stand alone yet.

This geopolitical and socio-economic reality of outer space has completely changed in the contemporary context of extra-atmospheric operations.

As of 2025, there are almost one-hundred States of the international community that have sent at least one object in outer space[8], and there are thousands of satellites in orbit that are owned and operated by private actors[9].

This is the outcome of the so-called privatisation[10], commercialisation[11] and democratisation[12] of space activities: a threefold trend that has revolutionised the dynamics of space activities.

It is not just a matter of number of satellites – which arrived at 11,200 units in 2025[13] – or of frequency of rocket launches – which were almost 300 only in 2024[14].

It is the fact that since the early 2000s private companies started profiting on their own from space services and applications. With that, private competition increased, the development in space technologies advanced more quickly, the costs to access space were reduced, and an ever-growing number of public and private actors from all over the world embarked in the space adventure.

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[7] See S. Doyle, *Legal aspects of space commercialization*, in Space Law: Development and Scope (ed. N. Jasentuliyana), Praeger, 1992, p. 128.

[8] See the data collected at the following link: https://ourworldindata.org/grapher/cumulative-number-of-objects-launched-into-outer-space?tab=map.

[9] See the report of the Satellite Industry Association (SIA's Report) at the following link: https://sia.org/commercial-satellite-industry-continues-historic-growth-dominating-global-space-business-27th-annual-state-of-the-satellite-industry-report/

[10] The term 'privatisation' refers to the fact that private actors have started to offer space services which were once provided only by public agencies.

[11] The term 'commercialisation' indicates a shift from the use of space assets for public services to their use for commercial purposes, creating a market of space activities based on the logic of profit.

[12] The term 'democratisation' indicates the lowering of the economic and technological barriers of entry to outer space, which as a consequence rendered space activities democratised, as in doable by everyone, from States to small universities.

[13] See the space environment statistics published by the European Space Agency (ESA) in September 2024 and the environment statistics updated on 11 March 2025, available at the following link: https://sdup.esoc.esa.int/discosweb/statistics/.

[14] See SIA's report, above at 9.

Even if all this started at a slow pace, twenty years later, that threefold trend has arrived at its maturity, shifting nowadays to a phase of expansion and consolidation.

As a result, the balance upon which the regime of space law was created has tilted. While the advancements in the technology were imaginable, the dominance of the private sector over the public one was not foreseen; nor was it conceivable that space operations were going to have a dynamic multinational life, involving multiple States through transfers and transactions during the lifespan of a single space object.

In the new reality of space activities, States are not anymore the main operators and contracting authorities of all space operations. Every year, their role becomes more and more the one of the national regulator and of the authorising and supervising authority for non-governmental entities.

Thus, the State-centred ideology that informed the main rules and principles of space law does not meet anymore the context where such rules and principles need to be applied.

Having said that, a clarification is necessary.

The consequence of all this is not that the original norms of space law have to be discarded. There is no need for a new Outer Space Treaty.

To the contrary, the changed reality of space activities calls for two reactions in point of law.

The first one is to critically review old traditional interpretations of the provisions of space law that do not suit anymore the dynamics of space activities. It is therefore necessary to search for new meanings within the same provisions, interpreting them in an evolutive manner and looking at space law as a 'living' legal framework.

The second one is to adopt at the international and/or at the national levels the necessary corrective measures where the means of interpretation do not suffice. New provisions have to be created. But they should be built upon the applicable legal framework, expanding it where needed and clarifying it where necessary. Thus, the gaps left by the founders of space law can be filled.

Against this background, as a manifestation of the two reactions just described, the following study is presented.

1.2. RESEARCH QUESTIONS AND OBJECTIVES

Before turning to the more substantial legal analysis in the following Chapters, it is useful to expound the main research question upon which this Thesis is built:

> *How do contemporary private space activities affect the interpretation and the application of the international legal framework of space law?*

To answer this question, the discourse follows a line of analysis that is developed around four main sub-research questions which are reflected in four different Chapters, from II to V.

The first one looks at whether the general principles of space law and the provisions of the space treaties that expressly mention private actors assume a particular meaning today in front of the current reality of the space industry.

While Chapter II provides an answer to this question, Chapter III addresses a different aspect: which private space activities are considered nowadays as "*national activities in outer space*"[15]? And, in relation to that, under which factual and legal conditions can a State be considered an "*appropriate State*"[16] pursuant to Article VI of the OST?

Answering this question means rethinking the relationship between States and private space operators in the light of the dynamism of private space activities, especially in cases of space objects whose launch was merely procured from a non-launching State and in cases of space objects whose control was transferred to a non-launching State. It is found that the system of Article VI can properly work today only if the qualification of "*appropriate State*" is movable. From this, other questions follow, mainly on the relationship between the jurisdiction exercised by the "*appropriate State*" and the rights and obligations over the same activity placed by the space treaties upon the "*launching State(s)*"[17] and the "*State of registry*"[18].

[15] OST, Article VI.
[16] *Ibid.*
[17] OST, Article VII. See also the other three main space treaties.
[18] Registration Convention, Article I.

The fourth Chapter revolves around the other two main aspects that connect States to non-governmental entities: responsibility and liability.

Put otherwise, the sub-research question addressed here is composed of to connected queries:

1) Is the traditional idea of the "*appropriate State*" bearing a direct responsibility for the conduct of private actors in outer space the correct interpretation of Article VI, and if not, what is the actual regime of responsibility applicable to States for the activities of non-governmental entities?

2) Is the liability for damages caused by private space objects an exclusive prerogative of the launching State(s) or can it be borne also by the "*appropriate State*", even if it is a non-launching State, and if so, on which grounds and to what extent?

Answering these questions requires to rethink some of the fundamental concepts and legal categories of space law, putting into question some of the most traditional and consolidated doctrinal theories on them.

While the first three sub-research questions critically analyse general aspects of space law, which are applicable to any private space operation irrespective of its specificities, the last sub-research question shifts the focus on the issues raised by particular extra-atmospheric endeavours called 'new space'.

In front of the need for new definitions (e.g. space debris or private paying passenger) and for the regulation of new kinds of space activities (e.g. in-orbit services or lunar activities), which interpretative and legislative measures can be implemented to correct the inadequacies of the current legal framework of space law? If the means of interpretation are insufficient, then what initiatives should be taken and at which level (e.g. international or national) to avoid disputes over the conduct of 'new space' operations?

Moving from one sub-research question to the other, as the discourse unfolds through the Chapters of the present work, an answer to the main research question is finally obtained.

In the end, the analysis, the evaluations and the findings offered throughout the Thesis are all aimed at three objectives:

1) To provide the legal grounds that can justify novel interpretations of the provisions of the space treaties, suitable to the changed balance in the relationship between public authorities and private space entities;

2) To propose the possible corrective measures at the international and at the national levels for adapting the ill-suited – or, at times, inapplicable – norms of space law to the novelties of private space activities;
3) To offer guidance to States and to the space industry: for the former, when they exercise their function of authorising and supervising authority and, in particular, when a new legislation pursuant to Article VI of the OST has to be drafted; for the latter, when they need to understand the legality and the limits of their actions and omissions in outer space.

1.3. OUTLINE

To address the questions and fulfil the objectives described above, the present study adopts the following structure.

Chapter II starts with a historical and conceptual review of the development of international space law, examining its origins and evolution. The discourse here is not limited to a descriptive account of dates, legal sources and provisions, but it already offers some considerations on the impact of the private industry in the historical development of space law (Section 2.3).

Moreover, Chapter II looks at the underlying principles that inform all activities in outer space, such as the benefit-aiming obligation, the principle of cooperation, the duty of due regard, as well as at the core freedoms and prohibitions that define the legal status of outer space. It inquires their value and their interpretation, but – most importantly – it tests their application in front of activities put in place by non-governmental entities (Section 2.4).

A final section highlights the relevance, meaning and interrelation between the provisions of the space treaties that address directly private actors or their activities (Section 2.5).

In Chapter III, Article VI is brought under attentive scrutiny.

The wording used therein is interpreted looking at the ordinary meaning of the terms used, in combined reading with the other relevant provisions used by the international legislator in the space treaties (Section 3.1). This interpretative exercise is performed adopting a critical approach to the theories generally

advanced on the interpretation of Article VI and on its relation with the categories of State of registry and of launching State.

It is found that the legal qualification of "*appropriate State*" is a movable concept, linked to the capacity of a State to exercise legislative and enforcement jurisdiction over the mission control centre of private space missions. As a consequence, the category of Article VI should be interpreted as detached from the other ones mentioned above, discarding any theory that overlaps them (Section 3.4 – 3.6). To support this argument, Chapter III explores the current dynamics of space activities where a State has jurisdiction over the control of a private space activity without falling under the definition of launching State nor of State of registry (Sections 3.5 and 3.6).

The critical interpretations offered in the first six sections of Chapter III are then tested against the practice of States in regulating and overseeing private space activities (Section 3.7).

As the discourse moves to Chapter IV, the focus shifts to State responsibility and State liability for authorised private space activities under international law.

The first two Sections interpret the regime of responsibility envisaged by Article VI of the OST, concluding that it imposes an obligation of due-diligence upon "*appropriate States*". They do so by looking at the general rules on State responsibility in international law (Section 4.1), by analysing the text and negotiating history of the provision and by applying analogous reasoning with the field of maritime law to its interpretation (Section 4.2). The findings of all this are tested against three cases where private space companies have acted without or in contravention of their authorisation (Section 4.2.4).

Chapter IV continues with a review of the concept of liability for damages caused by space objects, arguing that while launching States are always liable, they are not the only States that can be liable for damages caused by a space object, meaning that international liability is not their exclusive prerogative (Section 4.3). In application of the rules on the consequences of wrongful acts in international law together with the principles of State liability for lawful activities, it is found that the "*appropriate State*" should be held liable even if it does not qualify as a launching State. This allows to offer a more coherent distribution of rights and obligations between launching States and 'non-launching-appropriate States' (Section 4.3).

The discourse concludes with an inquiry on the particular regime of fault-based liability for orbital damages, exposing the inefficiency of the current legal framework and proposing a reversal of the burden of proof in case of disputes as the most logical solution (Section 4.4).

The fifth Chapter focuses on the emerging legal issues related to 'new space'. It first looks at how space debris and suborbital vehicles are putting in crisis the traditional notion of space object. To solve this, a new definition of space waste is proposed (Section 5.2.1) and a possible regulation of suborbital vehicles based on a clear demarcation line in outer space is offered (5.2.2). The discourse then moves to the regulatory gap exposed by the arrival of private paying passengers, arguing that while the aspect of safety, supervision and licensing can be addressed at the national level, the matter of international liability for damages to private paying passengers necessarily needs a binding international regime (Section 5.3).

Chapter V is not limited to the examination of troublesome space definitions, it also tackles the issues raised by 'new space' activities on the distribution of rights and obligations between States. In particular, it examines the legal implications of in-orbit services (Section 5.4) and private lunar missions (Section 5.5), indicating the possible measures that can allow their development within a clear legal framework: a system of consent and waivers of claims between States for in-orbit services and an international set of norms for guiding the domestic regulation of private lunar activities in a spirit of international cooperation.

Finally, in the conclusion, a few last pages are dedicated to a reflection on the main findings of the study and to a look on the way forward.

1.4. METHODOLOGY

The present research adopts a doctrinal legal research method, relying on primary normative sources, doctrinal works, and factual considerations, with a focus on analysing the international legal framework that applies to private space activities. It primarily draws on international treaties, especially the OST, the Liability Convention, the Rescue and Return Agreement, and the Registration Convention. These primary sources are systematically analysed, using the means of

interpretation of international law and, in particular, the instrument of analogical reasoning.

The sources of law at the domestic level are often mentioned, offering a comparative study of the aspects of relevance for the issues assessed.

Academic commentaries, legal treatises, and research papers are extensively used to interpret the primary sources of law and to find the grounds necessary to bring forward the current understanding of space law as applied in the relationship between States and non-governmental entities.

There is, however, no mention of international case law specific to space activities as there has yet to be an international dispute on space law judged by an international tribunal. Nonetheless, the case law of international judiciary bodies such as the International Court of Justice and the International Tribunal for the Law of the Sea are used to underline certain principles applicable also in the present field of research.

In addition to these aspects of legal analysis, the Thesis takes into consideration also factual considerations that are relevant to the application of space law to private space activities, such as private space missions and technological innovations. These facts are used to contextualise and support – for example as case studies – the legal arguments used throughout the text.

All the legal and factual sources upon which this Thesis is built were analysed relying on a deductive method, used as the backbone of this research to reach conclusions where the law was silent and the road was not paved.

CHAPTER II

INTERNATIONAL SPACE LAW AT A GLANCE

SUMMARY: 2.1. Introductory remarks – 2.2. Origin – 2.3. Evolution – 2.3.1. The first phase of space law – 2.3.2. The second phase of space law – 2.3.3. The third phase of space law – 2.3.4. A new phase taking shape? – 2.3.5. Final remarks – 2.4. The spirit of space law. – 2.4.1. The benefit-aiming obligation. – 2.4.2. Cooperation, understanding and assistance. – 2.4.3. The duty of due regard. – 2.4.4. Final remarks. – 2.5. The legal status of outer space. – 2.5.1. The prohibition to appropriate outer space – 2.5.2. The prohibition to violate international law in outer space – 2.5.3. The prohibition to 'weaponise' outer space and 'militarise' celestial bodies – 2.5.4. Final remarks. – 2.6. Main legal aspects of private space activities – 2.6.1. Article VI of the OST. – 2.6.2. Article IX of the OST – 2.6.3. Article III of the Liability Convention – 2.7. Concluding remarks.

2.1. INTRODUCTORY REMARKS

This Chapter serves the purpose of setting the scene for the following ones.

It describes the historical development of space law and the main principles that inform all human endeavours beyond the atmosphere, including private ones.

Its purpose is to underline the context in which non-governmental activities are performed and to analyse how the provisions of the space treaties that mention private actors expressly should be interpreted today.

To that end, it is necessary to start from the understanding of what is the international law of outer space.

The international law of outer space is a set of rules that determines how the subjects of the international community should act and interact in the cosmic environment.

It is a legal framework that is specific to and exclusive of outer space, as it applies only there and nowhere else.

But as a geographical area, like the air or the sea, the cosmic environment is not regulated only by space law. Next to it, there are other rules that may find application in respect of certain conducts happening in outer space.

For example, the prohibition to threaten or use force in any manner inconsistent with the purposes of the United Nations (UN) – as established in Article 2(4) of the UN Charter[19] – applies beyond and below the atmosphere, equally.

It follows that space activities must comply with two layers of norms: one, specific to outer space, the other, contained in the larger framework of international law and applicable in outer space like in any other environment on Earth as a *lex generalis* of international activities.

Through the years, the actions of humans in outer space evolved into a vast variety of operations.

A sense of the complexity reached nowadays can be grasped by reading the Agenda of the UN Committee on the Peaceful Uses of Outer Space (COPUOS) for the 67th Session of its Legal Subcommittee in 2024[20].

Among the items of discussion, it is possible to find:

- the activities of international intergovernmental and non-governmental organizations;
- the definition and delimitation of outer space;
- the character and utilization of the geostationary orbit;
- national legislation;
- space resources;
- space debris mitigation and remediation measures;
- space traffic management;
- small-satellite activities[21].

This non-exhaustive list of activities regulated by space law is constantly growing as the progress of science and technology unlocks new opportunities for the use and exploration of the cosmic environment.

From such dynamism derives a never-ending necessity of new rules, establishing limits on what is achievable and providing legal clarity for what is permissible.

[19] *Charter of the United Nations* (UN Charter), 1 UNTS XVI, 1945, Article 2(4).
[20] UN Doc. A/79/20 of 15 July 2024, titled 'Report of the Committee on the Peaceful Uses of Outer Space Sixty-seventh session (19–28 June 2024)', p. 23.
[21] *Ibid.*

That necessity was felt, for the first time, at the very beginning of human endeavours in outer space.

2.2. ORIGIN

On October 4, 1957, the first artificial space object in human history was launched across the borders of the atmosphere. It was Sputnik-1, an artificial satellite built by the USSR with the primary function of placing a radio transmitter into orbit around Earth. Its trajectory allowed it to pass over the same part of the world every ninety-six minutes.

The reaction of the Western block was of shock and alarm. With the spectre of the Cold War already looming over the world, the main fear was the capacity of the Soviets to perform sub-orbital launches with their intercontinental ballistic missiles and to use satellite technology for the placement of nuclear weapons in space.

As a result, on November 14, 1957 (just forty days after the launch of Sputnik-1), the UN General Assembly adopted Resolution 1148 (XII) urging States to reach a disarmament agreement that included "*an inspection system which would make it possible to assure that the launching of objects through outer space would be exclusively for peaceful and scientific purposes*"[22].

Although the text of the resolution represented more of an exhortation, it addressed the first legal concern related to space activities: the need of rules on the militarization of outer space.

All the first extra-atmospheric missions – including the ones of Western countries after Sputnik-1[23] – were the product of military investments and interests. This condition influenced the work of the UN, which placed at the centre of its normative efforts on space matters one priority: the peaceful utilization of outer space.

[22] UNGA Res. 1148 (XII) of 14 November 1957, titled 'Regulation, limitation and balanced reduction of all armed forces and all armaments; conclusion of an international convention (treaty) on the reduction of armaments and the prohibition of atomic, hydrogen and other weapons of mass destruction', Article 1, lett. f).

[23] On January 31, 1958 the United States, using the technology of a rocket Juno, successfully launched in orbit *Explorer I*, first satellite of NASA to reach outer space.

To allow a speedy development of rules in that spirit it was deemed necessary to set up an *ad hoc* body within the UN.

In 1958, as a first step, the General Assembly established the Committee on the Peaceful Uses of Outer Space (COPUOS)[24], an international forum where States could discuss "*the legal problems which may arise in the carrying out of programmes to explore outer space*"[25].

In only two years after its establishment, the work of COPUOS allowed the UN General Assembly to adopt Resolution 1721 (XVI) of 20 December 1961, with the title: "*International cooperation in the peaceful uses of outer space*"[26].

This document marks the birth of international space law.

For the first time, a framework of principles and recommendations was set forth in an international source of law.

Despite its recommendatory nature, the articles of Resolution 1721 (XVI) contained the views of the international community on what should have been the core elements of space law.

Notably, in the text of the resolution it is already possible to find some of the building blocks of the future resolutions and conventions on the matter. In particular, the General Assembly commended to States "*for their guidance in the exploration and use of outer space the following principles:*

(a) International law, including the Chapter of the United Nations, applies to outer space and celestial bodies;

(b) Outer space and celestial bodies are free for exploration and use by all States in conformity with international law and are not subject to national appropriation"[27].

Furthermore, the General Assembly called upon States launching objects into orbit or beyond "*to furnish information promptly to the Committee on the Peaceful Uses of Outer Space, through the Secretary-General, for the registration of*

[24] See UNGA Res. 1348 (XIII) of 13 December 1958, titled 'Question of the Peaceful Use of Outer Space'. COPUOS became a permanent committee of the UN in 1959 with UNGA Res. 1472 (XIV) of 12 December 1959, titled 'International co-operation in the peaceful uses of outer space'.
[25] *Ibid.*, art. 1(d).
[26] UNGA Res. 1721A (XVI) of 20 December 1961, titled 'International co-operation in the peaceful uses of outer space'.
[27] *Ibid.*, art. 1.

launchings"[28] and requested "*the Secretary-General to maintain a public registry of the information furnished*"[29].

For as significant as these principles and recommendations were at that time, it was clear that – due to their non-binding nature – they could not represent a sufficient safeguard for the peaceful use of outer space. They were not the point of arrival, but only the first step in the regulation of space matters.

While COPUOS was working to find the international agreement necessary for the adoption of a stronger normative document, the incessant progress of space technology paced forward.

In 1961, Yuri Gagarin from the USSR became the first man to fly into outer space, followed the next year by John Glenn from the USA who completed a full orbit around Earth. In 1962, the number of satellites in space reached more than fifty units. That same year, in September, the President of the USA John F. Kennedy announced to the world that by the end of the decade an American flag would be planted on lunar soil[30]. It was the beginning of the so-called 'Moon Race'.

In this context of unceasing achievements, the urge for a more stringent set of rules became an impellent necessity in the UN.

The efforts of COPUOS proved to be fruitful as the international community reached a second milestone in the progress of space law only two years after Resolution 1721 (XVI).

On December 13, 1963, the General Assembly adopted its Resolution 1962 (XVIII) titled: "*Declaration of Legal Principles governing the Activities of States in the Exploration and Use of Outer Space*" (1963 Declaration)[31].

In its first twenty years of history, the UN General Assembly resorted to the adoption of a so-called "*declaration of principles*" only seven times. On the previous six occasions, the matters covered by this instrument were: human rights, rights of the child, the right to independence, nuclear weapons, disarmament, and racial discrimination. In 1963, the list of the most important concerns of the United Nations was expanded to include the use and exploration of outer space.

[28] UNGA Res. 1721B (XVI) of 20 December 1961, art. 1.
[29] *Ibid.*, art. 2.
[30] See John F. Kennedy's Address at Rice University on the Nation's Space Effort of 12 September 1962, available at the following link: www.jfklibrary.org/learn/about-jfk/historic-speeches/address-at-rice-university-on-the-nations-space-effort
[31] UNGA Res. 1962 (XVIII) of 13 December 1963, titled 'Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space' (1963 Declaration).

The relevance of the cosmic environment to the eyes of the international community was evident.

As can be imagined, this relevance was reflected also in the normative value of the principles contained in the 1963 Declaration[32]. Unlike previous resolutions, they were phrased in a manner that expressed an intention to set a landmark in the progressive development of space law.

While in 1961 the norms of Resolution 1721 (XVI) were simply commended to States for their guidance, in the 1963 Declaration, the General Assembly "*solemnly declares*" the nine legal principles that "*should govern and guide the exploration and use of outer space*"[33].

The text of the Resolution defines the legal status of outer space, celestial bodies and astronauts. It establishes the principle of responsibility for governmental and non-governmental space activities, specifying that States shall authorise and continuously supervise the activities of non-governmental entities so as to ensure their conformity with the principles of the Declaration. It indicates the rules on ownership, registration and return of space objects. It maintains the liability of launching States for damages caused by such objects. It promotes the application of the principle of cooperation, due regard and avoidance of harmful interference between spacefaring States.

These principles became the building blocks for the conduct of space activities in the years to come. Since then, not only they were enshrined in treaty norms, but they have also been followed by States unchangeably, using them as a reference point for their subsequent practice beyond the atmosphere.

The particular normative value of the norms enunciated in the 1963 Declaration was recognised also by scholars and commentators, who have traditionally regarded its principles as more than mere recommendations, representing norms that have been accepted as law[34].

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[32] As the UN Office for Legal Affairs explained in 1962: "*in view of the greater solemnity and significance of a 'declaration', it may be considered to impart, on behalf of the organ adopting it, a strong expectation that Members of the international community will abide by it. Consequently, in so far as the expectation is gradually justified by State practice, a declaration may by custom become recognised as laying down rules binding upon States*". See UN Doc. E/CN.4/L.610 of 2 April 1962, titled 'Use of the terms Declaration and Recommendation: memorandum'.

[33] 1963 Declaration.

[34] See J. Fawcett, *International law and the uses of outer space*, Manchester University Press, 1968, p. 16. M. Scharf, *Customary International Law in Times of Fundamental Change*, Cambridge University

Therefore, it is not without reason that it is possible today to consider the 1963 Declaration as establishing general principles formed within the international legal system[35].

At the moment of its adoption, however, the 1963 Declaration could not be considered a normative document of binding nature[36]. Even if a strong expectation of compliance was placed upon spacefaring States, it remained a UN General Assembly resolution. It was not for another three years that COPUOS was able to finalise the text of the first treaty of space law, namely the Outer Space Treaty (OST) of 1967.

However, in parallel to the works and achievements of COPUOS, another normative effort was taking place in those same years.

As mentioned above, the fear of the militarization of outer space moved the international community in its first steps towards a legal framework for peaceful space activities.

In this context, the UN Disarmament Committee played a crucial role.

Under its umbrella, the USA and the USSR negotiated the text of a convention regarding the testing of nuclear weapons, with outer space at the center of its scope of application.

In 1963, the "*Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space, and Under Water*" was adopted[37].

Article 1 stated that States Parties prohibit and prevent any nuclear explosion "*(a) in the atmosphere; beyond its limits, including outer space; or under water, including territorial waters or high seas; or (b) in any other environment if such explosion causes radioactive debris to be present outside the territorial limits of the State under whose jurisdiction or control such explosion is conducted*"[38].

Press, 2013, p. 123. S. Hobe, *Historical Background*, in Cologne Commentary on Space Law: Vol. 1 (ed. by S. Hobe and others) (Cologne Commentary I), Carl Heymanns Verlag, 2009, p. 13 and 23.

[35] On the formation and individuation of this category of principles see the specific work of the International Law Commission (ILC) in UN Doc. A/78/10 of 3 November 2023, titled 'Report of the ILC – 74th Session', p. 22. See also E. Bjorge, *General Principles of Law in the International Legal System*, in International and Comparative Law Quarterly, Vol. 72, No. 4, 2023, p. 845.

[36] See the opinions expressed by COPUOS' delegates on this regard as collected by B. Cheng, *Studies in International Space Law*, Oxford University Press, 1997, p. 133.

[37] *Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water*, 480 UNTS 43, 1963.

[38] *Ibid.*, Article 1.

With this provision, the spacefaring States of the time set the first binding limit on their extra-atmospheric activities. As will be seen (*infra*, par. 2.4.3.3), the topic of nuclear weapons in outer space was further elaborated in the soon-to-be-adopted OST, which established in Article IV stringent restrictions on their use.

Thus, with a declaration of principles and a treaty imposing a nuclear ban in outer space, the year 1963 can be seen as the completion of the original phase of space law. From the launch of Sputnik-1 in 1957, it took less than ten years for space law to take its initial form. From that point, it started evolving into a mature field of international law, made of multilateral conventions, customary norms, soft-law measures and national legislations.

2.3. EVOLUTION

2.3.1. The First Phase of Space Law

After the initial formation of space law, three different phases characterized its following evolution.

The first one took place between 1967 and 1984 and can be called the phase of *hard law*.

In this period, five space conventions entered into force[39]: the OST of 1967, the Rescue Agreement of 1968, the Liability Convention of 1972, the Registration Convention of 1976, the Moon Agreement of 1984[40].

Together, these binding instruments set forth the conventional legal framework for space activities.

Their adoption followed a precise legislative strategy: it was first deemed necessary to have a treaty of general principles (the OST) simply elaborating and expanding the already-adopted text of the 1963 Declaration. Then, as a second step, it was decided to leave specific issues – like registration and liability – to separate agreements, so as to circumscribe any lengthy negotiation on particularly controversial matters.

[39] In addition, at the regional level, the Convention for the establishment of ESA also entered into force in 1980.

[40] For the full names of the space treaties see above at 4.

This strategy proved to be fruitful as all the five space treaties entered into force in a short time span of about fifteen years, providing guidance for space activities up to now. It must be noted, however, that the last of the space treaties, namely the Moon Agreement, raised several issues during its negotiation which remained controversial even after the final text was elaborated. From its adoption in 1979, five years passed before its entry into force in 1984. And even after 1984, it never gained the acceptance of the most active spacefaring States. Due to the limited number of ratifying parties, one of which recently withdrew from it[41], today it can be regarded as a failed treaty[42].

Leaving aside the Moon Agreement, the legislative success of COPUOS in the adoption of the space treaties in such a short period of time was possible thanks to three factors:

1) At the time of the drafting, there were only two space powers sitting at the table of negotiations, namely the USA and the USSR, with a few other States contributing to the discussions[43]. In fact, the number of actual spacefaring States was still quite limited: only five States had launched an object into orbit as of 1967. Also, the number of members within COPUOS was relatively low, amounting until 1972 to only twenty-eight members, mostly aligned with either one or the other space power. Hence, it was relatively easy to find a balance between the different interests at stake.

[41] On 5 January 2023, the Kingdom of Saudi Arabia withdrew from the Moon Agreement in accordance with article 20 of the Agreement, taking effect on 5 January 2024, as reported in UN Doc. C.N.4.2023.TREATIES-XXIV.2 of 5 January 2023.

[42] Nonetheless, some authors still support its relevance for the future regulation of activities on the Moon. Among the most recent contributions: M. Manoli, *The Architecture of Authority in Global Space Governance: The Moon Agreement as a Deconflicting Mechanism of Space Activities*, in Utrecht Law Review, Vol. 20, No. 1, 2024, p. 100; E. Mavroeidi, *The Effectiveness and Applicability of the Moon Agreement in the Twenty-First Century: Will There Be a Future?*, in The Space Treaties at Crossroads (ed. by G. Kyriakopoulos and others), Springer, 2023, p. 35; I. Marboe, *What, if any, relevance does the Moon Agreement have to activities in space today?*, in Perry World House Web publications, 2023, available at the following link: https://global.upenn.edu/sites/default/files/perry-world-house/Marboe_SpaceWorkshop.pdf.

[43] The former Chairman of the Legal Sub-Committee of COPUOS, Professor Kopal, described the negotiations and the solutions to the issues raised during the negotiations of the OST in the following terms: "A number of such issues were reconciled only during the final stages of the negotiations by informal consultations between the representatives of the two major space powers with the participation of United Nations Secretary-General U Thant, the COPUOS Chairman, Kurt Waldheim of Austria, and the Chairman of the COPUOS Legal Subcommittee, Manfred Lachs of Poland". V. Kopal, *Introductory Note to the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies*, in UN Audio Visual Library of International Law, 2008, p. 2.

2) The wording of the provisions within the treaties was chosen not to be too detailed, due to the high risk of obsolescence *vis-à-vis* a field of technology in full development and with unpredictable potentials. It was not appropriate to establish a legal framework like the one adopted in 1944 for aviation, namely the Convention on International Civil Aviation (Chicago Convention) [44] . The latter was formulated as a long and technical international regulation because the field of aviation – after 40 years of development – had already reached an advanced stage, with little changes to the dynamics of air flight expected in the following years. This was not the case of space technologies, which were just starting to be tested and whose potential was still unknown. For this reason, the choice to rely on broad regulatory formulations, despite its evident shortcomings, was beneficial in terms of law-making and facilitated the compromise between opposite positions.
3) Defining the rights and obligations applicable to outer space did not require the creation of a completely new legal framework. COPUOS relied, in fact, on two previous international agreements regulating two other environments beyond national jurisdiction: Antarctica (1961)[45] and the high seas (1962)[46]. Also there, the international community was called to find normative solutions in terms of free and peaceful uses, registration of objects (e.g. vessels), responsibility for damages, and cooperation between users. As a result, many provisions in the text of the space treaties followed the example of the legal framework established for Antarctica and of the high seas, resembling the solutions adopted therein.

These three factors allowed a speedy negotiation of the space conventions and therefore an efficient and successful initial development of space law into *hard law* instruments.

However, at the end of this phase in the 1980s, with the Cold War coming to an end, the scenario changed.

[44] *Convention on International Civil Aviation* (Chicago Convention), 15 UNTS 295, 1947.
[45] *The Antarctic Treaty*, 402 UNTS 71, 1961.
[46] *Convention on the High Seas*, 450 UNTS 11, 1962.

More countries became interested in space activities, and the size of COPUOS increased to sixty-one members in 1994[47].

Obtaining consensus on the content of formal treaties became substantially more difficult[48]. Moreover, with the collapse of the Soviet Union in 1989, the equilibrium within the Committee was altered giving more weight to the interests of developing countries, often in contrast with the ones of developed spacefaring Nations. As a result, a second phase of the development of space law began: the phase of *soft law*.

2.3.2. The Second Phase of Space Law

Considering the reluctance of States to enter into legally binding international agreements, COPUOS was driven to other efforts. It oversaw the drafting, formulation and adoption of four additional UN General Assembly resolutions. They were focused on those activities which in that period were the most concerning.

More specifically, starting from the 1980s space programs and investments were redirected from the conquest of outer space to the exploitation of satellite services in the cis-terrestrial environment. The attention of spacefaring Nations shifted towards telecommunication and Earth observation services. With that, new issues were raised. Frequency interference and the global footprint of satellite signals became the main topics of discussion at the international level, with developing countries particularly concerned on the effects of all this on their territory, resources and sovereignty[49].

[47] The membership evolution of COPUOS is accessible at the following link: www.unoosa.org/oosa/en/ourwork/copuos/members/evolution.html

[48] S. Doyle, *A Concise History of Space Law*, in Proceedings of the International Institute of Space Law 2010, Eleven International Publishing, 2011, p. 108.

[49] All this was debated not only in COPUOS meetings, but also at the International Telecommunication Union (ITU). Notably, in the 1980s the ITU held the so-called Space World Administrative Radio Conferences, or Space WARC, where States debated the planning and use of frequencies and orbits. See the analysis on those events offered by M. Smith, *The Space WARC Concludes*, in The American Journal of International Law, Vol. 83, No. 3, 1989, p. 596. In the same period, the ITU elaborated its new Constitution and Convention, which entered into force in 1994: *Constitution and Convention of the International Telecommunication Union*, 1825 UNTS 330, 1994. On the issues raised by developing States on its application, and in particular on the case of Togo, see: J. Thompson, *Space for Rent: The International Telecommunications Union, Space Law, and Orbit/Spectrum Leasing*, in Journal of Air Law and Commerce, Vol. 62, No. 1, 1996, p. 279.

In light of that, COPUOS developed a new set of principles and guidelines concerning direct television broadcasting (1982), remote sensing (1986), nuclear power sources of electric power on board of space objects (1992), space cooperation and benefits for all States irrespective of their degree of development (1996).

Once again (after the 1963 Declaration) – without recurring to norms of conventional nature – the system of space law advanced providing guidance on new issues. The resulting legal framework was indeed based on UN General Assembly resolutions, but with a strong normative value of the principles contained therein.

Unlike in the case of the 1963 Declaration, however, the four resolutions of principles adopted in the 1980s and 1990s were never translated into binding agreements due to the unfavourable conditions within the international community mentioned above.

Next to them, a large number of other *soft law* measures on space matters was produced in the same years.

The UN General Assembly continued to adopt a periodic resolution (issued since 1959[50]) titled "*International Cooperation in the Peaceful Uses of Outer Space*" where it endorsed the annual report and recommendations of COPUOS and where it stressed the matters of greatest urgency for the international community. In particular, starting from 1989, it is possible to notice the inclusion of issues such as space debris, traffic management, and sustainability[51], determining the addition of new items in COPUOS agenda and the emergence of the contemporary problems of space law.

All this did not take the attention of the international community away from the most important and old concern of space law: the militarization of outer space.

Before the fall of the Berlin wall in 1989, the great majority of space assets were of military or dual (civil and military) nature. As the progress of technology increased, the dependence of military operations on space capabilities followed. This brought the USSR and the USA to develop advanced systems of anti-satellite

[50] For the first time as UNGA Res. 1472 (XIV) A of 12 December 1959, titled 'International co-operation in the peaceful uses of outer space'.

[51] UNGA Res. 44/46 of 8 December 1989, titled 'International co-operation in the peaceful uses of outer space', para. 22 and 23.

(ASAT) weapons and co-orbital satellite interceptors[52]. While the USA was ahead in terms of number of military space assets, the USSR was stepping up in its preparation of combat capabilities beyond Earth[53].

In order to limit the risk of using weapons from and in the extra-atmospheric environment, the international community started working on a possible normative solution to the problem.

In 1981, the UN General Assembly added a second periodic space resolution to the one on cooperation, it was titled "*Prevention of an Arms Race in Outer Space*" (PAROS)[54].

The goal was to urge all States, especially the ones with major space capabilities, to refrain from any action fomenting the so-called 'weaponisation' of outer space[55]. To facilitate this objective, this resolution placed upon the UN Committee on Disarmament (succeeded in 1978 by the Conference on Disarmament, or CD) [56] the task of negotiating an effective and verifiable agreement on the matter. After the initial efforts of the 1980s, the progress of the CD in creating an agreement to prevent an arms race in outer space stalled. Thus, just like COPUOS, also the work of the CD failed to produce new agreements on space legal issues.

2.3.3. The Third Phase of Space Law

As the progress of space law continued at the international level between UN General Assembly resolutions and other non-binding instruments, a new situation suddenly started taking shape at the beginning of the 21st century: the so-called "democratization" of outer space.

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[52] See UNIDIR, *Disarmament: Problems related to Outer Space*, Report n. 87/35, 1987. See also K. Gottfried and others, *Anti-Satellite Weapons: Weighing the Risks*, in Daedalus, Vol. 114, No. 2, 1985, p. 147.

[53] For example, in the 1970s Russia deployed the so-called 'Almaz' military space station which had a R-23M Kartech cannon installed. For more, see R. De Benedictis, *La prevenzione della corsa agli armamenti nello spazio*, in Affari Esteri Rivista Trimestrale, No. 146, 2005, p. 422.

[54] UNGA Res. 36/97C of 9 December 1981, titled 'Prevention of an arms race in outer space'. The idea of preventing an arms race in outer space was expressed the first time in the Final Document of the Tenth Special Session of the General Assembly (A/RES/S-10/2) of 1978 at para. 80.

[55] This expression refers to the placement and use of weapons in outer space, which entail the possibility to perform an attack from space either on Earth or in the cosmic domain itself. See the analysis on this matter in: R. Connolly and others, *The Next Arms Race and the Unknown Frontier of Outer Space: the Conceptual Challenges for International Law and Space Weaponization*, in Journal of Space Law, Vol. 46, No. 2, 2022, p. 310.

[56] See P. Meyer, *The CD and PAROS: A Short History (UNIDIR Discussion Paper)*, UNIDIR, 2011.

This expression indicates a radical change in two aspects of space activities: 1) the possibility to access outer space; 2) the dependence of human societies on satellite services.

The two aspects are intertwined.

First, technologically and financially, accessing space became easier. Thanks to the developments in computing and thanks to the miniaturization of technologies, the barrier to entry space lowered[57]. Small, powerful, and energy-efficient hardware – like the ones of mobile phones – became affordable, easy to build and perfectly suited for satellites. But it was not just less expensive and complicated to construct a satellite, it was also much cheaper to send it into space[58]. The costs of rocket launches were reduced as their demands increased. A greater need to access space pushed various spacefaring Nations to develop programs for low-cost launch vehicles, improving their carrying capacity, reliability and operability[59].

All this had the effect of (…or was caused by) a growing awareness of the potentiality that space had for Earth.

As human societies became more technologically advanced and interconnected[60], they became more dependent on satellite services. Telecommunication, earth observation, global positioning, and connectivity were enablers and facilitators of a plenitude of commercial sectors on Earth, such as mobile phones, internet, mobility, and industrial agriculture.

From a sector dominated by public interests and government operations of the most developed States, it evolved into an accessible sector for all, with a strong market-oriented dimension.

In sum, the change in the aspects of accessibility and dependence to space 'democratised' its use and exploration, starting a trend of commercialisation and privatisation that is still ongoing today.

The impact of all this can be better grasped by looking at some numbers.

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[57] D. Baiocchi, *The Democratization of Outer Space*, in Foreign Affairs, vol. 94, no. 3, 2015, p. 99.

[58] Z. Song and others, *Autonomous Trajectory Planning and Guidance Control for Launch Vehicles*, Springer, 2023, p. 5.

[59] *Ibid.* For example, in the early 2000s the US Atlas V, and Delta IV rockets were launched for the first time. In the same years, the French rocket Ariane V, and shortly after the Italian one Vega, started their operations. Also the Chinese LM-2F space launcher lifted off for the first time in 1999.

[60] See OECD, *21st Century Technologies: Promises and Perils of a Dynamic Future*, OECD Publications, 1998.

With outer space ‘closer’ to Earth, the number of spacefaring Nations increased significantly.

Before all this happened, in the ten years between 1994 and 2004, COPUOS was able to increase its membership with just six States.

In the next twenty years, up until 2024, the committee expanded at a much faster speed: forty new States joined and COPUOS reached one-hundred-and-two members (one of the largest Committees in the United Nations)[61].

Behind this growth, there was a greater interest for States in discussing at the international level the technical and legal issues related to the new commercial and private space activities.

An even greater evidence of the effects of the ‘democratisation’ of outer space can be found in the number of active satellites.

While in 2001 there were less than one thousand active satellites in orbit[62], in 2025 they have arrived at 11.200 units[63], causing a great deal of international orbital traffic.

This situation had an impact also on the development of space law, which in this period entered its third phase: the phase of national laws.

There was a pressing need for regulating new space activities, new space actors, and an overall changed scenario of space operations.

At the international level, any negotiation continued to produce only soft-law measures.

They were useful instruments for several purposes: they helped clarify the provisions of the space treaties[64], provided some norms of good behaviour on new

[61] In 1999, the Third UN Conference on the Peaceful Use and Exploration of Outer Space (UNISPACE III) was held in Vienna. In that occasion, COPUOS received new indications on the goals that it was meant to pursue. Namely, the promotion of the space treaties to increase the number of ratifying members and the adoption of documents that could clarify their interpretation and application.
This was deemed necessary as the space treaties were not yet reaching the universal character that was expected for a matter of relevance and with implications on Earth for all States.

[62] See the data published by Statista Research Department on 28 August 2024, available at the following link: www.statista.com/statistics/897719/number-of-active-satellites-by-year/.

[63] See ESA’s Environmental Report, above at 13.

[64] See, for example, UNGA Res. 59/115 of 10 December 2004, titled ‘Application of the concept of the launching State’.

topics[65], and promoted transparency and confidence among States[66]. However, they presented severe shortfalls in terms of specificity and bindingness.

In addition to this, there was also the new need of spacefaring States to regulate the activities of their nationals beyond the atmosphere, ensuring their compliance with all applicable international obligations.

Thus, in little more than twenty years, the realm of space law witnessed a proliferation of domestic legislations: almost fifty new national space laws have been enacted between 2000 and 2024[67].

Leaving a deeper analysis on the legal repercussions of all this to the following Chapters, it suffices here to say that the trend of adopting national legislations has raised a problem of fragmentation in the interpretation and application of international space norms. The latter have been implemented by different States in different manners, creating a patchwork of rules and, at the same time, raising concerns on the conformity of domestic measures with the obligations stemming from the system of international space law.

Despite its shortfalls, the trend has not exhausted its momentum, as more and more States continue to adopt national space legislations in the lack of international coordination on many pressing issues of space activities.

It is yet to be seen whether the next phase of development of space law will set a different course. What will be the fourth phase of the evolution of space law?

2.3.4. A New Phase Taking Shape?

For now, it can be said that a new wave of multilateralism is on the horizon.

[65] See, for example, UNGA Res. 62/217 of 22 December 2007, titled 'International cooperation in the peaceful uses of outer space', endorsing the *Space Debris Mitigation Guidelines* prepared by COPUOS (A/62/20, paras. 118-119 and Annex).

[66] See, for example, UNGA Res. 68/50 of 10 December 2013, titled 'Transparency and confidence-building measures in outer space activities', endorsing the Report of the Group of Governmental Experts on Transparency and Confidence-Building Measures in Outer Space Activities (A/68/189).

[67] The number includes both completely new laws and the few cases in which older laws were amended in this timespan. For a database of national space laws, see the database held by UNOOSA at the following link: https://www.unoosa.org/oosa/en/ourwork/spacelaw/nationalspacelaw/index.html

The newest legal issues raised by space activities – e.g. sustainability, suborbital activities and lunar missions – have brought back a sense of necessity for solutions adopted at the international level[68].

All this may be the start of a new shift in the law-making process on outer space. As is often the case when the fragmentation of a system of law becomes too excessive, the response is a reaction towards the opposite: harmonisation.

This is exactly what is now happening in the European Union (EU), where the Commission has started to work on a EU law on space activities with the aim of strengthening the European space market through a regulatory intervention[69].

Interestingly, other regions of the world are taking steps in the same direction of Europe, even if still at a level of political-coordination rather than regulatory harmonization: Latin American and Caribbean States have created in 2021 a regional space agency called ALCE[70]; African States have started to cooperate at the regional level through the African Space Agency and with the adoption by the African Union (AU) of a common Space Policy[71] as well as a common Space Strategy[72]; in the Asia-Pacific region, two institutions are working towards the creation of common grounds among the States of the region, namely the Asia-

[68] The Artemis Accords, the EU space traffic management initiative, the UN Guidelines for the Long-term Sustainability of Outer Space Activities are recent examples of international commitments taken through multilateral negotiations.

[69] The proposal for a European Space Law has been presented by the President of the European Commission, Ursula Von der Leyen, in 2023 and assigned in September 2024 to the new commissioner for Defence and Space, Andrius Kubilius, with the objective "*to introduce common EU standards and rules for space activities and harmonise licensing requirements*". See *Mission Letter to Andrius Kublius from Ursula Von der Leyen of 24 September 2024*, 2024, p. 6, available at the following link: https://commission.europa.eu/document/1f8ec030-d018-41a2-9759-c694d4d56d6c_en. For the status of advancement of the work on the proposal see the dedicated webpage on the EU Parliament website at the link: www.europarl.europa.eu/legislative-train/theme-a-europe-fit-for-the-digital-age/file-eu-space-law.

[70] See the press release available at the following link: www.gob.mx/sre/en/articulos/signing-of-the-convention-establishing-alce-the-latin-american-and-caribbean-space-agency-283235?idiom=en.

[71] Notably, objective 5 of the AU's Space Policy, titled Coordinating the African Space Arena, reads as follow: "To regulate space activities. The African space programme will need to be regulated in order to guarantee that strategic objectives are attained. Conflicts of interest will need to be managed to best serve African interests. A regulatory environment will have to be established to allow industrial entities to access space technologies and to promote African commercial private sector participation in the space arena. This regulatory framework will need to be developed and implemented to ensure effective compliance with international treaties and conventions, with the necessary levels of transparency. The African space programme should be compliant with national, continental and broader international laws and regulations".

[72] African Union, *Space Strategy*, 2019.

Pacific Space Cooperation Organization (APSCO) [73] and the Asia-Pacific Regional Space Agency Forum (APRSAF)[74].

But as the fourth phase of space law is only timidly starting to reveal itself, it is already possible to draw some concluding remarks on the three phases described in the previous pages.

2.3.5. Concluding Remarks

After almost seventy years, it is clear that the evolution of space law has seen a progressive loss of COPUOS' capacity to express binding obligations upon spacefaring States. This development was mainly caused by the radical transformations (of numbers and purpose) in the dynamics of COPUOS as well as by the disruptive changes of the commercialisation and democratisation of space activities. In the current phase of space law, States have chosen not to transfer in the hands of the international legislator the regulation of new space activities. Instead, they have turned to their domestic regulatory powers, using them as an instrument to set out new rules.

All this – as the expression goes – has put a new church in the centre of the village: the instrument of authorisation.

New requirements – such as the ones on sustainability – and new rights – such as the ones on space tourism and lunar operations – are created by States in their national laws on private space activities.

It is therefore central for any inquiry on the conformity of nationals' activities with the international regime of space law to focus on the authorising and supervising phases. Any investigation in terms of State responsibility or liability revolves around the manner in which the duty to authorise and supervise private actors has been implemented at the national level.

What remains then of the traditional international framework of space law?

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[73] The Asia-Pacific Space Cooperation Organization (established in 2005 and operational since 2008) is intended to serve the purpose of setting the first brick for a proper regional space law. APSCO inaugurated in February 2024 a new initiative called the APSCO Space Law Alliance (ASLA). Developing regional and international alliance of space law institutions was listed as one of the key strategic areas in the *APSCO Strategy for Space Law and Policy of APSCO (2021-2030)*, which was approved by the APSCO Council in 2020.

[74] The Asia-Pacific Regional Space Agency Forum (APRSAF) was established in 1993 to enhance space activities in the Asia-Pacific region. See the document titled Principles of APRSAF available at the following link: www.aprsaf.org/about/pdf/Principles.pdf

The UN space treaties and the subsequent soft-law measures still represent today the legal parameter for any human activity beyond the atmosphere, including private ones. Thus, before delving into the legal analysis of space authorisations, it is necessary to spend a few words on the content, object and purpose of the international framework of space activities.

2.4. THE SPIRIT OF SPACE LAW

When in the 1960s the members of COPUOS were confronted with the task of creating the framework of space law, they decided to draft only a limited number of basic principles: nine in the 1963 Declaration, enlarged to thirteen in the OST of 1967[75].

Among them, it is possible to find the enunciation of the fundamental values on how to conduct space activities. In other terms, those basic principles clarified the purpose of space law, they defined the legal status of outer space and expressed the spirit with which the exploration and use of the cosmic environment was meant to be conducted.

For that reason, their meaning and their legal implications are described in the following paragraphs.

2.4.1. The benefit-aiming obligation

When the OST was adopted, it was permeated with an underlying idea: the expansion of humans in outer space should be done in accordance with a new set of values, inspired by a greater sense of community among States.

The translation of this idea into practical legal terms appears manifestly in the first sentence of Article I:

> "*The exploration and use of outer space, including the Moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind*".

[75] This is without considering the other four procedural articles of the OST, Articles XIV-XVII.

Since the last expression – "*province of all mankind*" – entails that the use and exploration of the cosmic environment shall be characterised by some form of entitlement on the part of humanity, its analysis will be carried out in conjunction with the non-appropriation principle of Article II, OST (*infra*, Section 2.5.1).

As for the rest of the provision, it appears from the ordinary meaning of the terms[76] that space activities shall aim to benefit ("*for the benefit*") and to bring advantages ("*in the interest*") to other States. Moreover, the beneficiaries of such obligation are "*all countries*", including non-parties to the OST and especially undeveloped States, such as the ones that do not possess the capabilities to undertake space activities.

This interpretation, however, does not remove all ambiguities from its application among States. Scholars have traditionally found the meaning of Article I contentious: some, in particular, have interpreted it as imposing on spacefaring States the obligation to concretely share the benefits of their space activities with the world[77].

In reality, the verb 'share' is never used in the OST or in any UN instrument of binding nature on space matters[78]. Nothing in the system of space law suggests that Article I imposes an obligation to share the benefits of the exploration and use of outer space with the rest of the international community.

Using a grammatical interpretation[79], it can be said that the term "*for*" suggests the idea of an aim in the conduct of space activities; in particular, it is an aim directed towards creating benefits and advantages for all countries. Therefore, it is more correct to speak of a 'benefit-aiming obligation'.

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[76] The interpretation according to the ordinary meaning to be given to the terms of the treaty is recognised as part of the general rule of interpretation in Article 31 of the *Vienna Convention on the Law of Treaties* (VCLT), 1155 UNTS 331, 1980.

[77] See *ex multis* IISL Directorate of Studies, Background Paper, 2016, stating with regard to the application of Article 1(1) OST to space mining: "Some sharing of the benefits of space resource exploration and use is imperative". More recently, see R. Deplano, *Inclusive space law: the concept of benefit sharing in the Outer Space Treaty*, in International & Comparative Law Quarterly, Vol. 72, No. 3, 2023, p. 671.

[78] The only reference to the share of benefits is in Article 11 of the Moon Agreement, which however was ratified only by a handful of States none of which can be considered space powers. Moreover, lacking an express mention to the verb "sharing" in the OST any obligation in that sense is ungrounded. This is further demonstrated by the fact that in other fields of international law, there are conventions that mention expressly the concept of benefit sharing when they want to create that kind of obligation (e.g. the *Convention on Biological Diversity*, 1760 UNTS 69, 1992, Article 1).

[79] On the use of grammatical interpretation as an expression of Article 31, VCLT, see: U. Linderfalk, *On the interpretation of treaties: the modern international law as expressed in the 1969 Vienna Convention on the Law of Treaties*, Springer, 2007, p. 62.

Due to the lack of specifications on how such obligation should be translated in practical terms, some other scholars have dismissed *trenchant* the possibility that the concept of 'benefit-aiming' corresponds to a binding obligation upon States. According to their view, the norm is "*at best a joint expression of intention, conferring no legal rights and imposing no real obligations*"[80].

However, this interpretation would render the very first obligation of the OST void of normative value, disregarding inexplicably the use of the imperative "*shall*"[81]. But if it is not an "*expression of intention*", what kind of obligation is established by this norm?

Firstly, it is an inter-State obligation. It is owed by States Parties to all other States, including third States that have not ratified the OST. This is clearly based on the presumption of their assent, as established by the general rule on treaties according rights to third parties (later enshrined in Article 36 of the Vienna Convention on the Law of Treaties, or VCLT[82]). Therefore, as a State-to-State obligation, it must not be read as a duty to benefit some other subjects, such as peoples or communities within States. It is not a so-called intra-State obligation.

Secondly, it is an obligation of result[83] as it does not impose a precise conduct to be performed but rather – as said already – a purpose to achieve: the benefit and the interests of all countries.

The instruments to realise such purpose are left to the discretion of each State.

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[80] B. Cheng, above at 36, p. 405.

[81] P. De Man, *Exclusive Use in an Inclusive Environment*, Springer, 2016, p. 56.

[82] Article 36, VCLT.

[83] The class of obligations of result, as opposed to obligations of means or conduct, in international law was long debated in the ILC's work on the responsibility of States. See for example, UN Doc. A/CN.4/SER.A/1977/Add.l(Part 2) of 1977, titled 'Yearbook of the International Law Commission 1977 - Report of the Commission to the General Assembly on the work of its 29th session', p. 24. The express inclusion of the category of obligations of result was not included in the final output of the ILC in 2001, called *Articles on Responsibility of States for internationally wrongful acts* (ARSIWA), adopted as Annex 1 of UNGA Res. 56/83 of 12 December 2001, titled 'Responsibility of States for internationally wrongful acts'. However, the concept survived in the lines of article 12 as explained in: ILC, *Draft articles on Responsibility of States for Internationally Wrongful Acts, with commentaries* (ARSIWA Commentary), adopted as UN Doc. A/56/10 of 2001, titled 'Report of the International Law Commission on the work of its 53rd session', p. 56, commentary to article 12.
Among the scholarly work on the topic, see: P. Dupuy, *Reviewing the Difficulties of Codification: On Ago's Classification of Obligations of Means and Obligations of Result in Relation to State Responsibility*, in European Journal of International Law, Vol. 10, No. 2, 1999, p. 371. More recently: R. Wolfrum, *Obligation of Result Versus Obligation of Conduct: Some Thoughts About the Implementation of International Obligations*, in Looking to the Future: Essays on International Law in Honor of W. Michael Reisman (ed. by R. Sloane and others), Brill Nijhoff, 2011, p. 363.

It is clear how the fundamental question for national authorities becomes: in which circumstances can a space activity be considered short of achieving the result imposed by Article I(1), OST? In other terms, when is the exploration or use of outer space *not* for the benefit and in the interests of all countries?

To answer these questions it is necessary to see how the subsequent practice of States applied this provision.

As a preliminary consideration, it must be noted that a breach of Article I has never been claimed at the international level nor an official protest on its application has ever been advanced. Therefore, it is possible to assume that the space activities conducted so far have complied with the benefit-aiming obligation[84]. This includes also, for example, commercial space activities, which are moved by the purpose of profit-making.

The reason why they can be considered compliant with Article I is not that the scientific progress and technical achievements of any activity automatically enrich mankind as a whole[85]. Rather, it is the fact that the services provided by commercial space operators can bring benefits and advantages to all States inasmuch as they are willing to buy them. Nothing in Article I, in fact, specifies that the purpose of the benefit-aiming obligation must be achieved without any economic return. On the contrary, since the benefit must be of all, the norm must be interpreted as being beneficial for both sides, the one that provides the space service in exchange of a fee and all the other potential acquirers[86]. Therefore, the exchange of space services in return of money is perfectly in line with Article I(1), OST.

But if even activities that are moved by the logic of individual profit can be considered in conformity with the provision at hand, is there any activity that can fail to respect such obligation of result?

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[84] This is true also for space military activities, but only on the basis of the relationship between the conventional obligation under scrutiny here and the customary norm that allows non-aggressive military uses of outer space (as will be seen in Section 2.5.3). In sum, despite the strong individual interests pursued by military activities, which aim to ensure the protection of a State's sovereignty and to support its military operations on Earth, they have always been considered allowed. This is because the customary value of the norm that allows them supersedes the conventional benefit-aiming obligation.

[85] See M. Lachs, above at 1, p. 107.

[86] See S. Gorove, *The Geostationary Orbi: Issues of law and policy*, in The American Journal of International Law, Vol. 73, No. 3, 1979, p. 448: The "benefits and interests" of the country conducting the exploration and use of outer space must be taken into account; otherwise, the exploration and use would not benefit "all" countries.

In order to find a violation of the benefit-aiming obligation it appears that it is not correct to see at whether a space activity benefits only one or some States instead of all. It is rather a matter of whether the purpose of a space activity is the opposite of being "*for the benefit and in the interests of all countries*". This means a space activity that aims to hinder or disadvantage all countries[87].

So far, the only example of a State's conduct that may have fallen within this situation is the authorization issued in 2023 by the USA to its private company Astrobotic for the launching of a lunar lander carrying – *inter alia* – human remains to be deposited on the Moon[88].

This activity not only lacked any scientific value and any capacity of providing space services, but it also raised issues.

It was openly criticised by various indigenous people, among which the Navajo Nation was most vocal, asking through its President to halt the mission as it would have desecrated the Moon[89].

Moreover, the presence of human remains on the lunar surface could create uncertainties with regard to the legal qualification of the area used for that purpose[90]. Lacking any meteorological events, the capsules containing the ashes would remain in the place where they are deposited creating a sort of exclusive use of the corresponding area.

Notably, Astrobotic's lunar lander suffered a mechanical malfunction and never landed on the Moon, avoiding the concretisation of any troubles[91].

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[87] The use of the expression "*all countries*" may raise doubts over the qualification of a space activity that hinders one or more States as a violation of the benefit-aiming obligation. However, just as a space activity that benefits only one or some States, leaving others unaffected, is still in line with the norm, also a space activity that hinders only one or some States, while the rights of others are untouched, is not a violation of it. In other terms, the expression "*all countries*" seems to imply that all States at least potentially may be hindered by a space activity, with no benefits to be gained.

[88] This was part of a contract between Astrobotic and Elysium Space, which according to its website offers the service of arranging the launch of "a symbolic portion of remains to the surface of the Moon, helping to create the quintessential commemoration", as indicated at the following link: https://elysiumspace.com/#services. A similar contract was signed also with Celestis, which reserved a spot as payload for materials from about seventy people and one dog. See M. Bartels, *Human Remains Are Headed to the Moon despite Objections, in Scientific American*, 2024, available at the following link: www.scientificamerican.com/article/human-remains-are-headed-to-the-moon-despite-objections/

[89] See A. Harvey, *Stop sending human remains to the Moon*, in Nature, No. 625, 2024, p. 425.

[90] Traditionally, in all human societies and legal systems the plots of land dedicated to private burials or public cemeteries have a strong legal protection, especially in terms of third-parties activities that may interfere with the dedicated area.

[91] M. Ravisetti, *We finally know why Astrobotic's private Peregrine moon lander failed*, 2024, available at the following link: www.space.com/peregrine-lunar-lander-failure-why.

Nonetheless, the license issued by the USA after the payload review is questionable as an activity of that kind would fall short to achieve the result imposed by the benefit-aiming obligation and could result in the responsibility of the State that authorised it.

2.4.2. Cooperation, understanding and assistance

Next to the purpose of bringing advantages to all countries, space activities were imagined since the 1960s as an opportunity for enhancing cooperation between States.

It was believed – as the Preamble of the OST remarks – that cooperation will contribute to the development of mutual understanding and to the strengthening of friendly relations between States and peoples[92].

As a result, the OST contains several references to cooperation.

They are not phrased as direct obligations to cooperate, but as exhortations for States to apply a cooperative spirit in the carrying out of their space activities.

In particular, States Parties are called to promote and encourage international cooperation[93], and to be guided in their exploration and use of outer space by the principle of cooperation[94]. As the verbs "to promote", "to encourage" and "to be guided" suggest, there is no actual duty to cooperate in the system of space law[95].

What is expected then of States Parties to the OST?

Some guidance comes from the two other concepts that are associated with cooperation in the text of the Treaty: "*understanding*" and "*assistance*".

Article III speaks of "*promoting international cooperation and understanding*", while Article IX refers to "*the principle of cooperation and mutual assistance*".

What do they mean?

[92] OST, Preamble.
[93] OST, Article I and III.
[94] OST, Article IX.
[95] Some authors have maintained the opposite, although without providing a convincing legal basis for their conclusion. See for all R. Wolfrum, *International Law of Cooperation*, in Max Planck Encyclopedia of Public International Law, 2010, para. 26: "*[The OST] obliges States which are active in outer space not only to co-operate with each other for the exchange of information but also to develop the knowledge and research capabilities of all States*".

The expression "*promoting understanding*" can be linked to the idea of communicating or sharing information and therefore building transparency between States.

"*Mutual assistance*", on the other hand, suggests the concrete action of providing support to another State, on a mutual basis.

It follows that communication and support are ancillary aspects of the concept of cooperation, but they do not define the core meaning of cooperation itself.

When in 1996 the UN General Assembly adopted the "*Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of all States, Taking into Particular Account the Needs of Developing Countries*" (1996 Declaration) [96], it provided further details on the meaning of verb "to cooperate" with regard to space activities.

After having clarified that States are free to determine all aspects of their cooperation [97], it specified that "*international cooperation should aim at the following goals: (a) Promoting the development of space science and technology and of its applications; (b) Fostering the development of relevant and appropriate space capabilities in interested States; (c) Facilitating the exchange of expertise and technology among States on a mutually acceptable basis*"[98].

In view of those aims and considering the verbs used in relation to cooperation (promoting, encouraging, fostering, facilitating), it can be concluded that cooperation in the system of space law amounts to an expectation of openness.

Openness to engage with other States, to involve other countries in space programs, to create exchanges of expertise, personnel, technologies and data.

This is confirmed also by Article X of the OST, which establishes that States Parties "*in order to promote international cooperation … shall consider ... any requests by other States Parties ... to observe the flight of a space object*".

A more recent confirmation can be found in the UN Space2030 Agenda where international space cooperation is linked to "*promoting the increased involvement*

[96] UNGA Res. 51/122 of 13 December 1996, titled 'Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of All States, Taking into Particular Account the Needs of Developing Countries'.
[97] *Ibid.*, Principle 2.
[98] *Ibid.*, Principle 5.

of all countries in space activities, including through capacity-building initiatives"[99].

Moreover, this interpretation of space cooperation reflects the ordinary meaning of the verb "*to cooperate*", which is connected to the idea of acting jointly or operating together for the achievement of a goal of mutual interest[100].

Thus, the three concepts of cooperation, understanding and assistance taken together can be seen as a general standard of behaviour which should inform all space activities. This standard can be summarised as follows.

In the use and exploration of outer space, States are expected to dialogue at the international level, for example sharing and exchanging information on their space objects through the apposite UN mechanisms; they are expected to assist other States, for example providing technical support in case of the accidental re-entry of a foreign space object or offering satellite aid for disasters management; they are expected to maintain a reasonable level of openness to other States in view of international collaborations and involvement, for example discussing joint initiatives for the realisation of space operations.

All these behaviours fulfil the purpose of space law, intended as a framework of norms that aim at facilitating development and progress among the whole international community.

The conclusions reached so far concern the relations between States. But for the purpose of the present research, which is focused on how private space activities affect the application of space law, the question is: what is the relevance of cooperation, understanding and assistance when space activities are conducted by non-governmental entities?

As can be imagined, the standard of behaviour described above does not change when States authorise and supervise their private actors. There are expectations of dialogue, transparency, support and coordination also when national activities are put in place by non-governmental entities. It is for States to impose on their nationals the behaviour necessary to fulfil the aims of cooperation, *lato sensu* including also understanding and assistance.

[99] UNGA Res. 76/3 of 25 October 2021, titled 'The "Space2030" Agenda: space as a driver of sustainable development', p. 3.

[100] For a comprehensive analysis of the meaning of cooperation in international law see: C. Leb, *Implementation of the general duty to cooperate*, Research Handbook on International Water Law, Elgar, 2019, p. 95.

In addition, the principle of cooperation applies to private space activities also under a different and preliminary perspective, focused on how States authorise and supervise their non-governmental entities.

In particular, under this lens, 'to cooperate' must be understood as facilitating undeveloped States in their effective implementation of the international obligations related to authorisations and supervisions.

Notably, in the UN Space2030 Agenda, the fourth pillar (*rectius*: overarching objective) refers to cooperation precisely under these terms. It stipulates that States "*commit to promote cooperation as the exchange of information and best practices on the supervision of space activities of non-governmental entities, consistent with international law, with a view to enhancing the safety and long-term sustainability of outer space activities while facilitating the development of the space industry*"[101].

Finally, there is one last dimension of cooperation that comes to relevance with regard to private actors.

As stated above, international space cooperation in its core meaning is measured in terms of openness. When it comes to private actors, a State may be more or less cooperative depending on how open its space sector is to foreign investments.

In fact, a very concrete way of cooperating is through international investments in foreign undertakings. Thanks to them, virtuous collaborations and beneficial transfers of technologies are made possible. They increase economic growth and create bridges that connect the State of the investor to the so-called host State, which is the State of the target company.

All this allows the integration of different space markets and the interweaving of human, social and economic elements from multiple spacefaring nations.

Recently, the world of international space investments has been affected by a new trend: the adoption of screening regimes[102].

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[101] UNGA Res. 76/3 of 25 October 2021, section 4.7. In more general terms see also the *UN Guidelines for the Long-term Sustainability of Outer Space Activities of the Committee on the Peaceful Uses of Outer Space* (LTS Guidelines), UN Doc. A/74/20 of 2019, titled 'Report of the Committee on the Peaceful Uses of Outer Space 62nd session', p. 32, recommending States to promote new forms international cooperation and capacity-building to assist countries in achieving efficient regulatory frameworks and governance methods that support the long-term sustainability of outer space activities and sustainable development on Earth.

[102] A. Capurso and others, *Screening of Foreign Investments in the Space Sector: The Italian (Virtuous) Example*, in Proceedings of the International Institute of Space Law 2023, Eleven International Publishing, 2025, p. 29.

The latter consist in scrutiny and approval processes that need to be completed before certain investment-related actions by foreign individuals or entities will be allowed[103]. They are always based on the elusive concept of 'national security', which allows screening authorities to adopt the widest margin of discretion in deciding which space-related investments can be allowed and under which conditions.

It is evident how screening regimes – especially if constructed with a protectionist-oriented approach – can represent significant barriers to international cooperation between private actors.

For this reason, States should balance their screening regimes with regulatory guarantees, such as the definition of clear and limited grounds for screening foreign investments as well as the possibility to access a judicial form of review in front of adverse screening decisions[104].

Only this way, national space sectors will remain attractive to foreign investors and the latter will be allowed to continue fostering development as well as joint international endeavours in outer space.

It is therefore also in the field of investments that the principle of cooperation can find its translation in practical terms, safeguarding openness and promoting exchanges between foreign space markets.

2.4.3. The duty of due regard

Outer space is an international domain beyond the sovereignty of any State where actors from different jurisdictions share its use and must coordinate their activities to avoid collisions and other interferences. This is particularly important today, in an extra-terrestrial environment that appears packed with objects like never before[105]. The founders of space law understood that it was not sufficient to hope

[103] T. Voon, *How International Investment Law Constrains Foreign Investment Screening*, in Journal of World Investment & Trade, Vol. 24, 2023, p. 76.

[104] A. Capurso, *Investing in Space: The Consequences of Regulation (EU) 2019/452 for Foreign Investors*, in EU Law Live – Weekend Edition, No. 165, 2023, p. 20.

[105] See the discourse on the commercialisation, privatisation and democratisation of outer space above in Section 1.1. An idea of the importance of coordination for extra-terrestrial activities today can be grasped also by looking at the current international discussions on the matter of space traffic management. See for example at the EU level the *Joint communication to the European Parliament and the Council: an EU Approach for Space Traffic Management, an EU contribution addressing a*

in the goodwill of space actors to be mindful of the activities of others while performing their own. Thus, they included in Paragraph 6 of the 1963 Declaration and then in Article IX of the OST a duty of due regard:

> "*States … shall conduct all their activities in outer space, including the Moon and other celestial bodies, with due regard to the corresponding interests of all other States Parties to the Treaty*"[106].

The wording used leaves no doubt that the provision imposes a concrete obligation on the States Parties, applicable to all extra-terrestrial activities including private ones. The question is: what does it mean to give "*due regard*" to the "*corresponding interests*" of all other States?

It is not easy to provide an answer based on the general rule of treaty interpretation[107]. In fact, the ordinary meaning of the sentence mentioned above remains ambiguous even if examined in the context of the OST and in light of its object and purpose[108]. Furthermore, there are no agreements or instruments of space law, nor any subsequent State practice which establishes the agreement of the parties on the matter, that can help clarifying the meaning of Article IX[109].

Turning to the supplementary means of interpretation envisaged in Article 32 of the VCLT, some indications come from the preparatory works of Article IX and of its predecessor Principle 6 of the 1963 Declaration: the UK suggested the

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global challenge, of 15 February 2022. See also: T. Masson-Zwaan, *Towards an International Regime for Space Traffic Management*, in Air and Space Law, Vol. 48, 2023, p. 75.

[106] The text is almost identical in the Declaration and in the Treaty, however it is interesting that the drafters of the OST added one specification: due regard must be given to "*all other States*", while in the Declaration a different expression was used "*other States*". The latter appears to be more limited because the word "*other*" is interpretable as referring only to a certain group of States, such as those potentially affected by a space activity. The difference with the expression used in Article IX of the OST implies that the treaty obligation was meant to have a wider scope of application: in conducting space activities, States must take into consideration the overall picture of corresponding interests, looking at the ones of all States and – in an expansive interpretation – looking also at common interests. In practical terms, this is translated in a higher standard of compliance compared to the formulation used in the 1963 Declaration.

[107] See Article 31, VCLT.

[108] See the analysis made on this regard in: E. Carpanelli, *Unweaving the Tangled Web: The Due Regard Obligation Under Article IX of the Outer Space Treaty*, in Air & Space Law, Vol. 49, No. 1, 2024, p. 35. See also: J. Jarose, *Giving due regard to the obligation of 'due regard' under Article IX of the Outer Space Treaty*, in Melbourne Journal of International Law, Vol. 24, No. 2, 2023, p. 235. See also: A. Harrington, *Due Regard as the Prime Directive for Responsible Behavior in Space*, in Loyola University Chicago International Law Review, Vol. 20, No. 1, 2023, p. 68.

[109] For example the Moon Agreement mentions "*due regard*" in its Articles 2, 4 and 15, but it does not add any insights on its meaning or application. The only additional element in Article 4 is that in the context of Moon activities the object of "*due regard*" are the interests of present and future generations. As for the practice of States parties to the OST, there is no evidence of an express or even tacit accord on the meaning of "*due regard*".

insertion of the duty of due regard in 1962 in the context of a debate between the Soviet Union and the Western block over the principle of cooperation and the duties to discuss and consult when harmful interferences may be caused by space activities[110]. This debate resulted in the recognition of a guiding principle of cooperation, of a duty of due regard, and of a duty of consultation in case of harmful interferences[111]. From this, it follows that "*due regard*" is connected to the concepts of cooperation and consultation, but it does not completely overlap with them. To the contrary, it maintains its own autonomous role and function, as it will be further examined shortly.

Moreover, when in 1966 the first draft of the OST was presented, it was explained that under the proposed treaty "*not only must States not abuse their rights, but they must respect those of others*"[112]. The due regard obligation appears to be an expression of this idea. It is based on a relation between one State and the others and its compliance depends on whether this relation has received enough consideration[113].

The two aspects of autonomy and relativeness[114], however, are not sufficient to determine the content of the obligation of due regard. Based on these two elements, it is not possible for States to know which conduct amounts to its breach. However, a hint on how to interpret it and apply it can be found in the few instances of State practice expressly addressing the meaning of due regard.

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[110] For the UK proposal, see UN Doc. A/C.1/879 of 4 December 1962, titled 'Letter dated 4 December 1962 from the Permanent Representative of the UK to the UN addressed to the Chairman of the First Committee'. See also the positions of delegates on the matter in the summary records of COPUOS, such as UN Doc A/AC.105/C.2/SR.22 of 26 April 1963, p. 11, and UN Doc. A/AC.105/C.2/SR.24 of 1 May 1963, p. 11. For an account of the debate and an analysis of its value for understanding the due regard obligation, see J. Jarose, above at 108, p. 251.

[111] See the text of Article IX, OST.

[112] These were the words of the chairman of COPUOS Legal Subcommittee as reported in UN Doc. A/C.1/SR.1491 of 16 December 1966, p. 418.

[113] Such a conclusion is confirmed also by the Chairperson's summary of the '*UN Open-ended working group on reducing space threats through norms, rules and principles of responsible behaviours*' in UN Doc. A/AC.294/2023/WP.22 of 1 September 2023, at para. 18, stating that during the works of the group many States noted that the duty of due regard represents a balancing of rights and interests which "*could involve two dimensions: first, between spacefaring and affected nations; and, second, between a spacefaring nation and the wider international community, as a whole*".

[114] Some authors correctly point out that the due regard obligation in international law is always also reciprocal, meaning that in front of two equally legitimate activities its compliance should be evaluated both ways. T. Treves, *'Due Regard' Obligations Under the 1982 UN Convention on the Law of the Sea: The Laying of Cables and Activities in the Area*, in International Journal of Marine and Coastal Law, Vol. 34, No. 2, 2019, p. 170. J. Goehring, *Can We Address Orbital Debris with the International Law We Already Have? An Examination of Treaty Interpretation and the Due Regard Principle*, in Journal of Air Law and Commerce, Vol. 85, No. 2, 2020, p. 316.

For example, in 2022, within the '*UN Open-ended working group on reducing space threats through norms, rules and principles of responsible behaviors*'[115], the Philippines presented its position on the matter, indicating that the obligation of due regard does not permit States to merely note other States' rights and still do as they wish: it is a relative obligation whose application depends on the interests involved, but that it necessarily involve some form of consultations, demonstrating an understanding of other parties' concerns in connection with any proposed activities[116]. The same position was then taken by Germany[117] and endorsed by thirty-three other States in 2023[118].

Another more recent example is the statement delivered in 2024 by Canada during the sixty-third session of COPUOS Legal Subcommittee: "*In the context of space resource activities, [the duty of due regard] would involve notifying other States of activities that could have an impact on their activities, personnel or equipment. With that notice, States Parties can consult for the purpose of developing protocols or safety zones that prevent harmful interference with each other's activities*"[119].

Using a less elaborated formulation, that same year the USA addressed the matter at hand in the following terms: "*As we have explained in multilateral fora, the U.S. Government believes that due regard means that 'acting in a safe and*

[115] The Open-Ended Working Group (OEWG), convened under UNGA Res. 76/231 of 24 December 2021, held an organizational session on 7–9 February 2022. The four substantive sessions, which took place in May 2022, September 2022, January 2023, and August 2023, respectively addressed each of the items outlined in the mandate in turn. The OEWG was mandated to operate on the basis of consensus, which it did not manage to reach, and thus was unable to submit a report to the General Assembly after its conclusion. A. Ortega and others, *OEWG on Reducing Space Threats: Recap Report*, UNIDIR, 2024, p. 9.

[116] UN Doc. A/AC.294/2022/WP.12 of 11 May 2022, titled 'The duty of "due regard" as a foundational principle of responsible behavior in space Submitted by the Republic of the Philippines'. The Philippines took an even more elaborated stance within the UNODA '*Group of Governmental Experts on Further Practical Measures for the Prevention of an Arms Race in Outer Space*'. See UN Doc. GE-PAROS/2023/WP.6 of 4 December 2023, titled 'The principle of Due Regard as an element of a legally binding instrument to reduce arms race in space'. See also UN Doc. GE-PAROS/2023/WP.16 of 6 December 2023, titled 'Response to comments on the working paper on the principle of Due Regard'.

[117] UN Doc. A/AC.294/2023/WP.1 of 12 January 2023, titled 'Recommendations on possible norms, rules and principles of responsible behaviors relating to threats by States to space systems Submitted by the Federal Republic of Germany and the Republic of the Philippines'.

[118] As reported by a press release of the Philippine Mission to the UN and other International Organization in Geneva of 4 September 2023, titled 'Spacefaring states should have due regard to others, Philippines tells United Nations', available at the link: https://genevapm.dfa.gov.ph/philippine-mission-s-press-releases/1056-spacefaring-states-should-have-due-regard-to-others-philippines-tells-united-nations.

[119] Canadian statement at the sixty-third session of COPUOS Legal Subcommittee, April 15-26 2024, in '*Agenda Item 9 – General Exchange of Views on potential legal models for activities in the exploration, exploitation & utilization of space resources*'.

professional manner in outer space entails taking into account the corresponding interests of other operators', much like operations in the air and at sea"[120].

This last statement may appear as lacking any additional value as it repeats the wording used in Article IX of the OST. However, the last reference to operations in the air and at sea is particularly interesting.

Also the statements of the other States reported above were built upon a comparison between space law and other fields on international law[121].

In fact, the duty of due regard is used in many other international legal systems[122], but the most interesting elaborations come from the field of maritime law[123].

The UNCLOS contains several provisions imposing due regard in the relationship between maritime States[124] and – unlike in space law – their application has been the object of several disputes that clarified the contours of due regard in better terms[125].

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[120] See the remarks by the US Department of Defense General Counsel on '*Space Law: Promoting the Rules-Based Order through Multi-Domain Lawyering*' at US Space Command Legal Conference on 5 March 2024, available at the link: www.defense.gov/News/Speeches/Speech/Article/3696874/remarks-by-dod-general-counsel-on-space-law-promoting-the-rules-based-order-thr/.

[121] Other than the references already mentioned in the relative footnotes, see also the statement of Brazil at the third session of the OEWG, 30 January – 3 February 2024, Topic 1: "*Brazil also believes that the OEWG could benefit from analogies with other branches of international law dedicated to the regulation of common goods, such as the Law of the Sea and International Environmental Law, especially with regards to the concepts of due diligence and due regard*".

[122] See for example, the Chicago Convention, Article 3, lett. c). See also the *General Agreement on Tariffs and Trade*, 64 UNTS 187, 1994, Article 12, para. 4, lett. e). In the context of international trade, see also the case: *United States – Standards for Reformulated and Conventional Gasoline*, WTO Appellate Body Report, WTO Doc. WT/DS2/AB/R, 29 April 1996, p. 22, stating that the exceptions under Article XX must be applied reasonably, with due regard both to the legal duties of the party claiming the exception and the legal rights of the other parties concerned. In the field of international humanitarian law the *San Remo Manual on International Law Applicable to Armed Conflicts at Sea* of 12 June 1994 mentions the due regard obligation at para. 35 and 44.

[123] See the attempt to interpret the obligation of "*due regard*" in Article IX of the OST using the rules of interpretation contained in the VCLT in: J. Jarose, above at 108, p. 247. The author concludes that little clarifications can be found on the basis of the VCLT and, as a consequence, resorts to a comparison with the use of due regard in the UNCLOS.

[124] Starting with the area of the sea most similar to outer space, see Article 87, stating that the freedoms of the high seas listed therein "*shall be exercised by all States with due regard for the interests of other States in their exercise of the freedom of the high seas, and also with due regard for the rights under this Convention with respect to activities in the Area*". This provision is based on Article 2 of the Geneva Convention on the High Seas, which qualifies the "*regard*" as "*reasonable*" instead of "*due*". On the comparison between the two formulations and arguing in favour of the lack of substantial change, see B. Oxman, *The Principle of Due Regard*, in The Contribution of the International Tribunal for the Law of the Sea to the Rule of Law: 1996-2016, Brill Nijhoff, 2017, p. 109. The expression "*reasonable regard*" has been maintained in Article 147 of UNCLOS concerning activities in the Area. Another important instance in which the Convention refers to the notion of 'due regard' is in Articles 56, para. 2 and 58, para. 3, concerning the coexistence in the exclusive economic zone of rights of the coastal State and of freedoms of the other States. Other references to "*due regard*" can be found in Articles 60, 66 and 79.

[125] A first notable example is the case: ICJ, *Fisheries Jurisdiction (United Kingdom v. Iceland)*, Judgement of 25 July 1974, para. 72, where the ICJ specified that the concept of due regard is opposed

Among such disputes, the *Chagos Protected Area Arbitration* between Mauritius and the UK is particularly interesting[126]. In front of Mauritius' claim that the UK's declaration of a marine protected area around the Chagos Arcipelago was not compatible with the latter's obligations under the UNCLOS, the arbitral award issued in 2015 declared, on the basis of a unanimous decision, that the UK failed to give due regard to the rights of Mauritius in the same part of the sea.

More specifically, the tribunal's findings were the following: "*the ordinary meaning of "due regard" calls for the United Kingdom to have such regard for the rights of Mauritius as is called for by the circumstances and by the nature of those rights. The Tribunal declines to find in this formulation any universal rule of conduct. The Convention does not impose a uniform obligation to avoid any impairment of Mauritius' rights; nor does it uniformly permit the United Kingdom to proceed as it wishes, merely noting such rights. Rather, the extent of the regard required by the Convention will depend upon the nature of the rights held by Mauritius, their importance, the extent of the anticipated impairment, the nature and importance of the activities contemplated by the United Kingdom, and the availability of alternative approaches. In the majority of cases, this assessment will necessarily involve at least some consultation with the rights-holding State*"[127].

To give more substance to the requirement of consultations, the tribunal assessed the UK's approach to consultation with the USA on their reciprocal rights in the

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to a *laissez-faire* approach; in 2022, the Court addressed again the application of due regard between the parties in: ICJ, *Alleged Violations of Sovereign Rights and Maritime Spaces in the Caribbean Sea (Nicaragua v. Colombia)*, Judgement of 21 April 2022, para. 162. The ITLOS has examined the compliance of maritime States with the obligation of due regard in several instances, such as ITLOS, *Delimitation of the Maritime Boundary between Bangladesh and Myanmar in the Bay of Bengal (Bangladesh v. Myanmar)*, Judgement of 14 March 2012, at para. 475; but also in its Advisory Opinion of 2 April 2015 on the *Request submitted by the Sub-Regional Fisheries Commission*, p. 68; as well as in ITLOS, *The M/V "Norstar" Case (Panama v. Italy)*, Judgement of 10 April 2019, para. 231. Finally, a relevant contribution to the role of "*due regard*" was given also by the Permanent Court of Arbitration in *Arctic Sunrise Arbitration (Netherlands v. Russia)*, PCA Case No. 2014-02, Award of 14 August 2015, para. 328, where the obligation of "*due regard*" has been equated to the "*avoidance of unjustifiable interference*"; and in *South China Sea Arbitration (Philippines v. China)*, PCA Case No. 2013-19, Award of 12 July 2016, para. 744, where it linked "*due regard*" to a State's obligation to diligently prevent its nationals from committing unlawful activities to the detriment of another State's rights, as well as para. 757, where it recognised a breach of such "*due regard*" obligation. See their analysis in: T. Treves, *Advancing the practical implementation of the 'due regard' / 'reasonable regard' obligations: The applicable legal framework and practical options for its implementation*, in International Seabed Authority Technical Study Series, No. 24, 2019, p. 12.

[126] Permanent Court of Arbitration, *Chagos Marine Protected Area Arbitration (Mauritius v. United Kingdom)*, PCA Case No. 2011-03, Award of 18 March 2015.

[127] *Ibid.* para. 519.

same marine protected area finding that "*the record shows that the United States was consulted in a timely manner and provided with information, and that the United Kingdom was internally concerned with balancing the MPA with U.S. rights and interests*"[128]. Given the lack of information actually provided to Mauritius and the absence of a reasoned exchange between the Parties of the dispute, the tribunal concluded that the UK failed to properly balance its own rights and interests with Mauritius' rights[129].

From the *Chagos* award, it is possible to confirm the autonomous and relative nature of the obligation of "*due regard*". In addition, the tribunal has clarified that the 'relativeness' should be measured upon specific criteria, such as the nature of the rights held by the impaired State, their importance, the extent of the anticipated impairment, the nature and importance of the activities contemplated by the impairing State, and the availability of alternative approaches.

If a State can prove that it has taken into consideration those criteria prior to its activity, demonstrating for example that it engaged in timely and informative consultations with the potentially affected party, it can pass the test of "*due regard*". In sum, where the latter applies, States must engage in a context-dependent balancing exercise, putting in place some concrete actions informed by reasonableness, proportionality and openness[130].

All this concerns the procedural application of "*due regard*" in the relationship between two States *vis-à-vis* coexisting activities[131].

It follows that the reasoning and the findings described above are not based on the specificities of the norms concerning the marine protected area in the Chagos Arcipelago or on the exact content of the maritime rights impaired. To the contrary, their formulation by the arbitral tribunal was based on a general analysis of the meaning of "*due regard*". Therefore, in view of this generality, they can represent a useful means for translating in practical terms the obligation of "*due regard*" established by Article IX of the OST.

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[128] *Ibid.* para. 528.

[129] *Ibid.*, para. 535.

[130] See A. Harrington, above at 108, p. 83, arriving at a similar conclusion: "*Though 'due regard' is a broad term, one cannot consider it to lack substantive meaning or binding force. Rather, it requires the implementation of a balancing test rooted in a reasonableness standard, reliant on the good faith of States Parties*".

[131] On the procedural nature of "*due regard*" see: M. Forteau, *The Legal Nature and Content of 'Due Regard' Obligations in Recent International Case Law*, in The International Journal of Marine and Coastal Law, Vol. 34, No. 1, 2019, p. 32.

The activities of States beyond the atmosphere can be evaluated using the test of the *Chagos* award as guidance[132].

Its application should be adjusted to the particular features of space environment and technologies: for example, the number of potentially affected users along an orbital plane can be hard to determine; at the same time, the ultra-hazardous nature of space operations can affect the expectations of impairment connected to a contemplated activity.

This does not mean that it is impossible to give due regard to other users in the course of space activities, but only that the test is more onerous and more broad in outer space compared to activities such as fishing in a contested maritime zone[133].

Having clarified the meaning of the obligation of "*due regard*", the question is: how does a State comply with such obligation in front of private space activities? The answer is connected to the information-sharing mechanism between non-governmental entities and public authorities established in the domestic authorisation system.

In fact, the obligation of "*due regard*" established in Article IX of the OST is placed upon States. However, through the authorisation and supervision mechanism required by Article VI, States must assure that non-governmental entities comply with the obligations assumed by the former at the international level, including the one of "*due regard*".

The problem is that it is not sufficient for a State to simply impose on a private actor to perform its space activity taking in due regard the corresponding interests of other space users. That is because the test of "*due regard*" is based on an evaluation that concerns the corresponding interests of other States[134]. Those interests have a public nature and, therefore, only a public authority is in the right position to engage in the context-dependent balancing exercise mentioned above.

[132] Among the doctrinal works that support this conclusion, see: M. Hanlon, *The Outer Space Treaty (Annotated)*, in Space needs lawyers!, published by the Center for Air and Space Law of the University of Mississippi, 2025, p. 39.

[133] Along the same line, see the conclusions reached by: J. Jarose, above at 108, p. 256. See also H. Zha and others, *The "due regard" obligation in the deployment and operation of satellite mega-constellations*, in Space Policy, 2025, (in press), p. 3.

[134] This includes each State's interest to see its legitimately authorised private activity be performed without impairment.

It follows that the authorising State cannot leave its non-governmental entities perform such evaluation by themselves.

To ensure that authorised private activities are in conformity with the obligation of "*due regard*" established by Article IX, States should participate in the evaluation with private actors. To that end, they should impose an effective information-sharing mechanism that can allow them to have knowledge of the activities contemplated by its private actors and perform in dialogue with the holder of the authorisation the test of "*due regard*" discussed above.

2.4.4. Final remarks

From the analysis conducted in the preceding paragraphs, it can be said that the system of space law is not just a set of technical rules on how certain activities must or must not be performed. It does not only establish obligations specific to certain matters, such as assistance to astronauts, registration of space objects or mitigation of space debris.

Space law is also made of three overarching norms that permeate every other provision of this legal field: the benefit-aiming obligation, the principle of cooperation, and the duty of due regard.

They embody the spirit that is meant to guide all space activities. Every norm of space law insists upon them. And every activity in outer space must not defy them. In pragmatic terms, their function becomes evident when it is necessary to evaluate if a State has committed a wrongful act, defined as a conduct attributable to a State under international law and incompatible with the applicable international obligations of that State[135]: even if an activity beyond the atmosphere does not constitute a violation of any specific international obligation, it may nonetheless amount to a violation of the obligation of benefit-aiming or of the standard of behaviour set by the principle of cooperation. These three norms

[135] This definition is embodied in Article 2 of the ARSIWA. The ICJ has used an analogous definition in its judgement: ICJ, *United States Diplomatic and Consular Staff in Tehran* (Tehran case), Judgment of 24 May 1980, para. 56. Today, the ARSIWA definition is used widely and it is recognised as a norm of customary nature. See B. Stern, *The Elements of An Internationally Wrongful Act*, in The Law of International Responsibility (ed. by J. Crawford), Oxford University Press, 2010, p. 202. More recently, see J. Rudall, *Responsibility for Environmental Damage*, Edward Elgar, 2024, p. 52.

represent the parameters of legality for any conduct in outer space, irrespective of whether other more specific international obligations may have been breached (e.g. the duty to assist astronauts in distress[136]). They assume particular value also with regard to the activities of non-governmental entities as they must be translated in concrete conducts by States when they exercise their role of authorising and supervising authority.

In that sense, they can be considered as manifestations of the spirit of space law, as they stand (*figuratively*) over any activity beyond the atmosphere. No human act or omission in outer space, public or private, is exempt from passing through the test of their compliance.

2.5. THE LEGAL STATUS OF OUTER SPACE

Every field of law that regulates a specific environment must first answer the following questions: to which legal category does that environment belong? Is it a *res nullius*, a 'free land' belonging to no one? Or is it a *res publica*, an environment under the control of a public authority? Or perhaps a *res communis omnium*, an environment common to all?

The same questions needed an answer also when space law took form.

The choice made by the drafters of the OST was to define the legal status of outer space in its first four articles, not in an explicit manner stating for example that outer space is a global common, but delineating it through the rights and obligations contained therein.

Starting with Article I, it establishes the core rights that States enjoy in the exploration and use of outer space, including the Moon and other celestial bodies. In particular, each State has:

i. a general freedom to explore and use the space domain;

ii. a specific freedom of access to all areas of celestial bodies;

iii. a particular freedom of conducting scientific investigations in space.

These 'freedoms of outer space' are meant to ensure the broadest possible involvement of every State in space activities and avoid any situation of

[136] Article V, OST.

exclusivity. That is the reason why the language of the provision refers to "*all States*" and not only to States Parties[137].

Looking at the content of the three freedoms, the verb "*explore and use*" are so general that they can be considered as including also access and scientific investigation. In fact, the right of access to the space domain at large as well as to all areas of celestial bodies is logically implied in the right of exploration and use, which would not be possible without it. Similarly, scientific investigation is just one particular type of "use" that would still be guaranteed by the first freedom even if the third one was absent.

Therefore, the function of expressing separately the second and third freedoms is to underline how those two specific rights – access to all areas of celestial bodies and scientific investigation – were considered particularly relevant by the drafters of the OST. Consequently, their *effet utile* can be identified in the necessity to give them pre-eminence in case of conflicts with other uses[138].

For as broad as they are, the three rights of Article I are not unlimited.

The three following articles of the OST set forth the three core prohibitions in space activities:

i. the prohibition to appropriate outer space;
ii. the prohibition to violate international law in outer space;
iii. the prohibition to 'weaponise' outer space and 'militarise' celestial bodies.

2.5.1. The Prohibition to Appropriate Outer Space

The first prohibition is established in Article II of the OST:

> "*Outer space, including the Moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means*"[139].

The *rationale* behind this provision is threesome: firstly, at the time when the OST was drafted, two space powers – namely the USA and the USSR – were competing

[137] S. Gorove, *Freedom of Exploration and Use in the Outer Space Treaty: A Textual Analysis and Interpretation*, Denver Journal of International Law & Policy, Vol. 1, No. 93, 1971, p. 94.
[138] On this regard, ICJ Judge Manfred Lachs opined that the separation of scientific investigation from the other freedoms in Article I "*indicates an intention to extend to it a special legal protection*". See M. Lachs, above at 1, p. 44.
[139] OST, Article II.

in the 'Moon Race'. Considering that in the 1960s it was not yet clear who would have arrived first on lunar ground, it was deemed wiser to avoid any possibility of seeing the Moon become the extra-terrestrial property of the winner.

Secondly, all the other States that participated in the negotiations of the OST wanted to keep outer space fully accessible for when their technological capabilities would have allowed them to partake in space activities and lunar exploration[140]. Any form of national appropriation of outer space was considered incompatible with that prospect.

Finally, one more argument was considered: as the history of human civilisations had showed, the geographical extension of sovereignty was the reason of most wars on Earth. Hence, a ban on appropriation beyond Earth's atmosphere was believed to be an effective deterrent against the spectre of wars of conquest in outer space.

The result of all these considerations was the so-called non-appropriation principle of Article II.

As a consequence of its inclusion in the OST, no State can claim a sovereign right over the geostationary orbit[141] above its territory[142]. Nor it can appropriate *de facto* an area of the Moon by occupying it permanently with its lunar missions. In other words, outer space has been qualified as a non-appropriable domain beyond the territorial jurisdiction of States[143].

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[140] See the extensive recollection of developing States statements during that period in: R. Jakhu, *Developing Countries and the Fundamental Principles of International Space Law*, in New Directions in International Law (ed. by R. Girardot), Campus Verlag, 1982, p. 357.

[141] A geostationary orbit is an orbit that is located at approximately 36.000 km above sea-level and that is characterised by the fact that a satellite placed at that altitude has an orbital velocity which is equal to the velocity of Earth's rotation. It follows that from an observer on Earth a geostationary satellite will appear as a fixed point, not passing by its viewable portion of the sky. This is a particularly useful condition for transmitting continuously a satellite signal over the same area of the Earth.

[142] There was an attempt in this sense made by a small group of equatorial States. In the October of 1975 during the UN General Assembly, Colombia proclaimed its sovereignty on the geostationary orbit above its territory. In other words, it maintained that its sovereignty extended vertically up to 36.000 km, meaning that outer space would commence at 36.000 km +1.

Six other States supported Colombia's proclamation and decided to sign in 1976 the so-called "Bogota Declaration", where they all asserted their sovereignty over the respective segments of the geostationary orbit. In 1985, Colombia even sent an official letter of protest to the USA because one of its satellite was parked in the geostationary orbit claimed by Colombia without the latter's authorisation.

This letter, just like the Bogota Declaration and any other manifestation of sovereignty over the geostationary orbit, were discarded by the USA and the rest of the international community as unfounded and contrary to the non-appropriation principle of Article II.

[143] This is not to be intended as including also the right to property over the resources extracted from celestial bodies, which are not to be confused with the environments – or geographical areas – where they are contained. As the prospect of private exploitation activities on the Moon and other celestial

The combined reading of Article I and Article II provides for a domain characterised by free access, free use and non-appropriation. These are precisely the elements of a particular legal category known as '*res communis omnium*'.

As the Latin suggests, this category was envisioned for the first time by Roman jurists. They created it in order to protect certain environments, such as the sea, the air and the seashore, from exclusive uses. It was necessary in Roman times to keep them freely accessible and usable in order to guarantee to all the opportunity to gain economic advantages from their utilisation, for example by sailing, fishing and hunting[144]. After centuries of legal evolution, the same category was chosen to define outer space.

But if that is the legal status of the cosmic environment, what did the drafters of the OST mean when they used the expression "*province of all mankind*" in Article I?

The word "*province*" is not to be interpreted as conferring some form of jurisdiction over the space domain to a particular subject identified as "*mankind*". Any form of property over outer space or parts of it, in fact, even if vested in an entity as general as humankind, would be contrary to the non-appropriation principle.

To clarify this point, it is useful to consider the true meaning of the Latin expression '*res communis omnium'*. The latter does not mean that a '*res*' (a thing) is common 'of all', as in the sense of something that belongs to a group (such as "*mankind*"). The correct translation of '*omnium*' is: 'to all', meaning that all have a common right to use the '*res*'. Hence, by definition, outer space as a '*res communis omnium'* does not and cannot belong to any entity, not even mankind[145]. The word "*province*", therefore, must confer to mankind something else than sovereign rights.

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bodies is destined to be of pivotal importance in the next decade of space activities, it will be the object of a detailed analysis in Chapter V, Section 5.5.

[144] A. Capurso, *The end of res communes omnium*, A New Role for Roman Taxonomies in The Future of Goods?, Jovene, 2023, p. 59. Some authors have mistakenly interpreted the Latin term '*omnium*' as meaning '*of all*', as if it created some sort of joint property. See H. Hertzfeld and others, *How Simple Terms Mislead Us: The Pitfalls of Thinking about Outer Space as a Commons*, in Proceedings of the International Institute of Space Law 2019, Eleven International Publishing, 2020, p. 541.
In reality, its correct translation in English is '*to all*' and it indicates a domain with common access and use for everyone, without any form of property.

[145] A. Capurso, *The non-appropriation principle: A Roman interpretation*, in Proceedings of the International Institute of Space Law 2018, Eleven International Publishing, 2019, p. 111.

Going back to the wording of Article I, the full phrase under consideration is: "*The exploration and use of outer space, including the Moon and other celestial bodies …shall be the province of all mankind*"[146].

As can be seen, the subject of the verb "*shall be*" is "*the exploration and use*". Logically, being both activities, they cannot be the property or the belonging of anyone. However, in their qualities of activities, they can be recognized as a prerogative of someone[147].

Think of the ordinary meaning of the word "*province*". To interpret it in the sense of a territorial area under the jurisdiction of an entity would be incoherent with framework of space law. In other terms, the word "*province*" in Article I is not to be intended in its territorial dimension, as in 'the provinces of the Roman Empire'. The correct interpretation of "*province*" in the OST is in the figurative sense of power or authority, as "*it is the province of the court to judge of the law*"[148].

Further confirmation of this conclusion comes from the other official languages of the OST: the French version refers to it as "*l'apanage de l'humanité tout entière*"; while in Spanish it is translated as "*incumben a toda la humanidad*". Both texts are connected to a concept more similar to "*entitlement*", than to territorial sovereignty.

Some authors have interpreted such entitlement as referring to control over decisions regarding the use and exploration of outer space:

"*By itself the common control of humanity over outer space and celestial bodies does not deal with appropriation and property. It only means that the rules over outer space and celestial bodies can only be made by Humanity as a whole. No State ... can rule exploration and use of outer space, [or] can exercise any territorial jurisdiction over it without the agreement of Humanity*"[149].

The idea of "*province*" as conferring to "*Humanity*" the exclusive right to make the rules on space activities is contradicted by the subsequent practice of States. It

[146] OST, Article I.

[147] As the *travaux preparatoires* of the OST show, the draft of the OST "was designed to guarantee that the interests not only of individual States, but of all countries and of the international community as a whole, would be protected". See the statement of the USSR Representative to COPUOS, Mr. Morozov, as reported in UN Doc. A/AC.105/C.2/SR.57 of 20 October 1966, titled 'COPUOS Legal Sub-Committee summary record of the 57th session', p. 12.

[148] See the definition of "*Province*" in Black's Law Dictionary, 2nd ed.

[149] These are the words of Armel Kerrest as reported by: C. Buxton, *Property in Outer Space: The Common Heritage of Mankind Principle vs. the First in Time, First in Right, Rule of Property*, in Journal of Air Law & Commerce, Vol. 69, No. 689, 2004, p. 689.

is a common trend among spacefaring States to set up new rules on international space activities through national legislations [150] and to conclude multilateral agreements between only particular groups of them on specific space matters[151]. Moreover, it is not clear who would be in charge of representing "*Humanity*", considering that no international entity currently represents humanity as a whole. For these reasons, it is possible to conclude that the expression "*province of all mankind*" must be interpreted as an entitlement of mankind – intended as the whole international community – to explore and use outer space. The latter in fact, being a domain common to all, must always remain – as any *res communis omnium* – non-appropriable, freely accessible and freely usable by all States.

2.5.2. The Prohibition to Violate International Law in Outer Space

Moving now to the second core prohibition of the OST, Article III establishes that even if States are beyond the atmosphere, they cannot violate international law. They must carry on activities in the exploration and use of outer space "*in accordance with international law, including the Charter of the United Nations, in the interest of maintaining international peace and security and promoting international cooperation and understanding*"[152].

As mentioned above (*infra*, at 1.1), the legal framework of space law is not a self-contained regime, but it is integrated by all the applicable rules of international law.

For example, human rights law applies also on board of the international space station with regard to the treatment of astronauts; humanitarian law, such as the rules on targeting contained in Article 48 of the Additional Protocol I to the Geneva Conventions, applies also to satellites orbiting around Earth[153].

Next to this general reference to international law, Article III expressly mentions the UN Charter. In reality, the latter's application to space activities and the primacy of its norms over the norms of all space treaties could already be deduced

[150] A notable example is the regulation of activities on space resources for commercial purposes established in the USA, Luxembourg, Japan and UAE, as reported in Chapter V, Section 5.5.
[151] See for example the Moon Agreement of 1979 or the Bogotà Delcaration of 1976.
[152] OST, Article III.
[153] *Protocol Additional to the Geneva Conventions of 12 August 1949, and relating to the Protection of Victims of International Armed Conflicts (Protocol I)*, 1125 UNTS 3, 1977, Article 48.

from Article 103 of the UN Charter itself: "*[i]n the event a conflict between the obligations of the Members of the United Nations under the present Charter and their obligations under any other international agreement, their obligations under the present Charter shall prevail*"[154].

This supremacy clause has been taken to suggest that also the aims and purposes of the UN – maintenance of peace and security, and promotion and protection of human rights – constitute an international public order that other treaty regimes, such as the one on space matters, must conform[155]. This is reflected in the last sentence of Article III, OST which recalls precisely the interest of "*maintaining international peace and security*"[156] and "*promoting international cooperation and understanding*"[157] when States carry on space activities.

With that said, what happens if acting in accordance with international law determines the violation of an obligation under the system of space law?

While any contrast between space law and the UN Charter would be resolved in favour of the latter[158], for all the other norms of international law, the principle of supremacy does not apply. In its place, it is necessary to refer to the rules on normative conflicts in international law.

In general terms, a conflict of norms arises where a party to two treaties cannot simultaneously comply with its obligations under both treaties[159]. This kind of conflict is not limited to treaty norms, but it can also involve a conventional obligation and a customary obligation[160].

[154] UN Charter, Article 103.
[155] D. Shelton, *Normative Hierarchy in International Law*, in The American Journal of International Law, Vol. 100, No. 2, 2006, p. 294.
[156] OST, Article III.
[157] *Ibid.*
[158] UN Charter, Article 103.
[159] C. Jenks, *The Conflict of Law-Making Treaties, in British Yearbook of International Law*, Vol. 30, No. 401, 1953, p. 426.
[160] Already in the 1969, the ICJ recognized that States may agree in a treaty to depart from pre-existing customary rules, so long as those rules do not have the character of *jus cogens*, stating that 'without attempting to enter into, still less pronounce upon any question of *jus cogens*, it is well understood that, in practice, rules of international law can, by agreement, be derogated from in particular cases, or as between particular parties'. See ICJ, *North Sea Continental Shelf Cases (Federal Republic of Germany/Netherlands*), Judgement of 20 February 1969, para. 72.

Except for *jus cogens* and for the UN Charter[161], conflicts of norms are resolved through the rules on legal antinomies, such as *lex posterior derogat priori*, and *lex specialis derogat generali*[162].

The application of the *lex posterior* principle means, for example, that if it is demonstrated that a new rule of customary nature has emerged among spacefaring States with regard to a particular space activity (e.g. space mining), such rule must prevail among those States over any conflicting obligation contained in a precedent treaty of space law. Equally, if all the parties to a space treaty become parties also to a later treaty but the earlier treaty is not terminated or suspended, the earlier treaty applies only to the extent that its provisions are compatible with those of the later treaty[163].

As for the *lex specialis* principle[164], an example of its application can be found in the regime of State liability. Under general international law, in front of a transnational harm caused by a State, the latter can be released from its international liability when it proves the applicability of exemptions such as *force majeure*. On the contrary, under Article II of the Liability Convention, States have a special obligation to bear absolute liability for the damages caused by their space objects on Earth and to aircraft in the air, without the possibility to invoke any exemption other than the fact that the damage has resulted either wholly or partially from gross negligence or from an act or omission done with intent to cause damage on the part of a claimant State or of natural or juridical persons it represents[165]. Therefore, there is an incompatibility between a general and a special rule, which must be solved in favour of the latter when space law applies.

Determining the prevalence of a norm of *lex specialis* can be less easy when two norms can apply to the same activity and they are both individually 'special' in

[161] This is except for the superiority of the UN Charter, as already stated, and for the inderogability of peremptory norms, as enshrined in Article 53 of the VCLT.

[162] For a thorough study on both principles see the work of the ILC in: UN Doc. A/CN.4/L.682 and Add.1 of 13 April 2006, titled 'Fragmentation of international law: difficulties arising from the diversification and expansion of international law'.

[163] See VCLT, Article 30.

[164] See G. Marceau, *Conflicts of norms and conflicts of jurisdictions: the relationship between the WTO Agreement and MEAs and other treaties*, in Journal of World Trade, No. 35, 2001, p. 1086, explaining the concept as follows: "The lex specialis principle of interpretation favours the application of a more specific provision over a general one. Therefore, it may appear from the intention of the parties and in application of the lex specialis principle, that a state may exercise an express and more specific right provided for in an earlier or later treaty, albeit inconsistent with a subsequent treaty provision drafted in general terms".

[165] Liability Convention, Article VI.

relation to a more 'general' field of international law. In this situation, the solution can only be found by interpreting the two provisions so as to find among the possible interpretations the one that avoids an incompatibility[166].

2.5.3. The Prohibition to 'Weaponise' Outer Space and 'Militarise' Celestial Bodies

The third core prohibition established in the OST concerns the military uses of outer space.

It has been already mentioned (*infra* at 1.2) that space activities begun under the aegis of military programs and that the military application of space services have always represented a pivotal aspect of the exploration and use of outer space. This was very clear to the drafters of the OST. Nonetheless, there was the intention to preserve the cosmic domain from the spectre of war.

To achieve that goal, Article IV was structured as a double prohibition.

In the first paragraph, the issue of nuclear weapons and weapons of mass destruction[167] was tackled. Their use was prohibited, but only with regard to the following actions: "*place in orbit around the Earth*", "*install … on celestial bodies*" and "*station … in outer space*"[168].

All three verbs are characterized by a certain sense of perpetuity, as if such weapons have to be fixed in their position in outer space. It follows that crossing outer space with nuclear weapons or weapons of mass destruction without completing an orbit does not violate the prohibitions of Article IV, para. 1. Moreover, any reference to any other kind of weapon was omitted in the wording of the provision, imposing no restrictions on the use for example of conventional weapons beyond the atmosphere.

The second paragraph contains the only broad limitation to military activities beyond the atmosphere:

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[166] This is a general rule also in cases of simple conflicts between norms of the same value: the ICJ and other courts appear to have at least applied a presumption that the parties to any particular treaty have not intended to depart from the rules of international customary law. A parallel principle of reconciling a customary norm with a potentially conflicting treaty rule should apply where the customary norm is susceptible to different interpretations.

[167] For a definition of such weapons see the work of the UN Commission on Conventional Armaments as reported in: UN Office of Public Information, *The United Nations and Disarmament, 1945–1965*, UN Publication 67.I.8, p. 28.

[168] OST, Article IV(1).

"*The Moon and other celestial bodies shall be used by all States Parties to the Treaty exclusively for peaceful purposes*" [169].

Interestingly, this provision applies only to the Moon and other celestial bodies, meaning that the void of outer space – including the orbits around Earth – remains open to activities whose purposes are not exclusively peaceful[170].

The difference between the two domains raises a question: what does it mean that an activity must have exclusively peaceful purposes?

To answer this question it is first necessary to provide some clarity on the concept of "*peaceful purposes*".

The idea of preserving outer space for peaceful uses has always been a general concern of the international community. It has marked not only the negotiations that resulted in the adoption of the OST, but also the discussions among Member States in international fora, such as COPUOS and the CD, in the following decades[171].

Its importance is openly stated in the second and fourth *considérants* of the OST Preamble[172]. Article IX and Article XI of the OST set forth obligations that are centred not on the simple "*exploration and use of outer space*", but on the more qualified expression "*peaceful exploration and use*". Article III establishes the

[169] OST, Article IV(2).

[170] See B. Cheng, *Properly Speaking, Only celestial bodies have been reserved for use exclusively for peaceful (non ... military) purposes, but not outer void space*, in International law across the spectrum of conflict: essays in honour of Professor L.C. Green on the occasion of his eightieth birthday (ed. M. Schmitt), Naval War College, 2000, p. 81.

[171] A first notable example of all this is the letter dated 13 January 1958 from the President of the USA Dwight Eisenhower to the Chairman of the Council of Ministers of the USSR Nikolai Bulganin, where the former proposed "*that we agree that outer space should be used only for peaceful purposes*". The matter became repeatedly addressed in the UNGA Resolutions on the international cooperation for the peaceful uses of outer space, adopted for the first time in 1961 (UNGA Res. 1721 (XVI) of 20 December 1961). Its importance in the negotiation of the OST can be seen in: *Memorandum from the Executive Secretary of the US Department of State (Read) to the President's Special Assistant (Rostow)*, 10 August 1966, available at the link: https://history.state.gov/historicaldocuments/frus1964-68v11/d145. More recently, other than the thematic discussions within the UN Office for Disarmament Affairs and the Conference on Disarmament, see the two attempts (both failed) to adopt a first UN Security Council Resolution on the matter in April and in May 2024. For a doctrinal account of the matter at hand, see M. Markoff, *Disarmament and Peaceful Purposes Provisions in the 1967 Outer Space Treaty*, in Journal of Space Law, Vol. 4, No. 1, 1976, p. 3. See also S. Freeland, *Peaceful Purposes - Governing the Military Uses of Outer Space*, in European Journal of Law Reform, Vol. 18, No. 1, 2016, p. 35. See also S. Pekkamen and others, *International relations theory and the evolution of "peaceful purposes" in outer space*, in The Oxford Handbook of Space Security (ed. by S. Pekkanen and others), Oxford University Press, 2024, p. 3.

[172] Respectively stating "Recognizing the common interest of all mankind in the progress of the exploration and use of outer space for peaceful purposes" and "Desiring to contribute to broad international cooperation in the scientific as well as the legal aspects of the exploration and use of outer space for peaceful purposes".

duty to carry out space activities "*in the interest of maintaining international peace and security*".

All these references do not offer a clear indication on the meaning of the concept "*peaceful purposes*".

However, the second-to-last *considerànt* of the Preamble of the OST offers an initial hint, as it condemns conducts in outer space "*designed or likely to provoke or encourage any threat to the peace, breach of the peace or act of aggression*". Therefore, by interpreting the OST under the light of the UN Charter, it is possible to arrive at a first conclusion: an activity does not have a peaceful purpose when it amounts to an aggressive act in outer space that endangers international peace.

While this may seem an obvious statement based also on the mere application of public international law to outer space[173], a more specific argument comes from the subsequent practice of States Parties to the OST.

The use of outer space for non-aggressive military activities is traditionally part of the use and exploration of outer space[174]. States have always used space assets for military purposes, providing services such as secure communications and remote sensing to support war operations on Earth[175]. Moreover, nowadays space infrastructures have become part of the domain of operations of armed forces, as it is demonstrated by the creation of military branches specialised in space activities (e.g. in the USA and in France[176]).

From this, it follows that the adjective 'peaceful' associated with space activities allows non-aggressive military operations.

To confirm this conclusion, it is also possible to refer to other multilateral treaties that have used the same expression, such as the Antarctic Treaty[177] and the

[173] In particular by a combined reading of Article III of the OST with Article 2, para. 4, of the UN Charter.

[174] For a thorough account of the military uses of outer space see: D. Wolter, *Common Security in Outer Space and International Law*, United Nations Publication, 2006. See also the report of the Center for Strategic and International Studies called "Space threat Assessment 2024" of April 2024 available at the following link: https://www.csis.org/analysis/space-threat-assessment-2024.

[175] Such space programs result in so-called "passive military space systems" which are "not weapons themselves, but are used to enhance military systems below. Reconnaissance, early warning, communications, navigation and other satellites allow for effective use and coordination of aircraft, tanks, missiles, ships etc." See G. Steinberg, *The Militarization of Space: From passive support to active weapons systems*, in *Futures*, 1982, p. 379.

[176] See respectively the official page of the US Space Force at the link https://www.spaceforce.mil/, and the official page of the French Space Command at the link https://www.defense.gouv.fr/en/cde.

[177] Antarctic Treaty, Article I: "*Antarctica shall be used for peaceful purposes only. There shall be prohibited, inter alia, any measures of a military nature, such as the establishment of military bases and fortifications, the carrying out of military maneuvers, as well as the testing of any type of weapons*".

UNCLOS[178]. Also in those contexts, it has been recognised that "*peaceful*" does not mean "*non-military*", but rather "*non-aggressive*" [179].

Based on this interpretation of "*peaceful purposes*", it is possible to analyse the meaning of Article IV, para. 2.

The element that makes the latter particularly contentious is the adverb "*exclusively*". Its use suggests that the peaceful purposes to be pursued on the Moon and other celestial bodies are stricter than the ones to be pursued in outer space. Does that mean that the Moon and other celestial bodies shall be completely de-militarised?

A first point of consideration is that Article IV, para. 2, continues after the first period with additional sentences, specifying that: the establishment of military bases, installations and fortifications, the testing of any type of weapons and the conduct of military manoeuvres on celestial bodies are forbidden; at the same time, the use of military personnel, equipment and facilities for scientific research and exploration are allowed[180].

These two additional obligations indicate a list of activities that are, and are not, in conformity with the expression "*exclusively for peaceful purposes*". However, nothing in the provision indicates that the things that are expressly forbidden or allowed therein represent an exhaustive list.

For example, military equipment and personnel are admitted on celestial bodies for their exploration or research, but does that mean that they can *only* be used for such activities, forbidding any other operation?

Similarly, weapons cannot be *tested* on celestial bodies, but can they be *used* thereon[181]?

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[178] The references to the concept of peacefulness are made in the Preamble of the UNCLOS, whose *considerànt* n. 4 reads: "*promote the peaceful uses of the seas and oceans*", as well as in Articles 88, 141, 143, 147, 155, 240, 242, 246, and 301.

[179] In the case of Antarctica, the argument goes *a contrario*: since the Antarctic Treaty imposes a complete demilitarisation of Antarctica by adding elements to the concept of peaceful purposes, such as the word "*only*" and the terms "*inter alia*" with reference to the prohibited military uses, it can be concluded that only when those additional elements are present the activities with military purposes are forbidden. On this regard, see A. Proelss, *Peaceful Purposes*, in Max Planck Encyclopedia of Public International law, 2021, para. 3. As for the UNCLOS, see F. Francioni, *Peacetime use of Force, Military Activities, and the New Law of the Sea*, in Cornell International Law Journal, Vol. 18, No. 2, 1985, p. 203. Arguing in favour of the idea of "*peaceful*" as meaning non-military, see M. Lachs, above at 1, p. 98. Of the same advice is also Kai Uwe Schrogl, as explained in: K. Schrogl and others, *Article IV*, in Cologne Commentary I, p. 82.

[180] *Ibid.*

[181] The use of weapons on celestial bodies may seem in contradiction with the principle of exclusively peaceful purposes. However, the use of weapons for the purpose of maintaining peace and with a

The point of Article IV, para. 2, is that the goal of any activity on the Moon and other celestial bodies has to be exclusively peaceful. However, this expression leaves many grey areas in its application.

An example can clarify the problem.

It is imaginable that once critical infrastructures will be built on the Moon, for energy or communications or exploitation of minerals, they will be at risk of interferences from malicious players. Hence, the private or public actors owning them will want to protect them.

This is something that it is already happening with regard to submarine cables and pipelines in the high seas, which according to Article 88 of United Nations Convention on the Law of the Sea (UNCLOS) "*shall be preserved for peaceful purposes*" [182]. The increasingly frequent occurrence of interferences by external actors has pushed States and owners of underwater infrastructures to deploy protective devices, including submarine interceptors[183]. It should be noted that the most common cause of interference is not the use of any weapon, but the simple dragging of anchors or fishing instruments through the sea floor, thus breaking the submarine cable or pipeline caught along the way[184].

It would be unrealistic to expect that States benefiting from critical lunar infrastructures will leave them unprotected against potential malicious operations. Their security will entail the use of military personnel, equipment or devices not for scientific research or exploration, but for a purpose that is in itself merely protective. Will that be considered a violation of Article IV, para. 2? If so, how should States and private operators protect their investments and their reliance on lunar resources?

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deterrent effect is not only part of the reality of international relations, but it is also an institutionalized practice in the application of Chapter VII of the UN Charter, as demonstrated by the use of armed peacekeepers. See N. White, *The use of weapons in peace operations*, in Weapons under international human rights law (ed. by S. Casey-Maslen), Cambridge University Press, 2014, p. 197. See also T. Findlay, *The use of force in UN peace operations*, Oxford University Press, 2002, p. 18.

[182] *United Nations Convention on the Law of the Sea* (UNCLOS), 1833 UNTS 397, 1994, Article 88. In addition, according to Article 141: "*The Area shall be open to use exclusively for peaceful purposes by all States*".

[183] See P. Thevenin, *The Concept of Military Activities in the Law of the Sea and Its Implications for the Baltic Sea in a Context of Growing Threats of Hybrid Warfare*, in Maritime Security Law in Hybrid Warfare, Brill-Nijhoff, 2024, p. 57. See also: R. McLaughlin and others, *Submarine Communication Cables and the Law of Armed Conflict: Some Enduring Uncertainties, and Some Proposals, as to Characterization*, in Journal of Conflict and Security Law, Vol. 27, No. 3, 2022, p. 297.

[184] International Law Association (ILA), *Submarine cables and pipelines under international law - Third Interim Report*, 2024, para. 15 et seq.

These questions are yet to be posed in relation to a concrete case, but the example behind them is telling of the ambiguousness of the provision.

As mentioned before, there is no other provision in the OST nor in the whole system of international space law that contains an obligation like the one in the first sentence of Article IV, para. 2. Every other provision always uses only exhortative expressions or mentions the concept of peacefulness as a guiding principle, without imposing a clear duty on States. Therefore, the fact that the latter has made the condition of "*peaceful purposes*" an obligation upon States is already in itself something that holds a strong legal value, irrespective of the adverb "*exclusively*". This value is reinforced by the list of military activities that are expressly forbidden and allowed in the following sentences of the provision.

The lack of a similar set of obligations for outer space and the fact that for the latter environment the only clear prohibition regards the use of nuclear weapons and weapons of mass destruction creates a much more elusive contour of legitimacy with regard to military activities in the extra-atmospheric void.

This condition has become particularly evident in recent times, when the concept of "*peaceful purposes*" has returned at the centre of international discussions, especially for what concerns the use of weapons in outer space[185].

The fear of an arms race beyond the atmosphere has brought the international community to start thinking of additional limits to the ones imposed in Article IV, para. 1. In particular, between 2020 and 2024 the UNGA has adopted three resolutions titled: 1) *Reducing space threats through norms, rules and principles of responsible behaviours*[186]; 2) *No first placement of weapons in outer space*[187]; 3) *Destructive direct-ascent anti-satellite missile testing*[188].

The first one is focused on reducing misunderstandings on military space activities among Member States and fostering responsible behaviours in outer space through mutual communications.

[185] For a recent analysis of the so-called weaponisation of outer space, see A. Bateman, *Weapons in Space: Technology, Politics, and the Rise and Fall of the Strategic Defense Initiative*, MIT Press, 2024. See also on the topic in general, M. Schmitt, *International Law and Military Operations in Space*, in Max Planck Yearbook of United Nations Law, Vol. 10, 2006, p. 89.

[186] UNGA Res. 75/36 of 16 December 2020, titled 'Reducing space threats through norms, rules and principles of responsible behaviours'.

[187] UNGA Res. 79/20 of 9 December 2024, titled 'No first placement of weapons in outer space'. This is just the last one of a series of resolutions by the same title periodically adopted by the UNGA.

[188] UNGA Res. 77/41 of 12 December 2022, titled 'Destructive direct-ascent anti-satellite missile testing'.

The second one encourages all States, especially space-faring nations, to consider the possibility of upholding a political commitment not to be the first to place weapons in outer space. It also urges States to take substantive steps within the CD for the adoption of a multilateral treaty on this issue[189].

It is emblematic of the controversy and sensibility around the topic that such resolution was adopted by a recorded vote of 113 in favour to 51 against, with 6 abstentions, including among the contrary votes the ones of all EU Member States[190] and other major space powers such as USA, UK, Japan, India and Australia[191].

The third one is has the strongest normative character as it "*calls upon all States to commit not to conduct destructive direct-ascent anti-satellite missile tests; [and] considers such a commitment to be an urgent, initial measure aimed at preventing damage to the outer space environment, while also contributing to the development of further measures for the prevention of an arms race in outer space*"[192]. Interestingly, it received only nine votes against and nine abstentions[193]. Moreover, there have been several States that have unilaterally committed not to conduct such tests in outer space[194]. All this can be seen as evidence of a fertile ground for the negotiation of a multilateral treaty imposing a binding obligation in that regard.

[189] In particular, it refers to the draft treaty proposed in 2008 by China and Russia, and its updated version of 2014, on the prevention of the placement of weapons in outer space, which has not yet concluded its negotiation process. See UN Doc. CD/1839 of 29 February 2008.

[190] The reasons behind the contrary vote were explained in the Press Release of the Delegation of the EU to the UN of 31 October 2023 titled 'EU Explanation of Vote – UN General Assembly 1st Committee: No First Placement of Weapons in Outer Space'.

[191] See the vote summary reported in UN Doc. A/79/406 of 14 November 2024, titled 'Prevention of an arms race in outer space Report of the First Committee'.

[192] UNGA Res. 77/41 of 12 December 2022, p. 2.

[193] In particular, the recorded vote in the official records of UNGA 46th plenary meeting reads as follows: *Against*: Belarus, Bolivia (Plurinational State of), Central African Republic, China, Cuba, Iran (Islamic Republic of), Nicaragua, Russian Federation, Syrian Arab Republic. *Abstaining*: India, Lao People's Democratic Republic, Madagascar, Pakistan, Serbia, Sri Lanka, Sudan, Togo, Zimbabwe.

[194] The first commitment came from the USA, five months after Russia conducted such a test, destroying the defunct Cosmos 1408 satellite and creating thousands of pieces of debris. See the White House Press Release titled "*New U.S. Commitment on Destructive Direct-Ascent Anti-Satellite Missile Testing*" of 18 April 2022. It was followed by Canada, South Korea, Italy and others for a total of 36 States as of January 2024. Notably, on 1 December 2023 several private companies signed the "*Space Industry Statement in Support of International Commitments Not To Conduct Destructive Anti-Satellite Testing*", which continues to attract new signatories.

2.5.4. Final remarks

In concluding this section on the three core freedoms and three core prohibitions of the OST, one last consideration is due.

Each of the obligations mentioned here has been defined as 'core' norms because of the normative value that they hold.

They must be distinguished from the other provisions of space law insofar as they have all the elements to be recognized as general principles of international law.

General principles of international law, thus understood, are an autonomous source of international law, distinct from customary rules and conventional norms[195]. They can be of two types: the first one regards general principles of law proper to international law in general (e.g. the principle of sovereign equality); the second one – which is the one that matters for the present discussion – concerns principles of law proper to some domains of international law, such as international environmental law or space law.

As the International Law Commission stated in 2020, "*a way in which 'general principles of law formed within the international legal system' may be identified is by ascertaining that a principle has been widely incorporated into treaties and other international instruments, such as General Assembly resolutions*"[196].

In the case of space law, the principles enshrined in the three core norms mentioned above were formulated as a starting point in the 1963 Declaration and were then reiterated in the OST, underscoring the unaltered necessity to ensure their obligatory nature. After 1967, they continued to be repeated in subsequent UNGA resolutions and other recent soft law measures.

Thus, they have paved the way for the construction of a new *corpus iuris*, in a new domain of international law that required regulation, and the principles originally proclaimed have fully retained their value to date[197].

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[195] C. Rousseau, *Principes généraux du droit international public*, Vol. I (Sources), Pedone, 1944, p. 901.

[196] UN Doc. A/CN.4/741 of 9 April 2020, titled 'ILC - Second report on general principles of law by Marcelo Vázquez-Bermúdez, Special Rapporteur'.

[197] *Pulp Mills on the River Uruguay, Argentina v Uruguay*, Separate Opinion of Judge Cancado Trinidade, 2010, para. 38.

Since the beginning of space exploration, even before the adoption of the OST, States have recognised in their diplomatic correspondence[198], during the debates within COPUOS[199] and in the acts of the UN General Assembly[200] that the system of space law must be based on the respect of the following norms: the freedoms of exploration, use, access and scientific investigation in space, as well as the prohibitions to appropriate it, to violate international law therein, to place nuclear weapons or weapons of mass destructions in orbit, and to militarise the Moon and other celestial bodies.

This conclusion cannot find any confirmation in the international jurisprudence, lacking any case on space law brought before an international tribunal. However, the particular value of the core norms mentioned above emerges also from the writings of scholars and commentators[201].

By virtue of their status, they must not only prevail over conflicting norms of international law, but also over domestic legislative acts[202].

National authorities cannot waive them or allow their nationals to neglect them through their activities. Because of that, it is essential for national regulators to ensure that any national space activity – public or private – is conducted in compliance with the core principles of the OST.

Building upon these core principles, the field of space law has been elaborated into a rich set of norms. Most of them concern only the interests of States, as they define their rights and obligations in the use and exploration of outer space.

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[198] See for example the exchange of letters between USSR Chairman of the Council of Ministers, Mr. Bulganin, and US President, Mr. Eisenhower, on the use of nuclear weapons in outer space, respectively of 10 December 1957 and 13 January 1958.

[199] See the reports of COPUOS between 1959 and 1966. See also the statements made by States Delegates to COPUOS while negotiating the text of the OST, as reported by US Delegate Paul Dembling in: P. Dembling, *The Evolution of the Outer Space Treaty*, in Journal of Air Law and Commerce, Vol. 33, 1967, p. 419.

[200] See the various resolutions adopted on space matters and cited above at 3.

[201] See C. Christol, *Judge Manfred Lachs and the Principle of Jus Cogens*, in Journal of Space Law, Vol. 22, No. 1, 1994, p. 33. S. Freeland and others, *Article II*, in Cologne Commentary I, p. 55. F. Lyall and others, *Space Law: A Treatise*, Routledge, 2018, p. 63.

[202] The effect of general principles on other international norms can be deduced from the principles which the ICJ inferred from the Genocide Convention in its Advisory Opinion of 1951 on *Reservations to the Convention on the Prevention and Punishment of the Crime of Genocide*. As underlined by the former president of ITLOS Judge Rudiger Wolfrum: "By deducing principles from the Genocide Convention the ICJ broadened its scope, specified the obligations thereunder, and, in particular, ensured its universal applicability". R. Wolfrum, *General International Law (Principles, Rules, and Standards)*, in Max Planck Encyclopedia of Public International, 2010, para. 52.

However, among them, it is possible to find also provisions that address the position of private actors and – because of their centrality for the purpose of the present Thesis – they require an attentive analysis in the following Section.

2.6. MAIN LEGAL ASPECTS OF PRIVATE SPACE ACTIVITIES

Outer space has always been used by private companies, or at least since the beginning of the space age.

Already in the 1960s, the involvement of the private sector in space activities was a reality for the Western world. Companies such as AT&T and RCA in the USA were operating their own communication satellites [203], companies such as Telespazio in Italy were providing satellite services from their ground stations.

In sum, private companies were already active in the early stage of space exploration. However, it was generally believed that public space agencies would have remained the main actors in outer space and that the private industry would have stayed dependent on public procurements and commissions.

The legal framework that is in force today is a product of that vision. Hence, it is inevitably thrifty on rules specific to private actors.

There are only three references to the activities of private entities in outer space, namely Article VI and Article IX of the OST, and Article III of the Liability Convention.

2.6.1. Article VI of the OST

Article VI of the OST contains the first and most important provision on "*non-governmental entities*"[204].

Its content is the product of a compromise between the two blocs of the Cold War. While the USA and its allies wanted to promote and incentivise the development of their private space industry, allowing non-governmental actors to access and

[203] See D. Whalen, *Communications Satellites: Making the Global Village Possible*, published online on 30 November 2010 at the following link: www.nasa.gov/history/communications-satellites/

[204] OST, Article VI. For a thorough analysis of the legal issues connected to the application of Article VI to private space activities, and for an account of the relative literature, refer to Chapter 3 and 4.

commercially exploit the cosmic domain, the Soviet Union was firmly against it[205].

Considering such opposing views, the compromise was that the Soviet Union acquiesced to private actors accessing and using outer space, but only under the conditions established in Article VI of the OST. According to the latter, States must authorise and continuingly supervise their non-governmental entities in order to ensure the conformity of private activities with the other principles of the treaty, including Article III and therefore including all applicable norms of international law.

The responsibility of States for ensuring such conformity brings with it an important consequence: States cannot grant to private actors any right which they themselves do not possess[206]. Because the rights granted under the OST and the other space treaties are those of States, the margin of freedom in authorising private space activities at the domestic level is restricted by the limitations established at the international level. For example, a State cannot authorise an activity contrary to one of the core prohibitions mentioned in the preceding Section, e.g. the construction of a permanent base on a celestial body, which would result in a violation of the non-appropriation principle[207].

Article VI, therefore, functions as a door through which international obligations are transposed upon private space operators[208].

The form of that door is shaped by the requirements that each State establishes in its national authorisation processes, with only one condition: such authorisations must ensure the conformity of private space activities with the international norms applicable to the authorising State.

This mechanism can be better grasped by looking at the other two provisions that refer to private space activities: Article IX of the OST and Article III of the Liability Convention.

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[205] See UN Doc. A/5181 of 27 September 1962, Annex III(A), titled 'USSR: Draft declaration of the basic principles governing the activities of States pertaining to the exploration and use of outer space'.
[206] F. Lyall and others, above at 201, p. 416.
[207] By "*permanent*" it is meant a construction that a private operator is authorised to install on the Moon without any time limit and without any obligation of restoring the occupied environment to its status quo ante when the activity is terminated. Without such requirements, what would be the difference with an occupation *de facto* of the area where the construction is built?
[208] The function of Article VI and the regime of responsibility established therein are further analysed in depth in Chapter 4, at 4.1 and 4.2.

2.6.2. Article IX of the OST

Article IX of the OST establishes a duty among States to consult with each other when an activity planned by a national of a State Party may cause harmful interference to the activities of another State.

It follows that governmental authorities need access to information on the activities of private actors and private actors must keep States updated on their conduct in outer space.

Without knowledge on what private entities do, States bear the risk of violating – *inter alia* – the obligation to consult established by Article IX[209].

It becomes then essential to include among the authorisation requirements a process for ensuring effective communication channels between the authorising authority and the authorised private actor.

This is exactly what France has done in its domestic legislation concerning the authorisation for space activities. In particular, in Article 7 of the 'French Law on Space Operations'[210], it has envisaged a system of direct access to information by public authorities for controlling the conformity of private activities with their authorisation. At the same time, in Articles 7 and 10 of the 'French Applicative Decree on Space Authorisations'[211], France has required private operators to describe their operations in outer space and to inform without delay the public authorities of any modification that may incur.

This system of information-sharing between France and its authorised private entities is a way of avoiding the occurrence of unknown activities that may trigger France's international responsibility. This is true not just in case of harmful interference pursuant to Article IX, but also in any other situation where there is an international obligation based on sharing information at the international level: e.g. Article XI of the OST, which regards the duty to share internationally the nature, conduct, locations and results of space activities, as well as of Article IV

[209] There are many other aspects in the field of space law where an effective information sharing system between a non-governmental entity and an authorising State is essential to ensure the latter's compliance with its international obligations. Remaining in the context of Article IX, a perfect example is the duty of due regard, as already described in Section 2.4.3.

[210] French Law on Space Operations No. 518/2008.

[211] French Decree No. 643/2009 on the authorisations issued in application of the Law on Space Operations No. 518/2008, Articles 7 and 10.

of the Registration Convention, which sets a duty to furnish the UN Secretary-General with information on any space object registered at the national level.

2.6.3. Article III of the Liability Convention

The third and last provision of the space treaties that mentions private subjects is Article III of the Liability Convention, which speaks of "*persons for whom a launching State is responsible*" [212].

More specifically, Article III maintains that the "*launching State*" – defined as any State from whose territory or facility an object is launched as well as any State who launches or procures the launch of a space object[213] – is internationally liable when damage caused by space objects elsewhere than on Earth is "*due to its fault or to the fault of persons for whom it is responsible*"[214].

The use of that expression can raise some ambiguity on who are the "*persons*" for whom a State is responsible.

Considering that the expression "*its fault*" can be translated as the fault of a State and, hence, the fault of the organs of a State[215], the term "*persons*" must be identified with someone else. Under a restrictive interpretation, it could refer to subjects who either exercise elements of the governmental authority, or act on the instructions of, or under the direction or control of, a State, or finally subjects whose conduct has been acknowledged and adopted by a State as its own[216].

As a consequence, the international liability envisaged by Article III would be triggered only by the fault of organs or of subjects directly connected to the public authority of a launching State. This would exclude any liability for damages caused by the fault of non-governmental entities for which the launching State served also the function of the "*appropriate State*" pursuant to Article VI of the OST.

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[212] Liability Convention, Article III.
[213] *Ibid.*, Article I(c). A detailed analysis of the definition of launching State is offered in Chapter III, Section 3.5.
[214] *Ibid.*, Article III.
[215] A subject falling under the category of State organ is generally identified as any person who exercises legislative, executive, judicial or any other public function in accordance with the internal law of the State. See ARSIWA, Article 4.
[216] *Ibid.*, Articles 5-10

For instance, if a private space company overlooked a collision alert and hit another space object, the damage caused by its fault could not be recovered from the launching State that authorised the private activity. The liability for such damages would remain upon the non-governmental entity. Any victim – public or private – would be forced to claim compensation according to tort law in the jurisdiction of the liable party, knowing that the latter would be liable only within the limits of its legal nature (e.g. limited company).

In sum, under a restrictive interpretation of Article III, faulty private space activity could not trigger the liability of the authorising launching State because non-governmental entities would not fall under the category neither of State organs nor of persons directly connected to its public authority.

This conclusion however is unsatisfactory under different grounds.

Firstly, it goes against the purpose of the Liability Convention: a restrictive interpretation of Article III would narrow the scope of the Liability Convention in a manner inconsistent with its aim, which is to assure the prompt payment of a full and equitable measure of compensation in case of damages caused by space objects[217]. The whole treaty is based on a victim-oriented approach, aimed at facilitating the compensation of space damages by having always at least one launching State, if not more, that can cover the potentially enormous costs connected to accidents involving space objects. The same idea informs the provision of the OST upon which the Liability Convention was built: Article VII. The latter is also based on a general liability of launching States for damages caused by space objects on the Earth, in the airspace and in outer space, irrespective of whether such objects are operated by public or private entities. The logic is to extend the possibilities for victims to recover the damages suffered from space objects and to rely on States' budgets for a fair and equitable compensation.

Secondly, a restrictive interpretation of Article III of the Liability Convention would be inexplicably different from the wide scope of application of Article II of the same treaty, which attributes an absolute liability to launching States for

[217] Liability Convention, Preamble, fourth *considérant*. This is not limited to the relationship between a launching State and the victims of damages caused by space objects, but it is relevant also for the relationship among multiple launching States. In fact, the principle of joint and several liability among them, established in Article IV of the Liability Convention, would be undermined if private space activities could not trigger the liability of the authorising launching State.

damages caused by space objects, without any further qualification on their public or private nature.

Thirdly, the reference to responsibility in Article III of the Liability Convention must be read in light of the system of State responsibility established in the field of space law. The only other provision in the space treaties that mentions such concept is Article VI of the OST[218]. As already mentioned above, according to the latter States Parties are responsible for ensuring that authorised non-governmental entities act in conformity with all applicable norms of international law. It follows that under space law private operators are persons for whom the appropriate State holds a form of responsibility[219].

Therefore, by interpreting the expression "*persons for whom [a launching State] is responsible*" in light of the purpose and context of Article III of the Liability Convention it can only be concluded that it refers not just to persons directly connected to launching States under the rules on State responsibility of public international law, but also to non-governmental entities for which a State is responsible under Article VI of the OST.

Because of that, launching States are exposed to international claims for the compensation of damages resulting from the faulty conduct of private space operators whose activities they have, or should have, authorised[220].

When a claim is successful and the launching State has paid the compensation costs directly to the claimant in light of the Liability Convention, it has the power to seek recourse at the domestic level against the private operator of the space object that actually caused the damage.

However, a private space operator may not have the financial capacity to repay the liable State due to the potentially high costs of accidents involving space objects.

For this reason, most States have transformed their international obligation to bear international liability into a fundamental requirement for obtaining their

[218] Leaving aside Article 14 of the Moon Agreement, which replicates almost verbatim Article VI of the OST with regard to the Moon.

[219] For a deeper analysis of the regime of State responsibility for non-governmental space activities refer to Chapter IV.

[220] As can be deduced from this sentence, in case of private space activities the fault-based liability regime of the Liability Convention is inevitably connected to the "*appropriate State*", as addressed in Chapter IV, at 4.4.

authorisation: private operators must have an insurance against damages to third parties[221].

Through the imposition of a financial guarantee, States have created a safety net in case they are exposed to compensation claims because of the conduct of their non-governmental entities. They can then recover any expenses that they may suffer from the insurance company of the private space operator[222].

Considering the economic importance of this requirement, it can be easily understood how every State that has enacted a regulation on private space activities have included it among the conditions for obtaining the authorisation[223].

Thus, the international obligation on State liability stemming from the Liability Convention can become a binding requirement of insurance for private operators in the authorisation process.

This is another example of the centrality of the authorisation mechanism envisaged by Article VI, OST and of how the latter works as a door connecting the space activities of non-governmental entities to the international obligations of States.

It is important to underline one last aspect on this regard.

The centrality of the authorisation mechanism is not limited to assuring the conformity with international obligations, but it includes also norms of non-binding nature whose respect can be imposed on non-governmental entities by translating them into mandatory domestic requirements for obtaining a space authorisation.

For example, in 1996 the UN General Assembly adopted a resolution in which the following principle was expressed: "*the use of nuclear power sources in outer space shall be restricted to those space missions which cannot be operated by non-nuclear energy sources in a reasonable way*"[224].

[221] For example, see Luxembourg's Law of 15 December 2020 on space activities, Article 6, para. 4; or the US Code of Federal Regulations, Title 51 – National and Commercial Space Programs, para. 50914(a); or Australia's Space (Launches and Returns) (General) Rules of 2019, Article 57.

[222] For a comprehensive study on the space insurance market under a legal perspective, see A. Harrington, *Space Insurance and the Law*, Edward Elgar Publishing, 2021.

[223] Although the requirement itself is commonly found in national legislations, the specifics on the type of insurance required may change from State to State. For example, the liability cap required in the USA amounts to 500 MLN $, in Australia arrives at 750 MLN $, in the UK is only 60 MLN £.

[224] UNGA Res. 47/68 of 14 December 1996, titled 'Principles relevant to the use of nuclear power sources in outer space'.

This general statement was completed in the same resolution by ten other principles – known as the Nuclear Power Sources (NPS) Principles – in which several technical conditions were elaborated in order to achieve that goal.

In 2009, the matter was addressed again by COPUOS, issuing a non-binding framework called: "*Safety Framework for Nuclear Power Source Applications in Outer Space*", with the purpose of guiding governments in the authorisation phase[225].

The USA has embraced this international framework and has created specific binding requirements for private operators in order to obtain a licence for the launch of nuclear power systems. In particular, on October 20, 2023, the U.S. Federal Aviation Administration (FAA) issued advisory circular AC 450.45-1: "*Launch and Reentry of Space Nuclear Systems*", where it has addressed the safety review requirements and payload determinations necessary to authorise such operations in line with the relevant international guidelines and principles[226].

With that, the USA has transformed the international non-binding framework on nuclear power sources into national mandatory conditions for authorising private operators. Either the operator complies with the requirements specified domestically, or it does not obtain the authorisation to launch.

In similar ways, other norms of soft law have obtained binding value for private operators through domestic laws on space authorisations[227]. Among them, it is worth mentioning the ones concerning space pollution and sustainability, which are further examined in Chapter V, Sections 5.2.1 and 5.4.

It is common nowadays to find detailed requirements on the re-entry and disposal of space objects at the end of their life-cycle, reflecting the so-called Space Debris Mitigation Guidelines endorsed by the UN General Assembly in its Resolution 62/217 of 22 December 2007[228].

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[225] UN Doc. A/AC.105/934 of 19 May 2009, titled: 'Safety Framework for Nuclear Power Source Applications in Outer Space'

[226] Federal Aviation Administration, Advisory Circular 450.45-1 of 20 October 2023.

[227] This is irrespective of the value that soft law measures may have assumed at the international level. For private space actors, they become binding when they are part of the national legal framework to which private actors must abide.

[228] UNGA Res. 62/217 of 22 December 2007, Guideline 6 and 7. For example, see the UK Space Industry Act of 2018, Section 2, para. 2, lett. h, together with the UK Guidance for Orbital Operator Licence Applicants and Licensees, CAP 2210, 2024, para. 5.15. Another example is the Austrian Outer Space Regulation of 2015, Article 2, para. 4. See also the scholarly analysis in: A. Dey and others, *Study on Space Debris Mitigation Under the National Space Laws*, in University of Bologna Law Review, Vol. 9, No. 1, 2024, p. 45.

This is a way of implementing at the national level a non-binding instrument of international law, ensuring its respect when national space activities are conducted by non-governmental entities.

2.7. CONCLUDING REMARKS

In conclusion, from these initial considerations, it appears evident how the drafters of the space treaties envisaged the authorisation mechanism as the centre of all legal aspects on private space activities. The content of domestic space authorisations and the manner of domestic supervision are, therefore, of crucial importance for each State that has a private space sector.

However, the importance of the mechanism envisaged in Article VI has not been matched by the clarity of the terms used.

The drafters of Article VI have included private activities under the expression "*national activities in outer space*"[229], but they have not clarified in which circumstances a private activity may be considered "*national*". Is it on the basis of citizenship, or territorial jurisdiction, or something else?

Moreover, the subject responsible for the authorisation and supervision of non-governmental entities is the "*appropriate State*". However, there is no explanation nor any other reference to this concept in the OST and in the following space treaties. When is it that a State is "*appropriate*" for authorising and supervising non-governmental entities?

The confusion is only increased by the use of different expressions in different contexts: for liability, the relevant State is the "*launching State*", defined as the State from whose territory or facility an object is launched in outer space or the State that launches or procures the launch of a space object[230]. As for the registration of space objects, the relevant State under the Registration Convention is the "*State of registry*", defined as "*a launching State on whose registry a space object is carried*"[231].

[229] OST, Article VI.
[230] Liability Convention, Article I(c).
[231] Registration Convention, Article I(c).

It is not specified however how these different categories of States in the field of space law are connected between one another. Can a "*launching State*" or a "*State of registry*" be a State other than the "*appropriate State*"? And if so, with which consequences in terms responsibility, liability and jurisdiction over private space activities?

All these elements of terminological difference create several issues for the application of international norms to private space activities.

It is therefore the aim of the following Chapters to address them, to describe how they have been tackled in the practice of spacefaring States and to offer some solutions against the lack of clarity that the drafters of the space treaties have left us with.

CHAPTER III

THE CONCEPT OF "NATIONAL SPACE ACTIVITIES"

SUMMARY: 3.1. Finding the appropriate state under Article VI, OST – 3.1.1. Three theories on which State is "appropriate" – 3.1.2. Testing the criterion of jurisdiction – 3.2. International registration of private space objects – 3.3. National registration of private space objects – 3.4. The relationship between Article VI and Article VIII, OST – 3.5. When launching States are not appropriate States: the issue of private actors procuring the launch of a space object – 3.5.1. Defining the launching State: territory and facility – 3.5.2. (Continues): launches and procures the launch – 3.5.3. Privately procuring a launch from a non-launching State – 3.6. Transfers of control: when space objects change nationality – 3.6.1. A premise: transfers of control, not ownership – 3.6.2. The consequences of transfers – 3.6.3. Final remarks – 3.7. State practice with regard to "national space activities" – 3.7.1. Personal jurisdiction in national space laws – 3.7.2. The practice of registering private space objects – 3.7.3. The status of 'non-launching/appropriate State' in practice – 3.7.3.1. Privately procured launches – 3.7.3.2. Transfers of control to a non-launching State.

3.1. FINDING THE APPROPRIATE STATE UNDER ARTICLE VI, OST

An activity is 'national' when it relates or belongs to a State. That is the common understanding of the adjective 'national'[232].

The drafters of the OST have used it precisely in these terms in Article II of the OST when they established a ban on "*national appropriation*" [233]. This is confirmed by the inclusion of "*claim of sovereignty*"[234] in the list of means through which – according to the provision – such appropriation can be realised: only a State, in fact, can advance a claim of that kind. It can do so using a private

[232] For example, in Black's Law Dictionary 9th Edition, 2009, p. 1121, the term "*national*" is defined as: 'Pertaining or relating to a nation'.
[233] OST, Article II.
[234] *Ibid.*

entity – for example authorising it to occupy an area for the purpose of claiming sovereignty over it – but that is just a matter of means. The power to appropriate, as intended in Article II, belongs only to States. Therefore, the expression "*national appropriation*" can be replaced in Article II with the expression 'appropriation by a State' without affecting the meaning of the norm.

The same is not true with the use of the adjective 'national' in Article VI, which centres the whole system of State responsibility around the ill-phrased expression "*national activities in outer space*".

To be more precise, the relevant sentence of Article VI reads as follows:

"*States Parties to the Treaty shall bear international responsibility for national activities in outer space, including the Moon and other celestial bodies, whether such activities are carried on by governmental agencies or by non-governmental entities, and for assuring that national activities are carried out in conformity with the provisions set forth in the present Treaty*"[235].

As can be seen, Article VI stipulates that "*national activities*" include the activities of governmental agencies and of non-governmental entities.

The reference to the latter prevents the reading of "*national*" as indicating only activities 'by a State'.

Considering the specification made after "*whether*", the adjective "*national*" has to be read as meaning: 'by governmental agencies or by non-governmental entities of a State', or in better terms: 'by State's organs or private entities of a State'.

This conclusion, however, opens the door to another question: when is it that "*non-governmental entities*" can be defined as entities 'of a State'? Is it when they are nationals of that State?

If that were true, there would be an unreasonable inconsistency within the text of the OST.

The latter, in fact, uses the term "*nationals*" elsewhere in the body of the treaty. More specifically, Article IX refers to the potential harmful interference caused by "*an activity or experiment planned by [a State] or its nationals in outer space*".

If also Article VI was meant to refer to 'nationals of a State', it would be unclear why the same subjects were indicated with different expressions within the same agreement.

[235] OST, Article VI.

Moreover, also the Liability Convention, in its Article VII, speaks of "*nationals of [a] launching State*" and "*foreign nationals*" to indicate the subjects whose damage is not covered by the Convention[236]. This further confirms that the drafters of the space treaties expressly used the term "*nationals*" when that term was deemed appropriate in a certain context.

One last argument comes from the preparatory works of the OST.

In 1962, during the debates within COPUOS on State responsibility[237], the United Kingdom proposed a provision that read as follows: "*All States shall, for themselves and for their nationals, have equal rights in the exploration and use of outer space*"[238]. The fact that the reference to "*their nationals*" was not kept in the final text of Article VI indicates that the drafters of the OST wanted to refer to something else. They used the different expression "*non-governmental entities*" in Article VI to indicate a different category of subjects.

However, while it is possible through interpretation to understand with a certain degree of certainty who such objects are not, it is less easy to understand who they are.

A hint on the meaning of "*non-governmental entities*" can be found in the second sentence of Article VI:

"*The activities of non-governmental entities in outer space, including the Moon and other celestial bodies, shall require authorization and continuing supervision by the appropriate State Party to the Treaty*"[239].

Thus, the "*non-governmental entities*" mentioned in the first sentence of Article VI have to be authorised and supervised by the so-called "*appropriate State*".

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[236] Liability Convention, Article VII: "The provisions of this Convention shall not apply to damage caused by a space object of a launching State to: (a) Nationals of that launching State; (b) Foreign nationals during such time as they are participating in the operation of that space object from the time of its launching or at any stage thereafter until its descent, or during such time as they are in the immediate vicinity of a planned launching or recovery area as the result of an invitation by that launching State".

[237] The debates regarded the text of Principle 5 of the 1963 Declaration. However, as it was mentioned before, the text of Principle 5 was then replicated with very few differences in Article VI of the OST. Therefore, it is possible to refer to the discussions made in relation to the 1963 Declaration to understand the positions of States as expressed in the OST.

[238] Letter dated 4 December 1962 from the Permanent Representative of the UK to the UN addressed to the Chairman of the First Committee, in UN Doc. A/C.1/879 of 4 December 1962, para. 4. For a more comprehensive analysis of the negotiations and drafting history behind Article VI of the OST see: M. Gerhard, *Article VI*, in Cologne Commentary I, p. 105.

[239] OST, Article VI. It must be underlined that Article VI contains also a third sentence related to the responsibility of States for the activities of international organisations. Since it is a topic that falls outside the scope of the present Thesis, its analysis is not included in the following discourse.

Therefore, the expression "*national activities*" does not refer to nationals of a State, but to private entities that have to be authorised and supervised by the appropriate State.

Even if this interpretation brings more clarity to the provision, the meaning of the adjective "*national*" is still fogged by the ambiguous expression "*appropriate State*".

When is it that a State is "*appropriate*" to authorise and supervise private entities? Article VI does not offer a definition of the term and the expression is not used in any other article of the space treaties. The only indication is that the noun "*State*" is in the singular form and therefore the provision does not envisage multiple appropriate States: in any space activity there will always be only one State that is appropriate to authorise and supervise the activities of non-governmental entities.

Lacking any further specifications, three different theories can be advanced on its meaning.

3.1.1. Three theories on which State is "appropriate"

The first one is that the "*appropriate State*" must be the State of nationality of the non-governmental entity that performs the space activity[240].

It has already been explained why this equation between 'non-governmental entities' and 'nationals' is problematic. In addition, it also brings unsatisfactory results on the allocation of responsibility, which is the purpose of Article VI. For example, if a national of State A performs a space activity from State B, despite the absence of any actual control over its national abroad and only because of the legal bond of nationality[241], State A would be responsible for authorising and supervising that activity. This is clearly an undesirable condition for the safety of space operations and for the accountability of States at the international level.

[240] See for example P. Stubbe, *State accountability for space debris*, Brill – Nijhoff, 2017, p. 269. See also M. Pedrazzi, *Outer Space, Liability for Damage*, in Max Planck Encyclopedia of Public International Law, 2008, para. 1, arguing that "both the State of the territory from which these activities are undertaken and the State, if different, of which the private entities are deemed to be nationals, according to international law, would qualify as 'national States'".

[241] In international law, the term 'nationality' is traditionally associated with the legal bond between an individual and a State, having at its basis a social fact of attachment, a genuine connection of existence, interests and sentiments, to which reciprocal rights and duties follow.

When the private operator is beyond the reach of the arm of its State, the international obligations of Article VI are factually impossible to be respected. Therefore, for the State of nationality the old Latin maxim applies: *ad impossibilia nemo tenetur.*

The second theory shifts the focus from the non-governmental entity to the State(s) involved in the launch of private space objects[242]. It argues that the appropriate State must be a "*launching State*", which is identified in Article VII as any State that either launches or procures the launch of a space object or from whose territory or facility a space object is launched[243]. Pursuant to the OST, the launching State is internationally liable for any damage caused by the object launched, whether the object is public or private[244].

Considering the connection between the "*launching State*" and international liability, and considering the connection between the "*appropriate State*" and international responsibility, the supporters of the second theory argue that it is only reasonable to unify in one State the aspects of responsibility and liability, which the drafters of the OST separated in two different provisions[245].

This way, the same State that is responsible for overlooking a private space activity is also liable for any damage caused by the respective private space object. Moreover, unlike the elusive definition of "*appropriate State*", the category of launching State is well-defined and has a wide scope of application which allows the various States involved in the launch of a space object to choose among themselves which one is the appropriate one for authorising and supervising the relative space activity. When there is only one launching State the choice of who has to bear the international responsibility for the non-governmental activity linked to the space object is straightforward, while in the case of multiple launching States, they have to decide among themselves which one will be the appropriate one for authorising and supervising the relevant space activity.

All this has the benefit of facilitating the individuation of the appropriate State.

[242] See M. Sundahl, *Legal Status of Spacecraft*, in Routledge Handbook of Space Law (ed. by R. Jakhu and others), Routledge, 2019, p. 46.
[243] OST, Article VII.
[244] *Ibid.*
[245] See H. Van Traa and others, *Space Law*, in The Practice of Shared Responsibility in International Law (ed. by A. Nollkaemper), Cambridge University Press, 2017, p. 459.

However, other than overlooking the fact that Article VI refers to activities while Article VII refers to objects, there is a structural problem that the present theory leaves unsolved.

The concept of launching State is rigid.

It functions as a photo taken at the moment of the launch and depicts the States that in that precise instant can be linked to the space object launched under one of the four categories of Article VII. But what if the private operator who ultimately controls the launched space object is in a State that cannot be qualified as a launching State under any of the four criteria of Article VII?

Pursuant to the second theory, the title of "*appropriate State*" would remain locked with a launching State even if the latter does not have any control over the private activity for which it is responsible.

However, enchaining the international responsibility for the activity of a non-governmental entity to one of the launching States – other than being problematic as it discards the fact that they are two different categories in the system of space law and are regulated in two different provisions – can be improperly restraining when the private space object is being managed by a State that does not qualify as a launching State. Either no State is actually "*appropriate*" in case the non-governmental entity is in a non-launching State at the moment of the launch, or – in case of transfers of the control of the private space object while in orbit – the original 'appropriate-launching State' incoherently continues to be internationally responsible for ensuring the conformity with international law of an activity over which it has lost any factual control.

Both results are equally undesirable.

As can be seen, the first two theories are troubled by the same problem: the dissociation between the State from where the non-governmental entity is managing the space activity and the State that is considered "*appropriate*" – and therefore internationally responsible – pursuant to Article VI.

The third theory corrects this problem, shifting the attention to the international obligations placed upon the "*appropriate State*", rather than the element of nationality or the qualification of launching State. Specifically, it brings the emphasis on the duties to authorise and supervise non-governmental entities.

As a first step, it looks at the *rationale* behind these two obligations.

They are established in the second sentence of Article VI because States have to ensure the conformity of private activities with the applicable international norms according to the first sentence of Article VI. In other terms, reading the provision as a whole, it appears that the instruments of authorisation and supervision are functional to the obligation of assurance, which is the basis for triggering State responsibility for national activities in outer space.

This brings the argument to the second step.

The verb "*assuring*" implies a position of power. Therefore, the appropriate State must be in a position of power with respect to the non-governmental entity.

At the same time, the concepts of 'authorisation' and 'supervision' imply the imposition of rules, of control mechanisms and of sanctions over a non-governmental activity.

The "*appropriate State*", therefore, must have the power to impose rules and the power to enforce them with controls and sanctions. Translated in terms of public law: it must have legislative and enforcement jurisdictions over the non-governmental entity. Only if it has such jurisdictions it becomes the appropriate subject to assure the conformity of private space activities with the applicable international obligations[246].

This criterion based on the position of power of a State in connection to the non-governmental entity allows a dynamic allocation of responsibility under Article VI.

In fact, wherever the private entity goes, there is a State that can exercise its legislative and enforcement jurisdictions on it. When the control over a space activity changes location, the original State that authorised and supervised that activity ceases to fall under the scope of application of Article VI, while – simultaneously – the State of the new location has the duties to authorise and supervise the activity and to bear the relative international responsibility.

Interpreting the term "*appropriate*" as referring to the State with jurisdiction guarantees that whichever State is in a position of complying with the obligations set forth in Article VI becomes responsible for the activity of non-governmental entities in outer space.

[246] In similar terms, see: N. Palkovitz, *Regulating a revolution: small satellites and the law of outer space*, Kluwer Law International, 2020, p. 67.

In light of this conclusion, it is possible to rewrite the expression "*national activities*" as referring to the activities of State's organs *and* of private entities that are under the legislative and enforcement jurisdictions of a State.
All this brings clarity to the scope of application of Article VI.
Yet, the soundness of the solution offered by the third theory needs also an answer to the following question: under which circumstances does a private entity fall under the legislative and enforcement jurisdictions of a State?

3.1.2. Testing the jurisdiction criterion

The power of assuring the conformity envisaged by Article VI requires the presence of the non-governmental entity in the territory of the State. If the non-governmental entity is in a foreign territory, the State cannot compel compliance or punish non-compliance with its laws and regulations.
Consider a case where an entity having the nationality of State A is commanding a space activity from a territory under the jurisdiction of State B, State A would not have the means to exert its jurisdiction over that activity because it is outside its territory. In fact, even if State A were to require certain actions or omissions with regard to the space activity, or if it were to issue sanctions or monetary judgements to its private entity abroad, State A's measures could only be enforced within its territory, for instance by seizing territorially located assets. They would not have any effect beyond State A's borders without the cooperation of State B.
This means that it is not sufficient to exercise legislative jurisdiction.
A State can pass laws and regulations of any kind and form and direct orders to anybody whatsoever. When it claims to act coercively to enforce those orders its power is tested: it is only in the moment in which the addressee of its legislative power is in its territory that the State can obtain compliance.
It follows that the jurisdiction over the place from where the private activity is controlled – which is strictly territorial[247] – is pivotal for the purpose of applying

[247] As the debate on the *Eichmann* judgement confirmed (see *Attorney-General of the Government of Israel v. Eichmann*, Israel Supreme Court, 1962, International Law Report, Vol. 36, p. 277), a State is not allowed to take enforcement measures in the territory of another State without the consent of the latter. See H. Baade, *The Eichmann Trial: Some Legal Aspects*, in Duke Law Journal, Vol. 1961, No. 3, 1961, p. 405.

Article VI[248]. Only if the non-governmental entity that manages the space activity is in the territory of a State, the latter can assure its conformity with the applicable legal framework.

The focus on the management of the space activity is particularly relevant and necessitates some further considerations.

In very pragmatic terms, every space activity requires different components in order to be performed: from the space object itself to antennas on the ground, from transmitters to data processing systems.

Irrespective of whether the activity consists in a rocket launch, in a satellite service or in any other endeavour involving a space object, there is always a central hub that controls the operations of the space object used in the activity. It is usually called the Mission Control Centre (MCC) and it has the authority and the capability to send commands that control the satellite's actions, including stopping data transmission, changing its course, or shutting off systems[249].

Even if a non-governmental entity relies also on other supporting infrastructures, such as ground stations, only through the MCC the entity can ultimately decide what to do with its space object. Therefore, the place where the mission control is exercised is the pivotal element for considering which State is the appropriate State to authorise and supervise the activity.

An example can better elucidate this conclusion.

Take the Italian company D-Orbit, which has developed an orbital transfer vehicle called ION Satellite Carrier (ION)[250]. In short, it consists in a bus where multiple satellites can be placed; the bus is launched in outer space and, once there, it has the ability to release each satellite in its orbital position.

In this fictional example, a bomb has been secretly mounted inside one of the satellites placed on the bus without anyone – not even D-Orbit – noticing it. The presence of the bomb has been discovered by Italian secret services when ION already reached outer space, but prior to its release in orbit.

[248] J. Mayence, *Granting access to outer space: rights and responsibilities for States and citizens*, in National Space Legislation in Europe (ed. F. Von der Dunk), 2011, p. 73.

[249] See. R. Frost, *How Mission Control Centers Work*, published online on 21 January 2015, available at the following link: https://medium.com/the-wonders-of-space/how-mission-control-centers-work-9cbe4d1f255f.

[250] For more information, see the link: www.dorbit.space/solutions.

The Italian public authorities decide to take action to solve this international crisis. To that end, they notify the situation to D-Orbit and order the immediate de-orbiting of ION together with the halting of any release of satellites in outer space. But can a situation of this magnitude depend on whether the authorised non-governmental entity executes the public orders received? What if it does not? Or what if the orders are not implemented exactly in the manner requested?

Leaving aside the option of defusing the bomb remotely from Earth, the only way for Italy to assure that an international crisis as the one exemplified here is solved with the application of its public powers is to: either have direct access to the MCC, enter it with public forces, and assure that any action ordered by the apposite authority is immediately put in place, or, alternatively, take direct control of ION, confiscating the keys necessary to operate it from the private MCC and assuming control of it from a public MCC.

It is evident that if D-Orbit had its MCC in a foreign State, Italy could not directly assure compliance with its orders nor with its confiscation. It would need an international accord with the foreign State from where ION is controlled, making any attribution of responsibility to Italy for the activities of D-Orbit completely illogical.

The presence of the principal place of business or of the legal headquarter, or the nationality of D-Orbit in Italy would not allow the latter to comply with its obligations under Article VI of the OST. Only the presence of the MCC in its territory could empower it to apply its public force on the authorised private actor and to assure the conformity of ION's operations with international law. That is why the qualification of a State as the "*appropriate State*" requires a direct territorial connection with the control of the space object.

It was said before that this conclusion is true even if a non-governmental entity relies also on other supporting infrastructures for its space activity.

Another example can bring more clarity to this point.

Take an earth observation satellite that is operated through a MCC placed in State A by a commercial company, Company A[251].

The raw data sent by the satellite is collected by the MCC of Company A in State A.

[251] This example is inspired by J. Mayence, above at 248.

Company A owns also several ground antennas and processing centres in various States, which are used to elaborate the data sent by the satellite and to transmit it to third parties (e.g. customers, users) around the world.

If the images taken by the satellite were considered contrary to the rights of a foreign sensed State[252], the latter should direct its complaint to the State that has jurisdiction over the actual command of the remote sensing satellite, namely State A. That is because only through the MCC it is possible to halt the collection of images by the earth observation satellite.

This means that even if the multinational infrastructure supporting the space activity of Company A entails components, facilities and centres in various States, it is the place from where the space asset is controlled – the MCC – that matters for the purpose of finding the "*appropriate State*".

Only the latter is entitled to use its enforcement powers against Company A, halting the payload operation and the transmission of the data that caused a dispute with a sensed State. It can do so because the MCC is under its jurisdiction. Therefore, State A qualifies *de iure* and *de facto* as the appropriate State for the purpose of assuring the conformity of the private space activity with international law.

This understanding of Article VI, and in particular of the expression "*appropriate State*", allows to clear the fog from the text of the provision.

The centrality of the concept of 'jurisdiction' is implicit in Article VI and it emerges through its interpretation, but there is another provision of the OST that explicitly revolves around the same concept: Article VIII. The latter regulates the registration of space objects, an aspect of particular relevance for the relationship between States and private space activities.

Considering that both provisions – one implicitly, the other explicitly – are based on the jurisdiction of spacefaring States, their relationship must be examined, testing whether the interpretation offered in the previous pages results in any incoherence within the system of the OST.

[252] The prohibition of remote sensing activities conducted in a manner detrimental to the legitimate rights and interests of the sensed State has been established in Principle IV of UNGA Res. 41/65 of 3 December 1986, titled 'Principles relating to remote sensing of the Earth from outer space'.

3.2. INTERNATIONAL REGISTRATION OF SPACE OBJECTS

Because the concept of jurisdiction in Article VIII is connected to the registration of space objects, it is necessary to describe briefly the way in which registration is regulated in space law.

There are two main forms by which space objects can be registered: one international, and the other domestic.

The international form of registration consists in furnishing information on space objects to the UN. This can be done through different legal channels, which find their legal basis in three different international norms.

The first is contained in UN General Assembly Resolution 1721B (XVI) of 20 December 1961[253].

As already mentioned before, through this resolution the General Assembly called upon States launching objects into orbit or beyond "*to furnish information promptly to the Committee on the Peaceful Uses of Outer Space, through the Secretary-General, for the registration of launchings*"[254] and requested "*the Secretary-General to maintain a public registry of the information furnished*"[255].

In the first two submissions made in 1962 according to this method, the USA and the USSR informed the Secretary-General about their objects launched into outer space between 1957 and 1962, seventy-two and sixteen respectively, indicating basic technical information (e.g. date of launch, apogee, perigee) and the purpose of each space object[256].

After the first submissions of the USA and of the USSR, several States followed their example, starting with France in 1966 and Italy in 1967[257].

Despite being based on a non-binding norm and even if new methods for registering objects at the international level were created shortly after (e.g. the Registration Convention), the practice of furnishing information to the UN

[253] UNGA Res. 1721B (XVI) of 20 December 1961, para. 1.
[254] *Ibid.*
[255] *Ibid.*, para. 2
[256] See the letter of the USA dated 5 March 1962 to the UN Secretary-General U Thant and its annex, labelled A/AC.105/INF.001, available at: www.unoosa.org/documents/pdf/inf001E.pdf. For the USSR see the letter dated 24 March 1962 to the UN Secretary-General U Thant and its annex, labelled A/AC.105/INF.002, available at: www.unoosa.org/documents/pdf/inf002E.pdf.
[257] France was the first State to follow the submissions of the USA and the USSR in 1966, see the letter labelled A/AC.105/INF.127. Italy was next with a letter of 1967 labelled A/AC.105/INF.166 on the San Marco 2 satellite.

Secretary-General through Resolution 1721B (XVI) has continued until our time. Today, several States that are not party to all space treaties and in particular of the Registration Convention, still use the mechanism envisaged therein to register their space objects with the UN: in 2024, Malaysia, the Philippines, Monaco and Ireland resorted to this mechanism, while in 2023 it was used by Iran, Moldova, Uganda and Venezuela[258].

The second norm that envisages a form of information-sharing at the international level is Article XI of the OST according to which:

"*In order to promote international cooperation in the peaceful exploration and use of outer space, States Parties to the Treaty conducting activities in outer space, including the Moon and other celestial bodies, agree to inform the Secretary-General of the United Nations as well as the public and the international scientific community, to the greatest extent feasible and practicable, of the nature, conduct, locations and results of such activities. On receiving the said information, the Secretary-General of the United Nations should be prepared to disseminate it immediately and effectively.*"

Compared to Resolution 1721 B (XVI) which is limited to the registration of launchings, Article XI has a wider object. It concerns different aspects of space activities and it has a stronger emphasis on their scientific aspect, as it is remarked by the inclusion of the "*results of such activities*" among the information to be submitted and by the express reference to the international scientific community.

The larger scope and purpose of Article XI is, however, undermined by the expression "*to the greatest extent feasible and practicable*", which allows a certain degree of flexibility for States in deciding when and how to notify the UN Secretary-General.

Despite its less frequent use, the mechanism of Article XI has recently proved to be an effective means to inform the international community on events resulting from the dynamism of new private space activities, such as changes of ownership or changes of orbital positioning of space objects[259].

[258] For the registration made in 2023 and in 2024 see respectively the following two links: www.unoosa.org/oosa/en/spaceobjectregister/submissions/years/2023.html. www.unoosa.org/oosa/en/spaceobjectregister/submissions/years/2024.html

[259] See for example the satellite EchoStar XXIII, which was launched by the USA and registered with the UN in 2017 (ST/SG/SER.E/803), but in 2019 it passed under the supervision of the UK which informed COPUOS according to Article XI of the OST (A/AC.105/1277).

The third international norm can be found in Article IV of the Registration Convention of 1976.

It imposes on the so-called State of registry – which is "*a launching State on whose registry a space object is carried*"[260] – to "*furnish to the Secretary-General of the United Nations, as soon as practicable, […] information concerning each space object carried on its registry*"[261].

It then lists the minimum content of such information (e.g. name of launching States, date of launch, function of the object)[262] and it envisages the possibility of furnishing additional information during the life of a space object, including any update on objects which have been but are no longer in orbit[263].

Also here, the obligation to submit information at the international level is softened by the expression "*as soon as practicable*", which allows States to delay their submissions[264].

Unlike the first two mechanisms, Article IV of the Registration Convention has a narrower subjective scope of application as it is addressed only to the State of registry, defined as "*a launching State on whose registry a space object is carried*"[265].

However, when a State does not qualify as a State of registry for the purpose of Article IV of the Registration Convention, it may still be requested to submit information to COPUOS under the other mechanisms of information-sharing mentioned above[266].

See also the conference room paper submitted by the UK to COPUOS titled 'Sharing approaches of the United Kingdom to Article XI implementation and notifications', in UN Doc. A/AC.105/C.2/2024/CRP.21 of 15 April 2024.

[260] Registration Convention, Article I(c).

[261] *Ibid.*, Article IV.

[262] *Ibid.*, Article IV(1).

[263] *Ibid.* Article IV(2) and (3).

[264] The use of the indicator "*promptly*" in the text of the operative part of the Resolution is interesting: this is a stronger condition than the criterion applied in the Registration Convention, which requires submitting information on space objects somewhat vaguely "*as soon as practicable*". See M. Hofmann, *Registration of Space Objects*, in International Space Law in the New Space Era (ed. by Sandeepa Bhat), Oxford University Press, 2024, p. 124.

[265] Registration Convention, Article I(c).

[266] For the sake of completeness, it must be remembered that information on space activities may be sent to the UN also based on other mechanisms, such as Article V of the OST and Article V of the Rescue and Return Agreement concerning information on astronauts and space objects discovered on Earth after their re-entry; as well as Principle 5 of the Principles Relevant to the Use of Nuclear Power Sources In Outer Space concerning space objects with nuclear elements on board. They have not been included in the list because they represent specific expressions of the more general mechanisms described in the main text.

These three methods of registering space objects with the UN are based on different legal norms and are therefore officially organised under three different tracks of records by the UN Office for Outer Space Affairs (UNOOSA)[267].

However, the latter has recently transferred all the information it collected through the years in one place called "*Online Index of Objects Launched into Outer Space*" (hereinafter: Online Index)[268].

The latter – as clarified by Tanja Masson-Zwaan – is not an online version of the Register of Objects Launched into Outer Space[269]. Rather, it is a reference tool that contains "unofficial" information (but usually with a link to the official submission document) and that is intended to assist States in searching for registration documents associated with a space object as well as identifying which functional space objects remain unregistered[270].

On the Online Index, it is still possible to see separately the entries provided according to each of the three mechanisms[271], but the final result in pragmatic terms is a comprehensive list of space objects publicly available on the website of UNOOSA.

The reason behind the creation of this searchable database is simple: the informations submitted by States to the UN on national space activities help the identification of the relative space objects and contribute to the application and development of international law governing the exploration and use of outer space[272]; the practice of registration is a means for fostering international cooperation and building confidence among spacefaring States through transparency and openness. Every one of the three norms analysed above is based

[267] UNOOSA serves as secretariat office to COPUOS. The information furnished to UNOOSA are registered under different identification codes: A/AC.105/INF… for information furnished under Resolution 1721 B (XVI); ST/SG/SER.E… for information furnished under the Registration Convention; A/AC.105/… for information furnished under Article XI of the OST.

[268] The Online Index is available at the following link: www.unoosa.org/oosa/osoindex/search-ng.jspx?lf_id=.

[269] T. Masson-Zwaan and others, *The need to improve registration practices in the context of space traffic management*, in Acta Astronautica, Vol. 223, 2024, p. 246.

[270] *Ibid.* See also UNOOSA, *Registration of Objects launched in Outer Space – Stakeholder Study*, ST/SPACE/91, 2023, p. 34, specifying that the Online Index "is a synthesis of the official information mentioned above, as well as information obtained from official data sources, such as the United States Space Force Space Track website, as well as the websites of national space agencies, regulatory bodies, and official media sources. Unofficial information is differentiated by appearing within square brackets ([ ]) and are highlighted in green. As the Online Index includes unregistered functional space objects, it also serves as a means for States to identify which space objects require registration".

[271] See for example the classification of the submissions by the USA as reported at the link: www.unoosa.org/oosa/en/spaceobjectregister/submissions/usa.html

[272] Registration Convention, Preamble.

on that idea. Therefore, UNOOSA has organised in the Online Index the different information obtained through the complementary registers in a manner that centralises the information received. All this facilitates the access to them and provides a complete view of all space objects irrespective of the legal basis used to submit the relative information.

3.3. NATIONAL REGISTRATION OF SPACE OBJECTS

In parallel to the international registry maintained by the UN, there are also the domestic ones, which respond to a completely different *rationale*.

The idea of setting up a national registry administered by a domestic authority according to a national law did not originate from an international norm, but rather it was the practice of the early spacefaring States that set the example[273].

Both the USA and the USSR started cataloguing domestically the space objects launched by them in outer space at the very beginning of their space endeavours[274].

Thus, when the OST was adopted in 1967 it mentioned national registries as a given element of space activities, without requiring expressly States Parties to establish them. More specifically, Article VIII reads as follows:

"*A State Party to the Treaty on whose registry an object launched into outer space is carried shall retain jurisdiction and control over such object*"[275].

As can be seen, the text of the provision does not impose an obligation to set up a national registry, nor does it provide any detail on how the registration process should be performed, for example in terms of content, form or timing.

The reason is that Article VIII focuses on another aspect: the consequence of a domestic registration, which is the retaining of jurisdiction and control over the space object by the State that registers.

[273] See UNOOSA, above at 270, p. 16.

[274] The USA used to track and catalog space objects since the early days of space exploration through the so-called Satellite Catalog or SatCat, managed by the Space Surveillance Network under the Department of State. Similarly, the USSR had a system of cataloging space objects that was part of the broader Space Surveillance System (SSS) managed by the Soviet military, particularly under the auspices of the Strategic Rocket Forces.

[275] OST, Article VIII.

A proper obligation to set up a registry at the domestic level was established only in 1976 with the adoption of the Registration Convention.

In Article II thereof it is affirmed:

"*The launching State shall register the space object by means of an entry in an appropriate registry which it shall maintain*"[276].

The provision does not require specific elements for making the registry "*appropriate*". To the contrary, it continues by stating that "*the contents of each registry and the conditions under which it is maintained shall be determined by the State of registry concerned*"[277].

Notably, the obligation of Article II is addressed exclusively to launching States.

This difference in scope of application between Article II of the Registration Convention ("*the launching State*") and Article VIII of the OST ("*A State Party*") begs the question: what is the relationship between the two provisions?

There are two possible answers.

The first is that Article II of the Registration Convention is a development of Article VIII of the OST, transforming the latter into an obligation.

Therefore, when the drafters of the OST used in Article VIII the expression "*a State Party on whose registry an object launched in outer space is carried*" they meant a launching State. This implicit meaning was rendered explicit in Article II of the Registration Convention.

Considering that – according to Article II of the Registration Convention – only a launching State can carry a space object on its national registry, and considering that – according to Article VIII of the OST – the registration at the domestic level allows a State to retain jurisdiction and control over the space object, it must be concluded that jurisdiction and control over space objects are the exclusive prerogative of launching States[278].

Other than the issues already highlighted in the previous pages concerning the idea of locking the concept of 'jurisdiction' with the concept of 'launching State', this answer is unsatisfactory also under other considerations that are purely related to registration.

[276] Registration Convention, Article II.
[277] *Ibid.*, Article II(3).
[278] See for example A. Kerrest, *State responsibility and liability for space activities*, in Space Law (ed. by T. Leclerc), ISTE – Wiley, 2023, p. 114.

Firstly, nothing in the text of the OST points to the conclusion that a State that registers a space object in its domestic registry for the purpose of Article VIII must be a launching State. Article VIII refers in general to "*A State Party*" without any further qualification, meaning that any State Party to the OST can carry an object on its national registry. Article II of the Registration Convention on the other hand is confined to the category of launching State.

The different wording used by the drafters of the OST and by the drafters of the Registration Convention cannot be ignored. Even if the Registration Convention was considered a subsequent agreement regarding the interpretation or the application of the OST pursuant to Article 31 of the VCLT[279], the combined reading of the two provisions would create an asymmetric result. In fact, not all States parties to the OST have ratified also the Registration Convention. Therefore, for the ones who are not parties of both treaties, Article VIII of the OST would have a different meaning, detached from the concept of 'launching State'[280].

[279] According to Article 31, para. 3, of the VCLT, in the interpretation of a treaty "there shall be taken into account, together with the context: (a) any subsequent agreement between the parties regarding the interpretation of the treaty or the application of its provisions". On this regard, the ILC has concluded that an agreement under Article 31, para. 3, lett. (a), requires a common understanding regarding the interpretation of a treaty which the parties are aware of and accept. See ILC, *Subsequent agreements and subsequent practice in relation to the interpretation of treaties*, in Yearbook of the International Law Commission 2018 - Vol. II Part Two, 2023, p. 63. In the case of the Registration Convention, it is true that the second *considerànt* of its Preamble recalls the first sentence of Article VIII of the OST. However, this does not imply that the States Parties of the Registration Convention have specifically and purposefully assumed a position regarding the interpretation of Article VIII of the OST. Moreover, in the case at hand, only certain parties of the OST have ratified the Registration Convention. This may bring to the conclusion that the Registration Convention is an agreement aimed at modifying between its parties the interpretation or application of Article VIII of the OST, thus falling under Article 41 of the VCLT. However, there is no conclusive evidence of the fact that the States Parties to the Registration Convention intended to modify Article VIII of the OST, nor they notified the other parties of the OST of such intention as envisaged in Article 41, para. 2. In addition, there is a certain reluctance of international tribunals to recognise the interpretative influence of subsequent agreements. On this regard, see the analysis – focused on investment treaties – in: L. Kulaga, *Conflict of Treaty Norms and Subsequent Agreements in Relation to the Interpretation of Treaties in International Investment Law*, in Custom and its Interpretation in International Investment Law (ed. by P. Merkouris and others), Cambridge University Press, 2024, p. 219. More in general on subsequent agreements, see O. Dorr and others, *Vienna Convention on the Law of Treaties A Commentary - Second Edition*, Springer-Verlag, 2018, p. 777.

[280] This situation would create differentiated bundles of obligations split among subsets of States Parties, with some adhering to the modified text (i.e. Article VIII of the OST interpreted in light of the Registration Convention) and others following the original. Although this is a possibility envisaged in the law of international treaties (see Article 30 of the VCLT on the application of successive treaties relating to the same subject matter), its practical consequences could bring to confusing results. A launching State that ratified the Registration Convention and a non-launching appropriate State that ratified only the OST may both register the same space object claiming jurisdiction and control over it pursuant to Article VIII of the OST. On the matter of successive treaties in international law see: L. Bélanger and others, *Treaty amendment procedures: A typology from a survey of multilateral*

Secondly, the specific scope of application of Article II of the Registration Convention has a precise *rationale*: transparency on the details of space objects and on the individuation of the launching State(s) connected to it.

Because the category of 'launching State' revolves around the allocation of liability in case of damages caused by space objects, imposing on a launching State to become a State of registry pursuant to Article II and – as a consequence – to furnish information to the UN pursuant to Article IV, can be interpreted as being functional to liability claims.

Put shortly, the transparency professed by the Registration Convention serves the purpose of facilitating the allocation of liability in case of damages.

In pragmatic terms, letter a) of Article IV indicates as the first information to be submitted at the international level: "*Name of launching State or States*". This information allows any victim to find out who is the liable State (or States[281]) in case of damages caused by a space object. It is a mechanism that perfectly embodies the spirit of transparency and international cooperation that informs the whole Registration Convention.

On the other hand, Article VIII of the OST serves a radically different purpose, which – as already mentioned – is to allow a State to retain jurisdiction and control over an object registered domestically. It is not a registration aimed at safeguarding victims of damages, but at enhancing the position of the State who has jurisdiction over a space object *vis-à-vis* the rest of the international community.

The different purpose of the two provisions contrasts with any interpretation that strictly enchains them together.

Thirdly, it is true that only a launching State can be a State of registry under the Registration Convention, but this does not mean that a State that does not qualify as a launching State cannot register a space object in its national registry and then provide information to the UN using one of the other mechanisms described above, e.g. Article XI of the OST.

environmental agreements, in Leiden Journal of International Law, Vol. 37, 2024, p. 63. See also O. Dorr, above at 279, p. 550.

[281] The "*Name of launching State or States*" is the first information that the State of registry has to submit under Article IV of the Registration Convention.

Even if one of the launching States is obliged to register domestically the space object pursuant to Article II of the Registration Convention and to furnish all the relevant information to the UN pursuant to Article IV, the State that has jurisdiction and control over the space object can still register it in its national registry for the purpose of retaining jurisdiction and control over the object.

As a result, the same space object appears in the domestic registries of two different States for two different purposes. To avoid any confusion, it is possible to include in the entry of each domestic registry a note on the legal basis for registration, such as "*registered pursuant to Article II of the Registration Convention*" or "*registered for the purpose of Article VIII of the Outer Space Treaty*". Alternatively, among the information provided it is possible to add a line simply stating that the "*appropriate State*" is State X (or using a different terminology the 'authorising State' or the 'State of licence').

Traditionally, this has not been the case in space activities: the launching State was also the State with jurisdiction over the space object and therefore while it registered that object pursuant to the Registration Convention, it activated also the effects of Article VIII of the OST. In fact, the expression "*on whose registry*" in Article VIII can perfectly include also the domestic registry mentioned in Article II of the Registration Convention.

However – and this specification is crucial – even if Article VIII *can* apply to national registrations performed under the Registration Convention, it is *not limited* exclusively to such registrations[282].

It can perfectly apply autonomously to the registration of a space object by a non-launching State without any link with Article II of the Registration Convention and without the necessity of forcing any unwritten merging between the two provisions.

[282] This is confirmed by UN General Assembly Resolution 62/101 of 10 January 2008, titled 'Recommendations on enhancing the practice of States and international intergovernmental organizations in registering space objects'. It recommends that "States should encourage launch service providers under their jurisdiction to advise the owner and/or operator of the space object to address the appropriate States on the registration of that space object". It further recommends that "following the change in supervision of a space object in orbit: the State of registry, in cooperation with the appropriate State according to article VI of the Outer Space Treaty, could furnish to the Secretary-General additional information. If there is no State of registry – it continues – the appropriate State according to article VI of the Outer Space Treaty could furnish the above information to the Secretary-General".
These recommendations implicitly recognise that registration is not a prerogative of launching States. Also the appropriate State can register a space object and furnish the relevant information to the UN Secretary-General if the circumstances of the case so require.

In view of the three remarks described above, the question on what is the relationship between Article II of the Registration Convention and Article VIII of the OST must be answered differently: the two provisions belong to two different legal instruments and, therefore, they apply separately, as two different tracks.
They may overlap – as it has often been the case in space activities – but they maintain their different scope of application, their different purpose and their autonomy within the system of space law.
Having clarified the forms and mechanisms for registering space objects, it is now possible to analyse whether the conclusion reached with regard to jurisdiction under Article VI is compatible with the use of the same concept in Article VIII.

3.4. THE RELATIONSHIP BETWEEN ARTICLE VI AND ARTICLE VIII, OST

At the beginning of this Chapter, it was said that the "*appropriate State*" is the one with legislative and enforcement jurisdiction over the MCC of a private space activity.
At the same time, Article VIII of the OST prescribes that the State on whose registry a space object is carried retains jurisdiction and control over that object.
Does that mean that to become the "*appropriate State*", it is necessary to register domestically a private space object pursuant to Article VIII?
The words used by the drafters of the provision are clear: the domestic registration of a space object is connected to the concepts of "*jurisdiction and control*" through the verb "*retains*".
Not 'obtains', 'acquires' or 'exercises', but "*retains*" ("*conservera*" in the French text, and "*retenderà*" in the Spanish one).
It follows that the State on whose registry a space object is carried simply continues to hold "*jurisdiction and control*".
But if these two powers are merely retained after registration, it means that they were already in the hands of the relevant State before and irrespective of the act of registering the space object.
The verb "*retains*", therefore, expresses the real function of registration pursuant to Article VIII: to prove externally the exercise of a State's jurisdiction and control over a space object.

In other terms, this form of domestic registration appears to have only a declarative function. It does not have constitutive effects[283]. It serves as the basis to demonstrate – through a formal act – that a space object is under the powers of a particular State.

Put differently, whichever State concretely has jurisdiction and control over a space object is in the position to retain it by carrying that object on its national registry.

The declarative function of Article VIII is confirmed by the last sentence of the provision, which establishes that "*[space] objects or component parts found beyond the limits of the State Party to the Treaty on whose registry they are carried shall be returned to that State Party, which shall, upon request, furnish identifying data prior to their return*"[284].

Thus, under Article VIII, domestic registration is a means for proving to the international community that the State on whose registry an object is carried is the one who has jurisdiction and control over that object and, therefore, is entitled to having it returned[285]. The element of furnishing identifying data emphasizes the idea that only the State with actual jurisdiction and control can demonstrate to be the legitimate State under Article VIII, because it is the only one that has access to all data concerning the relevant space object.

A final confirmation comes from the fact that in case of conflicts between multiple domestic registrations made by different States, the solution must be found through an investigation in point of fact, individuating the State that was in the actual position of exercising (and therefore also retaining) jurisdiction and control over the disputed space object.

[283] Some authors have argued the opposite. For example, Bernhard Schmidt-Tedd considers that the registration of a space object has a constitutive effect. According to him, the appropriate State of registry 'gains' jurisdiction and control over the space object through the registration. B. Schmidt-Tedd, *Registration of Space Objects*, in Oxford Research Encyclopedia of Planetary Science, 2017.

[284] OST, Article VIII.

[285] An objection may be raised on this regard looking at the text of the Return Agreement. In fact, the latter stipulates in its Article 5(3) that if a space object is "found beyond the territorial limits of the launching authority, [it] shall be returned to or held at the disposal of representatives of the launching authority, which shall, upon request, furnish identifying data prior to their return". However, in case the State that qualifies as the launching authority is different from the State that has jurisdiction over the space object found, Article VIII of the OST must prevail in accordance with the rules on the interpretation of conflicting treaties among the same parties. The reason is that it would not be logical to return a space object to a State that has no jurisdiction on it and therefore has no right to enter in the possession of the object itself.

From this, it can be concluded that the "*appropriate State*" does not *need* to register domestically a private space object in order to exercise jurisdiction and control over it. However, a State that *wants* to register that space object domestically and that *wants* to trigger the legal consequences of Article VIII, *needs* to be – inescapably – the "*appropriate State*". Only the latter has the right to be the State on whose registry a private space object is carried for the purpose of Article VIII.

This association between the State indicated in Article VI and the State indicated in Article VIII may raise a doubt: why did the drafters of the OST not use the same expression – "*appropriate State*" – in both provisions?

The reason is that the concept of "*appropriate State*" is only relevant with regard to private space activities. However, 'domestic registration' and 'jurisdiction and control' are elements that concern also public space objects. Hence, Article VIII was drafted using the more general expression "*A State Party to the Treaty*"[286].

The difference between the two provisions is simply that Article VIII applies to all space objects irrespective of whether they are private or public, while Article VI translates the concepts of jurisdiction and control in the relationship between States and private space activities, and therefore uses the concepts of authorisation and supervision.

It is possible in fact to see those two concepts as nothing else than the application of jurisdiction and control to private space activities: 'authorisation and supervision' and 'jurisdiction and control' appear – under this light – as two sides of the same coin.

In this regard, the conclusion reached in the previous Section assumes particular relevance: a State is the "*appropriate State*", and therefore is in the position to comply with the international obligations of authorising and supervising a private space activity, only if it has the legislative and enforcement jurisdictions over the mission control centre of the respective private entity.

This condition is based on a *de facto* situation that depends merely on the geographical position of the MCC.

Because the MCC is the physical place where an entity controls the space object, having jurisdiction over the MCC, and therefore authorising and supervising the

[286] *Ibid.*

private activity conducted through it, means also having jurisdiction and control over the object in outer space.

As a result, the suggested relationship between the "*appropriate State*" and the registration of private space objects appears to be perfectly compatible with the conclusions reached in the previous Section on the role of the "*State of registry*" and on its possible separation from the State registering a private object under Article VIII of the OST.

It was said that the "*State of registry*", as a launching State, registers for a purpose and under a regime that are completely different from the ones applicable to the domestic registration pursuant to Article VIII. In the present Section, it was further argued that the latter form of registration is a prerogative of the "*appropriate State*".

Therefore, the system of space law can be seen as a system entailing the necessary conjunction between the "*appropriate State*" and the domestic registration of Article VIII, and the possible dissociation between the "*appropriate State*" and the launching State/State of registry under the Registration Convention. This creates a distribution of the rights and obligations set forth by the space treaties with respect to private space activities that depends on which State has jurisdiction over them.

A demonstration of all this can be found in the fact that private space activities can only fall under two possible scenarios.

In the first, a "*launching State*" has jurisdiction over the MCC of the private object launched. Therefore, it qualifies concurrently as a "*launching State*" and as the "*appropriate State*".

In this situation, the launching/appropriate State – assuming that it ratified the Registration Convention – must comply with two main obligations: 1) the obligation to authorise and supervise the non-governmental entity so as to ensure the conformity of its activity with the applicable legal framework; 2) the obligation to register domestically the relative private space object and to furnish all the necessary information to the UN pursuant to the Registration Convention.

The domestic registration which renders that State the "*State of registry*" triggers at the same time the application of Article VIII of the OST with regard to the declarative function of retaining jurisdiction and control over the private space object.

Therefore, the first scenario sees only one State that channels upon itself all the categories that are relevant in the system of space law for the relationship with non-governmental entities, creating a simple and perfectly coherent application of the various relevant provisions.

On the other hand, in the second scenario, none of the "*launching States*" has jurisdiction over the MCC of the non-governmental space operation, because a different State – with no connection to the launch of the private space object – is in the actual position of exercising legislative and enforcement jurisdiction over the private actor. In this scenario, only the latter State qualifies as the "*appropriate State*".

Thus, the distribution of obligations changes with respect to the first scenario.

The launching State chosen as the State of registry has two obligations: 1) to register domestically and 2) to register internationally the space object launched pursuant to the Registration Convention. However, due to the lack of any factual jurisdiction and control over the space object, that launching State/State of registry cannot trigger the legal effects of Article VIII of the OST.

At the same time, the "*appropriate State*" cannot become the "*State of registry*" because it does not qualify as a launching State. However, because of its position, it has one obligation: to authorise and supervise the non-governmental entity for the purpose of assuring the conformity of the latter's activity with the applicable legal framework.

Notably, it does not have an obligation to register the private object domestically because Article VIII does not contain such obligation, but if it decides to do so, it activates the legal consequences linked to the declarative function of Article VIII[287].

The second scenario, therefore, depicts a separation between the "*appropriate State*" – relevant under Article VI and Article VIII of the OST – and the launching State – relevant under the Registration Convention in its quality of "*State of registry*".

This distribution of rights and obligations among States which revolves around the concept of jurisdiction not only reflects a more coherent reading of the

[287] This is notwithstanding the fact that such State may be required to furnish information on that object at the international level pursuant to the other two mechanisms, namely Resolution 1721 (B) or Article XI of the OST.

international space treaties, but also better fits the current dynamics of space activities where the State that has jurisdiction and control over a private space object may very well be different from the launching State(s).

The theory exposed in the previous pages finds a final confirmation in two particular instances which are the product of contemporary private space activities: first, the increasingly frequent case of private actors procuring the launch of a space object; second, the often problematic practice of changing the control of a private space object after its launch.

3.5. When Launching States are not Appropriate States: The Issue of Private Actors Procuring the Launch of a Space Object

When an object is set to be launched in outer space, aerospace engineers would focus their attention mainly on two aspects: the type of rocket used and the place and time of launch.

For space lawyers, however, the aspects to look upon are quite more diversified.

Four different criteria have been envisaged by the drafters of the OST as legally relevant in case of space launches.

They are enshrined in Article VII of the OST where they are used as the basis to find and define the category of the "*launching State*".

According to the provision, a launching State is each State that launches or procures the launch of a space object as well as each State from whose territory or facility an object is launched[288].

The precise meaning of these four alternatives can be summarised as follows.

3.5.1. Defining the Launching State: Territory or Facility

Starting with the last two concepts, namely 'territory' and 'facility', they are the most straightforward ones in terms of interpretation.

[288] OST, Article VII. The same definition is used also in the Liability Convention at its Article I, lett. (c).

In general, the territory of a State can be regarded as the geographical area in which its sovereignty is exercised[289]. This area is delimited by the national borders, including the territorial sea and the airspace above it. Therefore, any space launch within them makes the territorial State a launching State.

The concept of "*territory*" includes also its fictional dimension. In fact, certain things that are registered within a State are considered through a *fictio iuris* an extension of its territorial sovereignty irrespective of where they are[290]. This is the case for vessels and aircraft, respectively under the UNCLOS [291] and under the Chicago Convention[292]. Therefore, a State is considered a launching State also if a space object is launched from a ship sailing with its flag (e.g. the launch of the rocket Gravity-1 from a Chinese vessel in the Yellow Sea[293]) or from one of its registered aircrafts in the air (e.g. the launch of the spacecraft Spaceship Two from a US registered aircraft[294]).

In addition to territory, vessels and aircrafts, also national facilities are relevant under Article VII. From the perspective of space launches, a facility can be regarded as an infrastructure devolved to the launching of spacecraft.

Because a launch from any of such infrastructures within national borders would be already included under the word 'territory' making the word 'facility' completely superfluous, it is clear that the drafters used the latter to refer to something else. Notably, in the same year of the adoption of the OST (1967), the Italian satellite San Marco 2 was launched from a maritime platform off the coast of Kenya[295]. It was the first time that an infrastructure of that kind, built in international waters, was used for launching space rockets, raising great resonance

[289] Max Huber in his award on the Island of Palmas case of 1928 stated: "sovereignty in relation to a portion of the surface of the globe is the legal condition necessary for the inclusion of such portion in the territory of any particular State". *Island of Palmas case (The Netherlands v. USA)*, PCA Case No. 1925-01, award of 4 May 1928, p. 829.

[290] See M. Shaw, *International Law (5th ed.)*, Cambridge University Press, 2018, p. 409.

[291] UNCLOS, Article 91 et seq. On this matter see the scholarly work of G. Gauci, *The Ship as an Extension of Flag State Territory and an Entity with Human Attributes – Is it Time to Jettison These Legal Fictions?*, in International and Comparative Law Review, Vol. 21, No. 2, 2021, p. 7.

[292] Chicago Convention, Article 17 et seq.

[293] For more information, see article posted by The State Council Information Office of the People's Republic of China on January 12, 2024, at the following link: http://english.scio.gov.cn/chinavoices/2024-01/12/content_116936688.htm

[294] For more information, see the press release of the company Virgin Galactic on its latest flight using such launching system, available at the following link: www.virgingalactic.com/news/virgin-galactic-completes-sixth-successful-spaceflight-in-six-months

[295] The story of the San Marco has been reported in English by: H. Nesbitt, *History of the Italian San Marco equatorial mobile range project*, NASA CR-111987, 1971.

at the international level[296]. It is imaginable that the drafters of the OST were aware of this peculiar Italian endeavour. Considering that the territorial status of offshore platforms was (and still is) questionable, any launch such as the one of San Marco 2 would have escaped the coverage of Article VII under the word 'territory'. Therefore, the addition of the word 'facility' was necessary to cover also the utilisation by States of similar launching systems in the future and to deal with any issues generated by a narrow interpretation of the term 'territory'.

Moreover, the word 'facility' was also functional to the appropriate attribution of the qualification of launching State in two other occasions. First, in case of launches from facilities built in other areas beyond territorial sovereignty, such as the ones on the Moon or on other celestial bodies. Second, in case of a facility owned and managed by a State in another State's territory, where – without the inclusion of the word 'facility' – the State managing the launch may escape the legal consequences of being a launching State[297].

3.5.2. (Continues): Launches or Procures the Launch

Shifting now to the other two circumstances that determine the status of launching State, it can be noticed that they are not connected to geographical or material elements, but to particular actions: "*launches*" and "*procures*".

Any State that launches or procures the launching of a space object from its territory or from its facility is already a launching State under the two words analysed above. Therefore, the verbs 'launch' and 'procure' must refer to a different launch dynamic in order to have their own semantic autonomy within the provision.

In particular, it is possible to interpret them as including any State other than the one from whose territory or facility a space object is launched. This means that they refer to third States that lack the infrastructural means to launch.

A factual consideration can help clarify this interpretation.

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[296] *Ibid.*, p. 4.

[297] A case in point is the Baikonur Cosmodrome, built on the territory of Kazakhstan, but managed by Russia. The legal consequences of this situation have been analysed in: G. Zhukov, *Can the State from Whose Territory a Space Object Was Launched Declare Itself a Non-Launching One?*, in Air and Space Law, Vol. 28, No. 1, 2003, p. 50.

Nowadays there are seventy-five individual States from across the globe that operate active satellites[298]. However, only a few dozen States have the capabilities to send a space object in Earth's orbit or beyond with their own infrastructures[299]. Therefore, there are several States of the international community that use foreign launching platforms to launch their space objects in outer space. In each of these cases, the State other than the State of territory or the State of facility can be considered a launching State.

For example, when Italy launches its rocket Vega from the French launching facility in Kourou (French Guiana), both Italy and France can be considered launching States respectively under the word 'launches' and under the words 'territory' or 'facility' of Article VII.

In its ordinary meaning, the verb 'launches' indicates the action of directly sending an object into outer space. It involves simply the utilisation of another State's territory or facility, but the launch itself is performed by the foreign State. This is precisely the situation described in the example of Italy and France.

In all other cases in which a State does not even have a launch vehicle, meaning that it does not have the capability of directly launching an object in outer space, it has to rely on a foreign entity for everything other than providing the space object to be launched. In this case its status of launching State is covered by the verb 'procures'.

'To procure a launch' indicates the action of purchasing a launching service from an external source and therefore causing – or contributing to cause – the launch to take place.

This relationship of cause-effect emerges also from the other official languages of the OST: the French version of Article VII uses the expression "*fait procéder au lancement*", while the Spanish one uses the words "*promueva el lanzamiento*".

Thus, when a State uses a foreign launching service provider to deliver its space object in outer space, it can be considered a launching State.

Also, among scholars, there is consensus that the concept of 'procurement' refers to States paying for the launch of their space objects on top of a foreign launch

[298] The information is taken from the database collected and published by the Union of Concerned Scientists, available at the following link: www.ucsusa.org/resources/satellite-database

[299] A list of States with launch site facilities is available at the following link: www.cia.gov/the-world-factbook/field/space-launch-sites/.

vehicle, irrespective of whether it is a public or private entity that performs the launch[300].

This feature of Article VII has proved to be foresighted, as the State that procures the launch is often the only one to have a legal link to the satellite once it is in orbit[301]. The other launching States, such as the one from whose territory the object is launched, have control over the latter only during the launch operation and until the object is detached from its carrier. After that, an enduring link with the space object must be found elsewhere; the procurement of the launch usually conveys the solution.

The interpretation of the four criteria of Article VII offered here concerns only the position of States. However, just as much as private actors can be the subjects that perform a space launch, they may very well be also the subjects that procure it.

Hence, the question: what happens to the application of Article VII – and therefore to the attribution of the quality of "*launching State*" – in case of privately procured space launches?

3.5.3. Privately procuring a launch from a non-launching States

According to the text of the provision, the subject of the verb 'procures' is "*each State Party to the Treaty*". Therefore, the action must be performed by a State to be relevant under Article VII.

This conclusion leaves out all the instances in which launches of space objects are procured by private entities which operate from a State that does not fall under the scope of application of Article VII – a condition increasingly frequent in contemporary space activities.

For example, a private space company operating under the jurisdiction of State A may decide to procure the launch of its satellite from State B's territory and facility. Only State B can be considered a launching State, while the position of State A does not come into relevance for the purpose of Article VII.

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[300] See A. Kerrest and others, *Liability and Insurance in the Context of National Authorisation*, in National Space Legislation in Europe: Issues of Authorisation of Private Space Activities in the Light of Developments in European Space Cooperation, Nijhoff, 2011, p. 126. See also N. Jasentulyiana, *International Space Law and The United Nations*, Kluwer Law Internationals, 1999, p. 36.

[301] A. Kerrest, *The concept of the 'launching State' in commercial launch ventures*, in Commercial Uses of Space and Space Tourism, Edward Elgar Publishing Limited, 2017, p. 5.

A more complex but not less frequent example is that of a private space company from State A that does not even directly procure the launch, but pays a third foreign party – usually called a launch broker – from State B to take care of all the preparation stages prior to the placement in orbit of a space object. Building the satellite, finding a launch service provider for the launch, delivering the space object into orbit, all these aspects are taken care of by the foreign party who hands 'the keys' of the space object to the first company only once the object is in orbit. In this case, the company who purchased the preparation service from the foreign party is not directly paying for the launch, but its interest in having the satellite launched is the sole reason why it is launched, so this would, at the very least, constitute 'procurement by proxy'[302]. Therefore, even if all the activities related to the launch are taken care of from State B, a non-governmental entity from State A is *de facto* procuring the launch. Nonetheless, State A should not be considered a "*launching State*" pursuant to Article VII, lacking any link to the four criteria established therein.

These examples show how the involvement of private actors in space activities can widen the occasions in which the launching State is not in the position to exercise any control over the space object launched because it has no jurisdiction over its operator. In these cases, the only thing in the power of the launching State is to conduct a payload review through the launch service provider before the rocket takes off. After that, anything that the operator of the space object launched does is beyond the purview of the launching State.

A separation between the launching State and the State exercising jurisdiction and control over a private space activity is considered by most scholars [303] as problematic because – according to Article VII of the OST – the launching State is internationally liable for any damage caused by the object launched (see Chapter IV, Section 4.3). This means that a State can have jurisdiction and control over the operations of a space object whose launch was privately procured therefrom, but because it does not fall under the notion of "*launching State*" it cannot be liable

[302] See F. Von der Dunk, *Regulation of Space Activities in The Netherlands: From Hugo Grotius to the High Ground of Outer Space*, in Space, Cyber, and Telecommunications Law Program Faculty Publications, No. 61, 2010, p. 234.

[303] A. Kerrest and others, *Article VII*, in Cologne Commentary I, p. 137. A. Froelich and others, *National Space Legislation*, Springer, 2018, p. 12. See also B. Schmidt-Tedd, *Article VIII*, in Cologne Commentary I, p. 153; as well as R. Jakhu and others, *Critical issues related to registration of space objects and transparency of space activities*, in Acta Astronautica, No. 143, 2018, p. 407.

pursuant to Article VII. At the same time, the State from whose territory that same object was launched must bear international liability for any damage caused by it, even if it lacks any possibility of controlling it or intervening over its operations with its public powers.

In light of this situation and in the spirit of allocating liability to the State with the closer link to the space object, some scholars have argued that Article VII has to be read extensively, including also privately procured space launches[304].

They have generally justified their theory on two arguments. Firstly, the State from where the non-governmental entity procured the space launch is the one that can use its public powers to control such company and therefore to control the appropriate use of the space object in outer space[305]. Secondly, if liability under the term 'procures' was attached only to States procuring space launches and not also to private companies under their jurisdiction, the system of protection for victims of space damages would be undermined: they would be deprived of the possibility to receive compensation from the State that has the more direct link[306] with the damaging space object. This would go against the logic of the system of liability in space law which is to extend as much as possible the options available to victims for obtaining compensation[307].

Therefore, the supporters of this theory arrive at the following conclusion: the launch of a space object procured by a private operator must be considered as if it was procured by the State itself, transforming the latter into a "*launching State*" under Article VII of the OST[308].

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[304] See the authors mentioned in the previous footnote.

[305] This first argument gives for granted that the non-governmental entity procures the launch of a space object and controls it from the same State. An assumption that does not always correspond to the reality of space operations, as the procurement of a launch can occur in one State (e.g. where the company has its headquarter), while the space object can be controlled from the territory of another State (e.g. where the company manages the technical operations of its space assets).

[306] A "*direct link*" is intended here as the power to impose a State's rules on the operation of the space object in outer space and therefore the power to use means aimed at preventing international damages.

[307] A. Kerrest and others, *Liability for damage caused by space activities*, in Routledge Handbook of Space Law (ed. by R. Jakhu and others), Routledge, 2017, p. 62.

[308] Other than the scholars already mentioned before, see also M. Pedrazzi, *Liability for Damage Caused by Space Objects: The Interplay between International and National Law*, in Comparative Visions of Space Law (ed. by S. Zolea), RomaTre-Press, 2024, arguing that: "because the effect of Article VI, OST, is to attribute private space activities to the national State, in case of a private entity procuring the launch of a space object the national State is procuring the launch, as the private operator's activity would be attributed to the national State".
The use of this interpretation of Article VI to include privately procured launches under Article VII is the object of a critical assessment in Chapter IV.

Although the reasons behind it are based on legitimate concerns, the solution offered is legally unconvincing[309].

A first remark is that this theory does not merely interpret Article VII, but it extends its scope of application. It has been said already that the subject of the provision is "*each State Party to the Treaty*". To include non-governmental entities in that expression goes beyond the plain meaning of the words used by the drafters of the OST[310]. In other terms, the extension of the scope of application of Article VII is not an interpretation of the treaty, but amounts to a proper amendment. According to Article XV of the OST, an amendment to the Treaty must be proposed to the other States Parties and it enters into force when it is accepted by a majority of them. However, the procedure of Article XV has never been activated in the context of the OST and, therefore, there are no legal grounds – based on the law of treaties – that can justify the addition of privately procured launches in the scope of application of Article VII.

A second element of criticism is that also in launches of space objects where both the procurement of the launch and the launch itself are completely private, the compensation of damages under Article VII is always guaranteed at least by one State. There is always at least one launching State, which is either the State of territory or the State of facility[311]. Therefore, the four criteria of Article VII are structured to prevent any void of liability. It is true that the system of liability in space law is victim-oriented and that it is aimed at enlarging the number of potentially liable States, however, even if a provision has to be interpreted in light of its purpose, this operation cannot result in the establishment of an additional criteria in Article VII.

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[309] Doubts over that conclusion have been expressed also by F. Von der Dunk, *Regulation of Space Activities in The Netherlands: From Hugo Grotius to the High Ground of Outer Space*, in Space, Cyber, and Telecommunications Law Program Faculty Publications, no. 61, 2010, p. 232: "*It should be kept in mind that the Liability Convention just refers to 'a State which (...) procures' (Article I(c)(i)), not to 'a state which procures or whose private entities procure'; references to private enterprise should not be simply read into a case where explicitly only reference is made to States*".

[310] Even by looking at the preparatory works and at the proposals that led to the definition of launching State which appears now in Article VII of the OST and in Article I, lett. (c), of the Liability Convention, there are no hints suggesting that the procurement of launches by non-governmental entities was envisaged in the concept of 'launching State'. The debate within COPUOS was on whether to use the term 'procure' or 'participation in the launch' or whether to refer to the State which owns or controls the object. See L. Smith and others, *Article I (Definitions) LIAB*, in Cologne Commentary on Space Law: Vol. 2 (ed. by S. Hobe and others) (Cologne Commentary II), Carl Heymanns Verlag, 2013, p. 107.

[311] The only exception would be a private launch from a private platform built and anchored in international waters. This is clearly more of a theoretical scenario than a concrete one.

A final remark is more general but decisive.

Every discourse on privately procured launches is always based on the same premise: in the system of international space law, only launching States can be liable for damages caused by space objects; the liability regime of space law is a *lex specialis* compared to the general rules of international law on State liability; hence, because Article VII of the OST prevails over international law, then compensation must be asked only from the launching State(s) and it is not possible to claim the liability of a State that does not qualify as such.

Considering that this premise is the principal obstacle to a different allocation of liability – an allocation more adapted to the dynamism of private space activities and more coherent with the position of the States linked to them –, its legal soundness must be the object of a careful scrutiny.

The first element of inquiry is the wording used in Article VII[312].

Nothing in the text of the provision expressly indicates an exclusive position of the launching States with respect to liability. There are no expressions such as "*Only* the States Parties to the Treaty that …", nor any words that can suggest an exclusivity in the statement "…*is internationally liable*".

Moreover, Article VII of the OST does not contain a definition of the States that are 'liable States'. It contains a definition of the States that are "*launching States*".

Put differently, it is true that only those States that meet the four criteria established in the provision can be qualified as launching States, however it is not true that the States that can be liable are only the ones defined as launching States.

Shifting the attention from the text of the provision to its purpose, it can be said that the drafters of the OST wanted to guarantee that always at least one State, irrespective of its responsibility, was going to respond for the damages caused by the hazardous activities involving space objects. The easiest way to ensure this was to connect liability to the only event that was unavoidable in every space activity: the launch of an object in outer space.

Thus, the launching States – as defined according to the four criteria of Article VII[313] – were deemed the most appropriate subjects to achieve that purpose.

[312] The considerations made here are not affected by the Registration Convention and the Liability Convention, which define "launching State" using the same wording of Article VII of the OST.

[313] Due to the complexity of space launches which could involve multiple States already in the 1960s, Article VII was structured so as to guarantee also a plurality of options for victims of damages caused by space objects, indicating a variety of potentially liable States.

For that reason, Article VII appears as the 'minimum common denominator' of liable States in front of any space activity.

This means that the category of launching States serves the purpose of guaranteeing a safety net for the victims of damages, permitting always the individuation of at least one liable State, without preventing – at the same time – the possibility of allocating the liability for damages caused by the same space object also to another State.

Therefore, a textual and teleological interpretation of Article VII allows to discard any reading of the provision that points to the exclusivity of the allocation of liability established therein.

Article VII appears as a *lex specialis* with respect to the general principles on State liability only insofar as it creates a special category of States that must always bear international liability for damages caused by space objects. However, the creation of this special category does not prevent the application of the general rules of public international law on liability to outer space operations in accordance with Article III of the OST.

As further elaborated in Chapter IV, international liability must be borne for the injurious consequences which – in accordance with the natural law of causation – are traceable to activities that lie within the jurisdiction and control of a State[314]. In the field of space law that means holding the "*appropriate State*" liable[315].

Even if the latter were not a launching State *vis-à-vis* a privately procured launch, its liability could still be claimed if a private space object was controlled from a place under its jurisdiction.

The solution offered here does not release the launching States from their liability. To the contrary, it extends the number of States that are liable for the damages caused by the same event, enhancing the possibility for victims to obtain

[314] As eloquently put by Sompong Sucharitkul, "international liability denotes a State's 'civil responsibility', or obligation to pay compensation or make reparations for injuries that non-nationals suffer outside its national boundaries as a result of activities within its territory or under its control. […] The control or exercise of jurisdiction by a State gives rise to its liability, irrespective of whether international law or the law of nations permits or prohibits the activities in question". S. Sucharitkul, *State Responsibility and International Liability under International Law*, in Loyola of Los Angeles International & Comparative Law Journal, No. 18, 1996, p. 822, 834.

[315] This conclusion may nonetheless raise doubts on the application of the regime of liability established in the Liability Convention, and in particular on the application of the two different standards of absolute liability for damages on Earth and fault-based liability for damages in outer space. Is that regime applicable also to non-launching States? Thanks to the nature of both standards as general principles of international law, the answer is in the affirmative as it is further explained in Chapter IV.

compensation as the number of States against which victims can present their claims is enlarged[316].

The legal grounds on the basis of which liability is attributed to the two categories of States are different: Article VII for the launching States, the *lex generalis* on State liability for the "*appropriate State*". One, fixed permanently at the moment of the launch. The other, movable and following the control of the space object wherever that may be placed.

From a procedural law perspective, if the State of the victim of damages caused by a foreign space object were to file a judicial claim against its launching State instead of the non-launching "*appropriate State*", a joinder of parties with the "*appropriate State*" in the judicial proceeding would be necessary, because the latter's closeness to the activity that caused the damage would place it in a position so situated that disposing of the action in its absence would – as a practical matter – impair or impede the launching State's ability to protect its interest[317].

Therefore, even in front of privately procured launches it is possible to reach a conclusion that confirms what has been argued in the previous Sections: the State with jurisdiction and control over a private space object (the "*appropriate State*") can be different from the launching State(s), without affecting the distribution of rights and obligations within the system of space law. That is true not only with regard to registration, but also with regard to liability.

As anticipated above, one last occurrence in contemporary private space activities must be taken into consideration as it brings additional support to that conclusion: the change of control over a private space object while in outer space.

3.6. TRANSFERS OF CONTROL: WHEN SPACE OBJECTS CHANGE NATIONALITY

[316] See A. Kerrest, above at 303, p. 136.

[317] Considering the international nature of the proceedings discussed here, there is a key issue in front of a third-party joinder request: the "*appropriate State*" may not accept the jurisdiction of the international tribunal where the claim was filed, thus leaving the launching State alone in the judicial proceedings. However, this possibility may be avoided with an agreement between the two States prior to the launch. In any case, a more logical and cooperative solution would be for the "*appropriate State*" to submit a request to be permitted to intervene in the case, having an interest of a legal nature which may be affected by the decision of the international tribunal taken without its participation. This mechanism of intervention is, for example, regulated in Articles 62 and 63 of the Statute of the ICJ.

Traditionally, when a private space object is launched beyond the atmosphere, one of the launching States has jurisdiction and control over its operator.
As underlined above, this is the most ideal situation for the distribution of the rights and obligations envisaged in the space treaties as they all fall upon one State. However, even when such a simple situation occurs, its integrity may be disrupted during the life of the space object in orbit: the non-governmental entity in charge of it may transfer its control in the territory of another State and with that, break the link between the space object and the jurisdiction of the launching State.
For example, a company can launch a space object from the territory of State A and it can continue to manage the space activity from that same State for a certain period of time. As long as everything remains static, State A – a launching State under the criterion of territory – can logically exert also the function of "*appropriate State*" under Article VI of the OST. However, while the object is in orbit, the company may decide to sell it to a foreign operator based in State B, or the company itself may move its mission control centre in State B's territory. These kind of events entail a relocation of the command of the space object in the territory of a State different from the original launching State. Consequently, State A is not anymore in the position to exercise the role of the "*appropriate State*", but – at the same time – it still bears the liability for damages caused by that space object.
In other terms, a situation quite similar to the one caused by privately procured launches from non-launching States is created in cases of transfers of control over private space objects to a non-launching State.
Before analysing the legal consequences of this situation, a preliminary consideration is necessary.

3.6.1. A Premise: Transfers of Control, not Ownership

The disrupting element in the matter at hand is the transfer of the control over the private space object to an entity placed under the jurisdiction of a foreign State.

Nonetheless, there is a tendency among scholars and commentators to refer to the change of 'ownership' either of the object or of the company[318].

This different specification between 'control' and 'ownership' may seem only nominal. In reality, the use of the expression 'transfers of ownership' is legally misleading, as it brings the focus on an aspect – 'ownership' – that does not by itself raise an issue for the application of international space law when it changes[319].

Take for example an investor which acquires a foreign space company managing multiple objects in orbit. After the acquisition, the investor decides to keep the control over those space objects in the same territory where they were managed before, without any relocation. For instance, it simply transforms the acquired space company in its subsidiary abroad.

Another example is that of an investor which acquires merely the ownership of the space objects as financial assets, but leaves them under the management of a foreign space company for a fee.

In these scenarios, lacking an international relocation of the operative control of the space objects, the State where such control was exercised before the

[318] See among the many authors that refer to transfers of ownership, M. Chatzipanagiotis, *Registration of Space Objects and Transfer of Ownership in Orbit*, in German Journal of Air and Space Law, Vol. 56, No. 2, 2007, p. 230. Also Frans Von der Dunk justifies the use of the expression 'transfer of ownership' on the fact that "in the practical fact of life 'ownership' usually also means 'control'". F. Von der Dunk, *Transfer of Ownership in Orbit: From Fiction to Problem*, in Ownership of Satellites: 4th Luxembourg Workshop on Space and Satellite Communication Law (ed. by Mahulena Hofmann), Nomos Verlagsgesellschaft and Hart Publishing, 2017, p. 33. Mark Sundhal refers to both "ownership and actual control" in M. Sundhal, *Legal status of spacecraft*, in Routledge Handbook of Space Law (ed. by R. Jakhu and others), Routledge, 2017, p. 45.

[319] The only relevant reference to the concept of ownership in the space treaties is contained in Article VIII of the OST. The concept appears also in two provisions of the Moon Agreement, but they are irrelevant for the purpose of the present discourse: Article 12 repeats in almost identical terms the sentence on ownership of Article VIII of the OST; Article 11 refers to the concept of ownership, but in a different meaning, as referring to appropriation and claims of sovereignty over the surface and subsurface of the Moon.

According to the second sentence of Article VIII, OST, even if an object is or was in outer space its ownership is not affected. This sentence follows the one on retaining jurisdiction and control through domestic registration and precedes the one on returning space objects to the State on whose registry they are carried in case of accidental landings. It follows that its meaning is connected to the position of a State with regard to an object registered domestically and in particular it refers to the right of such State to not see any impairment of its power over that object only because it is placed or found beyond its territory. Therefore, Article VIII is concerned with the recognition that manmade space objects are not res nullius even if they are in a domain beyond the jurisdiction of any terrestrial entity. This principle applies equally to public and private space objects. Thus, in case of transfers of ownership, the OST simply clarifies that the new owner acquires the rights stemming from Article VIII. This is evidently irrelevant for the problems related to the dissociation of the "appropriate State" from the launching State.

acquisition continues to be even afterwards in the same position for the purpose of international space law.

Even if the ownership over the space company or over the objects has changed, the State of the investor has not acquired any direct power over the relevant space activities because they are concretely put in place from another State's territory. As a result, the State of the investor cannot ensure that such activities are carried out in conformity with its legal framework[320]: it cannot impose its rules on the way that the control centre operates in another jurisdiction; it cannot access the control centre; it cannot directly enforce its public powers on the activities performed with the space objects.

Although the State of the investor has a connection with the space activity inasmuch as the space activity is performed with space objects or by a space company owned by a subject that is incorporated in its territory, this should not be considered a sufficient link for the purpose of international space law[321]. The rights and obligations established in the space treaties with regard to the activities performed by non-governmental entities in outer space are based on a territorial link, which revolves around having jurisdiction and control over the MCC. Without such territorial link, the entitlements of the State of the investor over the foreign space activity based on mere ownership appear limited and indirect.

Limited, because certain powers – such as an inspection in the MCC – require its presence within the State's territory.

[320] As it is required from the "*appropriate State*" pursuant to Article VI of the OST.

[321] From an international law perspective, there are other aspects that may be affected by a transfer of ownership of a space company to a new subject in a foreign State. For example, as the ICJ has clarified in the Barcelona Traction case, in allocating corporate entities to States for purposes of diplomatic protection, the traditional rule attributes the right of diplomatic protection of a corporate entity to the State under the laws of which it is incorporated and in whose territory it has its registered office. See ICJ, *Case concerning the Barcelona Traction, Light and Power Company, limited (new application: 1962) (Belgium v. Spain) second phase*, Judgement of 5 February 1970, p. 3, para. 70. Another instance where the role of the State of the owning company may be relevant under international law is that of human rights violations committed by that company in a foreign territory through its subsidiary. On this regard, see: UN Doc. E/C.12/GC/24 of 10 August 2017, titled 'UN Economic and Social Council General comment No. 24 on State obligations under the International Covenant on Economic, Social and Cultural Rights in the context of business activities'. See also D. Chirwa, *The doctrine of state responsibility as a potential means of holding private actors accountable for human rights*, in Melbourne Journal of International Law, Vol. 5, No. 1, 2004, p. 1. All this, however, does not concern the allocation to States of the rights and obligations established by the space treaties with regard to non-governmental activities in outer space.

Indirect, because the effects of any law or public order are dependent on the foreign subsidiary's collaboration or on the foreign State's cooperation[322].

As an old but famous case on the control of multinational corporations (the *Fruehauf-France* case)[323] demonstrates, the compliance or effectiveness of public powers is all but certain if the relevant activity is being conducted in a foreign territory.

In that case – as summarised by James Shand Watson[324] – a French corporation, which was two-thirds owned by a United States corporation, contracted with another French corporation, Berliet, to sell equipment designed to be put on trucks destined for the People's Republic of China. In response to this, the US Treasury Department, charged with the administration of the Trading with the Enemy Act, ordered the parent company not to execute the contract as it violated US law. The parent company attempted to comply, but the directors of the French branch sued the US parent company in France. The upshot of this was that the French court appointed a temporary administrator to enable the contract to be executed. The Treasury Department, on seeing the complete inability of the parent company to control the events in France, rescinded its order.

In a less contentious situation, the State where a company is incorporated may issue civil or criminal sanctions against the incorporated company or the natural persons owning it, and that may be enough to obtain a change of conduct from the subsidiary abroad.

However, is this enough to consider that State the new "*appropriate State*" for the purpose of space law?

The limitedness and indirectness of its powers prevents that State from assuring the compliance of the relevant private space activity with the applicable legal framework. Moreover, if that State was considered the new "*appropriate State*", this would deprive the State having jurisdiction over the MCC of its position of responsibility pursuant to Article VI of the OST, with illogical consequences on the application of the rights and obligations of the space treaties.

[322] For example, the State of the acquiring company cannot seize the control of its space object as long as the latter is managed from another State's territory, unless an international agreement allows otherwise.

[323] *Societé Fruehauf v. Massady*, Cour d'appel de Paris, J.C.P. II 14, 1968, p. 274.

[324] J. Watson, *Jurisdiction and Control Over the Multinational Enterprise: De Maximis Non Curat Lex*, in Mercer Law Review, Vol. 27, No. 2, 1976, p. 508.

Therefore, it must be concluded that the fact that a space object is transferred to a new owner or that a company managing space objects is merged or acquired by a different entity is irrelevant for the purpose of qualifying a State as the "*appropriate State*". 'Ownership' alone – either on a space object or on a space company managing a space object – does not affect the position of the State responsible for the activities conducted with that space object[325].

That is why the issue of the dissociation between the launching State and the "*appropriate State*" is not raised by a transfer of ownership. And because of that, the following pages refer only to a transfer of control over a space object, addressing the legal consequences of such transfers for the qualification of the States involved.

3.6.2. The Consequences of Transfers

As anticipated above, after the control over a private space object is transferred from the jurisdiction of a 'launching-appropriate State' to the one of a non-launching State, the former remains nonetheless liable for the object launched even if it has lost its jurisdiction and control over it.

The literature on the matter has approached this issue offering three main solutions: 1) attributing the quality of "*launching State*" to the State of the transferee[326]; 2) adopting national regulations imposing on private operators to

[325] In less explicit terms, but pointing to the same conclusion, see M. Gerhard, above at 238, p. 124. The author righteously points out that the State, which has been responsible for the activity according to Article VI until the transfer, will automatically forfeit this responsibility – unless the transferee also acts under the jurisdiction of that same State. Upon the international transfer, the State under which law the transferee undertakes the space activity, will become responsible. In fact, the legislating State which has jurisdiction over the original holder of the authorisation may only impose obligations on that very person. In addition to this, another State has jurisdiction over the transferee, e.g. to grant an authorisation to execute a space activity. Assuming that the transfer is an international one, the activity executed by the transferee is not subject to the jurisdiction of the State which originally granted the authorisation and therefore cannot be controlled according to the requirements set up by that State. The activity of the transferee has to be authorised and supervised by another State.

[326] See M. Chatzipanagiotis, above at 318, p. 238. See also K. Schrogl and others, *New Look at the Concept of the Launching State - The Results of the UNCOPUOS Legal Subcommittee Working Group 2000-2002*, in German Journal of Air and Space Law, Vol. 51, No. 3, 2002, p. 371, arguing: "If a 'Launching State' under the Liability Convention is required to be an original 'Launching State', this 'could mean that none of the States subject to international liability under the Liability Convention have the ability to prevent damage being caused by the space object in question. This situation could be avoided, however, if a 'Launching State' is not required to be an original 'Launching State'. A possible argument for this approach would be that the State in question has obtained some benefit from the launch, even though it was not involved when the launch took place".

obtain an indemnification from the governmental authorities of the transferee's State prior to any transfers[327]; 3) signing bilateral agreements between the launching States and the State of the transferee[328].

None of these solutions is beyond reproach.

The quality of launching State is not something that can be transferred as it is a qualification connected to a precise legal definition. Either a State falls within it at the moment of the launch, or it does not. Becoming a launching State at a later stage is not a possibility envisaged in space law, and therefore the first solution is simply legally unfounded.

As for the second one, it is questionable whether the State of the transferee would agree to be exposed to an indemnification claim. And even if such a promise of indemnification was given to the private transferor, its legal nature from an international law perspective would be doubtful: it could not amount to an interstate agreement, but at the most as a unilateral declaration. Therefore, could it be used by the launching State in an international judicial proceeding against the State of the victim? If not, under which condition could it be used against the transferee's State? Which exemptions could the latter use to avoid its liability? The answer to these questions would be completely dependent on the manner in which each transferee's State decides to consent to indemnify the transferor's State.

According to the third solution, States can avoid that uncertainty by resorting to bilateral (or multilateral depending on the number of launching States) agreements between the States affected by a transfer. However, the negotiations of the terms of that agreement would hinder the rapidness required by any private transaction. Moreover, in case of additional transfers of the same space object other agreements would have to be adopted with an increasing number of States.

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[327] See M. Byers and others, *Who owns outer space?*, Cambridge University Press, 2023, p. 87. Another similar solution – not touched by the author – is that the State of the transferor imposes as a condition to the transfer the signing of an indemnification agreement directly with the acquiring company. However, this type of solution is open to various risks: the acquiring company may cease to exist; the budget of the company may not be sufficient to cover the costs of damages; and even if the company was insured against a claim from the original launching State according to that agreement, there may be caps in the launching State's domestic space law that would prevent it from recovering the full amount of the liability paid.

[328] See M. Gerhard, *Transfer of Operation and Control with Respect to Space Objects - Problems of Responsibility and Liability of States*, in German Journal of Air and Space Law, Vol. 51, No. 4, 2002, p. 576.

It is evident how a solution of this kind is convoluted and inefficient *vis-à-vis* the protection of States interests and the enhancement of dynamic private space activities. In addition, such a solution has a limited scope since it deals only with a particular situation and not with the problem in general[329].

Overall, as was for the theories advanced by scholars with regard to privately procured launches, the doctrinal solutions to the issue of the permanent liability of the launching States for transferred space objects are troubled by the same erroneous premise: only "*launching States*" can be liable for damages caused by space objects.

Against this premise, the same arguments put forth in the previous Section are valid. While referring thereto for their description, suffice it here to recall that the general principles on State liability in international law – which connect liability to the State with jurisdiction and control over a certain (public or private) activity – apply also to space activities; the only element of *lex specialis* in terms of liability is Article VII according to which there is a category of States that irrespective of any event remains always liable: the launching States; therefore, a non-launching State which assumes jurisdiction and control over a space object – for example after a transfer of control between private space companies – assumes also automatically the international liability connected to that object.

This renders superfluous any forced interpretation of the OST as well as any regulatory or conventional case-by-case solutions between the States involved.

The outcome of a transfer of control is simply that the State from where the transferee assumes control over the space object becomes the "*appropriate State*", holding also the international liability – in addition to the liability of the launching States – for the injurious consequences of the relative space activity[330].

This is beneficial to both the launching States and the victim of damages, as they all can rely on an additional State from where compensation can be obtained.

It is true that the launching States remain exposed to compensation claims without having jurisdiction and control over the transferred space object, but this is a condition inherent in the definition of "*launching State*" contained in Article VII, irrespective of any transfer of control.

[329] *Ibid.*, p. 576.

[330] The aspect of the double regime of liability for space damages provided by the Liability Convention is addressed further below in Chapter IV, Section 4.3.

The system of liability in space law was created in fact with the idea that multiple States could be jointly liable for damages caused by the same space object[331]. It is clear that once different States are involved in a launching, only one of the launching States has jurisdiction and control over the space object, while the others bear the same liability pursuant to Article VII but without any connection to the operations of the object in outer space.

The only difference between this situation and the one resulting from an international transfer of control between private operators is that, in the latter, the State exercising jurisdiction and control is a non-launching State. However, the issue of bearing liability without jurisdiction is present in both.

As soon as there are multiple launching States connected to a private space object, either because they all participated to the launch or because they were affected by a transfer of control over that object, there are going to be States exposed to liability for damages caused by that space object without having control over the activities put in place with it.

In the case of multiple launching States, Article V(2) of the Liability Convention recognises that whichever launching State pays the compensation has a right to present a claim for indemnification to other participants in a joint launching.

Isn't this right of indemnification applicable also in the relationship between the States involved in a transfer of control?

In front of a request of compensation to a launching State that does not have jurisdiction and control over the damaging space object because there was a transfer of control to a non-launching State, the former is entitled to be indemnified by the latter pursuant to the general principle of law recognised by civilised Nations called 'unjust enrichment'[332].

As recognised since the times of Roman law, in fact, in case of two (or more) liable subjects for the same damage, one is released by what the other pays. As a result, however, an unjust enrichment arises, since the subject so released may be

[331] That is envisaged already in the 1963 Declaration.

[332] See C. Fombad, *The principle of unjust enrichment in international law*, in The Comparative and International Law Journal of Southern Africa, Vol. 30, No. 2, 1997, stating at p. 124: "Unjust enrichment can be regarded as a principle of international law of general application, stands on equal footing with the equally elusive doctrine of equity, itself derivative from municipal legal systems". See also R. Satkauskas, *Subrogation of State Responsibility? The Baltic Legations in Paris*, in Baltic Yearbook of International Law Online, vol. 5, No. 1, 2005, p. 133.

said thereby to have been unjustly enriched at the expense of the subject who pays[333].

This unjust enrichment cannot be avoided by subrogating the paying subject to the rights of the victim against the other subject, since any such rights have gone. Instead, there is an analogous device: the person liable *with* others is given an independent right of contribution, and the person liable *for* others is given a right of indemnity against those he releases by his payment to the victim. Such a measure of recovery is a creature of equity and just as it applies domestically in cases of tort law, so it can be applied in the relationship between States as a remedy based on just and equitable considerations[334].

Therefore, if the State called to compensate is unable to redirect the victim of damages to the State having jurisdiction and control over the space object, it still holds a right of recourse against the State with jurisdiction and control over the transferred space object that caused the damage.

3.6.3. Concluding Remarks

In conclusion, also in case of transfers of control over a private space object the issues of liability raised by the dissociation between the "*launching State*" and the "*appropriate State*" are only apparent.

A proper solution can be found nowhere else than in the OST itself, interpreting Article VII in light of its wording and purpose and unhinging the cage created by an unconvincing special and exclusive character attributed to the liability of "*launching States*".

To close the circle and render the solution effectively sound, the general principles of international law come in help: either with the application of a joinder of parties in judicial proceedings or with the recognition of a right of recourse for unjust enrichment in case of damages paid on behalf of the State with jurisdiction over the damaging activity, one can find in international law all the instruments necessary to make sure that launching States are not exposed to unjustified liabilities.

[333] T. Weir, *Subrogation and indemnity*, in The Cambridge Law Journal, Vol. 71, 2012, p. 3.
[334] *Ibid.* p. 6

Therefore, also the cases of transfers of control over private space objects confirm the conclusion reached in the previous Sections of the present Chapter: the distribution of the rights and duties imposed by the space treaties can only be coherent if the "*appropriate State*" is considered a movable category of space law, linked only to the factual exercise of jurisdiction and control over the non-governmental space activity.

The "*appropriate State*" holds the international responsibility for assuring the conformity with the applicable legal framework of private space activities managed from a place under its jurisdiction and control pursuant to Article VI of the OST, but it is also exposed to the international liability for the harm caused by that activity in accordance with international law. At the same time, because of its direct link with the space object of the authorised non-governmental entity, it can register it domestically, declaring its privileged position over that object as per Article VIII. It is, finally, offered several instruments for registering the same object with the UN, manifesting at the international level its link with the authorised private operator and its rights and duties over the latter's object in outer space.

Looking at the "*appropriate State*" under this light, what remains of the other special category of State in space law: the "*launching State*"?

The latter's role is to represent a safety net for victims of space damages. For that reason, the States that fall under the definition offered in Article VII of the OST must permanently bear two crucial obligations: the first is to be liable for damages caused by space objects launched; the second is to decide which one of them will become the "*State of registry*", with the additional duty on the latter to furnish to the UN all the information useful to individuate the space object launched and the liable launching States.

These obligations are irrevocably attached to the "*launching States*" because the category was created with a victim-oriented approach, placing upon them the function of being an everlasting guarantee of compensation in front of the potentially enormous damages caused by hazardous space activities.

Even if – because of that *rationale* – the definition of which States are "*launching States*" is fixed, irrevocable and untransferable, their liability is not exclusive.

And that is a crucial feature in the system of space law as it allows to hold ultimately liable the State from where the damaging activity is being controlled,

irrespective of its quality of "*launching State*", which is increasingly common in cases of privately procured launches and in cases of transfers of control over space objects to non-launching States.

All that has been said so far is based on an interpretative analysis of the most critical concepts connected to the expression "*national activities in outer space*", namely the concept of "*appropriate State*", of "*State of registry*", of State retaining jurisdiction and control, and of "*launching State*".

Each one of them has been scrutinised here using the lens of legal theory, reaching conclusions and offering solutions that are the fruit of an interpretative effort over the text of the space treaties.

It is necessary now to move from the plane of interpretation to the plane of application and to test the validity and solidness of the theories exposed against the practice of spacefaring States.

3.7. STATE PRACTICE WITH REGARD TO "NATIONAL SPACE ACTIVITIES"

Pursuant to Article VI of the OST, every State Party needs to put in place a national mechanism to comply with its obligation of authorising and supervising private space activities. The establishment of national space legislation is usually considered the most comprehensive and preferable method of complying with Article VI[335].

When such legislations are drafted, States are always faced with the question of determining what constitutes a "*national activity in outer space*" with regard to "*non-governmental entities*"[336].

At the beginning of the present Chapter, it was suggested that the most coherent solution in light of the text, context and purpose of the space treaties is to consider whether the mission control centre of a private space activity is in a place under the legislative and enforcement jurisdiction of the relevant State. Only in that case, the latter is in the position to assure the conformity of the private space activity

[335] F. Von der Dunk, *Scoping National Space Law: The True Meaning of "National Activities in Outer Space" of Article VI of the Outer Space Treaty*, in Proceedings of the International Institute of Space Law 2019, Eleven International Publishing, 2020, p. 228.
[336] OST, Article VI.

with the applicable legal framework and, therefore, to be considered internationally responsible pursuant to Article VI.

Does the subsequent practice of the States Parties to the OST support this solution? Do national space laws envisage a necessary link between their authorisation system and the State's legislative and enforcement jurisdiction over the control of private space activities?

Of the almost thirty States that have enacted at least one law on the licensing of private space activities[337], twenty of them use the terms 'operation' or 'control' to indicate the conduct related to a space object that requires an authorisation[338].

In other terms, the type of space activity that triggers the need for a governmental authorisation is the operation or control of a space object.

The remaining States either regulate only launching activities[339] or define space activities in less evident wording[340].

Even if pointing towards the solution theorised above, the mere use of the words 'operation' or 'control' by the majority of States does not provide a concluding evidence of the fact that such solution is reflected in State practice. Several States, however, have further elaborated those two concepts in their national legislations offering additional insights on their interpretation of Article VI.

Belgium, for example, imposes its authorisation on space operators, defined as subjects that "*ensur[e], alone or jointly, the effective control of the space object*" [341]. The expression "*effective control*" means "*the authority exercised on the activation of the means of control or remote control and the related means of supervision, necessary for the implementation of the activities of launching, the flight operations and guidance of one or more space objects*"[342].

[337] The database of national space laws can be accessed on the website of UNOOSA at the following link: https://astro.unoosa.org/astro/en/index.html.

[338] Austria, Azerbaijan, Belgium, Canada, Denmark, Finland, France, Germany, Japan, Liechtenstein, Luxembourg, Malaysia, the Netherlands, New Zealand, Portugal, Russian Federation, Slovenia, South Africa, Sweden, United Kingdom, USA.

[339] See for example Norway's Law n. 38 of 1969 or Australia's Space (Launches and Returns) Act of 2018.

[340] See for example Ukraine's Ordinance on Space Activities of 1996, defining "*space activities*" as: scientific space research, creation and application of space technology, use of outer space (Article 1). But there is also the unique case of Algeria which expressly defines space activities as the exclusive monopoly of the State (Article 5 of Law n. 19-06 of 2019 on Space Activities).

[341] Belgium's Law of 17 September 2005 on the Activities of Launching, Flight Operation or Guidance of Space Objects, Article 3, n. 2.

[342] *Ibid.*, Article 3, n. 3.

As explained above, the MCC consists precisely in the place from where the space object's operations, such as telemetry, tracking and control, are performed. It follows that in the Belgian national space law it is the authority over the MCC that renders a subject an operator for the purpose of the authorisation system.

Similarly, and even more explicitly, in Japan "*a person who intends to implement the control of a spacecraft using a spacecraft control facility located in Japan must obtain a license from the Prime Minister for each of the spacecraft*"[343].

The expression "*control of spacecraft*" is specifically defined as meaning "*to detect the position, attitude and condition of a spacecraft and to control these using a spacecraft control facility*"[344].

The Japanese domestic space legislation confirms that the place from where a space object is controlled is the key element for triggering the international obligations of authorisation and supervision.

A third notable example is offered by the Netherlands.

The Dutch Space Activities Act of 2007, in fact, requires a licence for the flight operation or the guidance of space objects in outer space[345].

In the Government's Explanatory Memorandum attached to the Act it has been specified that 'flight operation' and 'guidance' mean the navigation, tracking and control of a space object during the flight phase and beyond performed from control centres established in Dutch territory[346].

The connection between authorisations and MCCs is evident.

Finally, Luxembourg has established that its authorisation is required for the 'actual control' over a space object, defined as: "*the authority exercised over the activation of the means of control or telecommand and, where appropriate, the associated monitoring devices, required for the execution of the launch, flight operation or guidance activities of one or more space objects*"[347].

Other States, even if not using definitions and expressions that refer to the MCC, have nonetheless further qualified the concepts of 'operation' and 'control', implicitly suggesting that the same solution applies in their jurisdiction.

[343] Japan's Act on Launching of Spacecraft and Control of Spacecraft (Act No. 76 of 2016), Article 20.
[344] *Ibid.*, Article 2, n. vii.
[345] The Netherlands' Act n. 80/2007 titled 'Rules Concerning Space Activities and the Establishment of a Registry of Space Objects', 80 Staatsblad, Section 1, lett. b.
[346] For a thorough analysis of the Dutch space legislation see T. Masson-Zwaan, *Widening the Horizons of Outer Space Law*, Meijers-reeks, 2023, p. 211.
[347] Luxembourg's Law of 15 December 2020 on space activities, Article 12.

The German municipal space law – which is limited to remote sensing activities – applies to those who "*exercise effective control over [the] operations*" of remote sensing systems in Germany's Federal Area[348]. In Portugal, an authorisation is needed for any "*command and control operation*" which is defined as the activity consisting in exercising control over the space object in space[349]. In Slovenia, "*space activity*" means "*the launch of a space object into outer space, the operation and operational control of the space object in outer space, and the controlled termination of the space object's operation in outer space and/or its return to Earth, including the procedures for limiting the generation of space debris*"[350].

The centrality of the MCC for the purpose of authorisation can be seen also in another aspect contained in several national space legislations: enforcement measures.

For example, Germany applies the Remote Sensing Act only to "*enterprises for which the Act can be effectively enforced*"[351].

The Law on Licensing Space Operations of the Russian Federation grants to the Russian Space Agency the right to carry out verification measures of the licensee operations and shut down operations at the site of the space activity for reasons of health, safety, State interests or security, unlicensed activity or violations of licence conditions[352]. That applies to both Russian entities and foreign participants undertaking space operations under Russian jurisdiction[353].

Also in the South African Space Affairs Act "*an inspector may at any reasonable time enter any facility of a person who has applied for a licence […] or to whom a licence has been issued*"[354].

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[348] See German Ministry of Economy and Technology, *Background Information for the Act on Satellite Data Security*, 2008, p. 9. The text of the actual law, namely the Act to give Protection against the Security Risk to the Federal Republic of Germany by the Dissemination of High-Quality Earth Remote Sensing Data of 2007, refers to the 'operator' – in Article 1 – as the person who has the control of the remote sensing system under his own responsibility. In its Article 2, para. 4, it clarifies that a 'high-grade remote sensing system' is a space-based transport or orbital system, including the ground segment, by means of which data about the Earth are generated, where its sensor is itself/sensors are themselves technically capable either alone or in combination with one or more other sensors of generating data with a particularly high information content.

[349] Portugal's Decree-Law n. 16/2019, Article 3, lett. d, n. ii.

[350] Slovenia's Space Activities Act of 2022, Article 3, n. 2.

[351] See German Ministry of Economy and Technology, above at 348, p. 9.

[352] Russian Federation's Law n. 5663-1 of 1993, Article 10.

[353] *Ibid.*, Article 5.

[354] South Africa's Space Affairs Act n. 84 of 1993, Article 10.

Similarly, the United Kingdom's Space Industry Act diffusely regulates the powers of enforcement and it maintains that compliance with a requirement imposed on the licensee "*may, without prejudice to other means of enforcement, be enforced on the application of the person who gave the direction by injunction*"[355].

It is evident that only the presence of the MCC in a place under the jurisdiction of the authorising State allows the latter to effectively use its enforcement powers.

This confirms another key element of the interpretative theory advanced in the previous Sections: the "*appropriate State*" must be the one with enforcement jurisdiction over the control of the private space object.

Although most national space laws are based on territorial jurisdiction, they also often contain another criterion of application: personal jurisdiction.

The inclusion of the latter seems to contradict what has been said so far, as it links the "*appropriate State*" to the nationality of the operator. However, a closer look at the effects and motivation of such inclusion reveals its little relevance for the interpretation of Article VI of the OST.

3.7.1. Personal jurisdiction in national space laws

Under the criterion of personal jurisdiction, the basis for requiring an authorisation is the nationality of the natural or legal persons conducting the private space activity, irrespective of the fact that the control of the latter occurs in a foreign territory.

For example, the US domestic law establishes that a license or a permit is required "*for a citizen of the United States to launch a launch vehicle or to operate a launch site or reentry site, or to reenter a reentry vehicle, outside the United States*" [356].

Another traditional manner of including the criterion of personal jurisdiction is exemplified by the Austrian space law, according to which "*national activities in outer space*" are space activities (defined as the launch, operation or control of a space object, as well as the operation of a launch facility[357]) carried out: 1) on

[355] UK Space Industry Act of 2018, Section 31(4).

[356] US Code of Federal Regulations, Title 51 – National and Commercial Space Programs, para. 50904(a)(2).

[357] Austrian Federal Law n. 132/2011 on the Authorization of Space Activities and the Establishment of a Space Registry, Article 2.

Austrian territory, 2) on board of vessels or airplanes, registered in Austria or 3) by an operator who is an Austrian citizen or a legal entity based in Austria[358].

There are also some States that have included the criterion of personal jurisdiction with a limited application, conditioning it to the conclusion of an international agreement with the State from where the private space activity is actually being controlled. For example, the Belgian Space Law applies its personal jurisdiction to private space activities only when the following preliminary condition occurs: "*When provided for under an international agreement, this law may apply to [space] activities […] carried out by natural or legal persons of Belgian nationality, irrespective of the location where such activities are carried out*"[359].

Finally, some other States have used it only as a last resort in case of private activities conducted from beyond national territories, where no other jurisdictional link was possible[360].

Overall, the criterion of personal jurisdiction – phrased in one or the other forms just described – appears in almost all of the domestic authorisation systems in place around the world[361]. They represent, therefore, a significant number of

[358] *Ibid.*, Article 1

[359] Belgium's Law of 17 September 2005 on the Activities of Launching, Flight Operation or Guidance of Space Objects, Article 2, para. 2. Another example can be found in the UK Outer Space Act, Article 3, n. 2, lett. b, where it is stated: "A licence is not required for activities in respect of which it is certified by Order in Council that arrangements have been made between the United Kingdom and another country to secure compliance with the international obligations of the United Kingdom".

[360] See, for example, the Norwegian Act n. 38/1969 Act on launching objects from Norwegian territory into outer space, Article 1, which applies to "areas that are not subject to the sovereignty of any State, when the launching is undertaken by a Norwegian citizen or person with habitual residence in Norway". See also the Luxembourgish Law of 15th December 2020 which applies to "space activities carried out by an operator […] on an area not subject to the sovereignty of a State by natural persons possessing Luxembourg nationality or legal persons governed by Luxembourg law".
The wording used seems to suggest that in order to fall under that definition a private operator would have to control its space activity from a fixed platform built *ex novo* in international waters or suspended in international airspace, a structure that could be considered as a new territory. It can be easily understood why the application of an authorisation system based on that condition – on Earth – appears more virtual, than real. A more plausible application may be found in the case of private entities operating and controlling space activities from a place that has no link with any State, leaving to the nationality of the operators the only connection to Earth: e.g. a facility or structure built on the Moon or on Mars, or a spacecraft travelling in outer space, not controllable from Earth and responding only to the commands of the operators on board. Yet again, considering the lack of territorial jurisdiction over such activities, the inclusion of such a broad definition of "*space activity*" for the purpose of Article VI of the OST raises the already-mentioned doubts on the actual power of the authorising State to assure the conformity of such activities with the applicable legal framework. A more in depth analysis of this matter is offered in Chapter V, with regard to States' authorisations for mining activities on celestial bodies.

[361] As of March 2025, personal jurisdiction (in one of the different forms described) appears in the national space laws of Australia, Austria, Azerbaijan, Brazil, Belgium, Canada, China, Denmark, Finland, France, Germany, Japan, Lichtenstein, Luxembourg, Malaysia, Netherlands, Norway, Portugal, South Korea, Russia, Slovenia, Sweden, Ukraine, United Kingdom, USA.

implementations of Article VI in domestic laws, connecting the concept of "*appropriate State*" with the criterion of nationality.

Is this sufficient to attribute to the expression "*national activities in outer space*" the meaning of a double criterion of jurisdiction for private space activities: territorial and personal?

From a general perspective, the conduct of States Parties to a treaty can affect the interpretation of its provisions[362]. However, that conduct has to have a certain degree of uniformity[363]. Moreover, it is generally recognised that when a conduct is contrary to the letter and spirit of a treaty, it cannot be regarded as a justifiable reading of such treaty[364].

Looking at the inclusion of the criterion of personal jurisdiction in domestic space laws, the element of uniformity appears lacking. In fact, as described before, State Parties to the OST have referred to personal jurisdiction in different manners: some have not recognised it at all as a criterion for defining "*national activities in outer space*"[365]; some others used it only to regulate a potential *lacunae* in the application of territorial jurisdiction, referring to it as a residual criterion in cases of space activities performed from places beyond the jurisdiction of any State[366]; some, finally, have envisaged its application on the basis of an autonomous

[362] Even when the conduct of the States Parties to a treaty falls short of representing a subsequent agreement or practice under Article 31, para. 3, of the VCLT, it can still be a factor which weighs in the interpretation of a treaty. See ICJ, *Immunities and Criminal Proceedings (Equatorial Guinea v. France)*, Judgement of 11 December 2020, para. 70. On the effects of States' conduct on the interpretation of treaties see ILC, above at 279, p. 47. For a recollection of the doctrinal debate on the topic see: R. Crootof, *Change Without Consent: How Customary International Law Modifies Treaties*, in The Yale Journal of International Law, Vol. 41, 2016, p. 260. See also B. Chigara, *Treaty-text Loyalists' Burden with Subsequent State Practice*, in Netherlands International Law Review, Vol. 68, 2021, p. 61.

[363] International tribunals usually refer to a conduct that is concordant, common and consistent. For example, *The Canadian Cattlemen for Fair Trade v. United States of America*, UNCITRAL Arbitration under NAFTA Chapter Eleven, Award on Jurisdiction, 28 January 2008, para. 187. Also, *United States - Measures Affecting the Cross-Border Supply of Gambling and Betting Services*, WTO Report of the Appellate Body AB-2005-1, 2005, para. 194. And *Japan - Taxes on Alcoholic Beverages*, WTO Report of the Appellate Body AB-1996-2, 1996, p. 13. Among scholars, see R. Gardiner, *Treaty Interpretation (Second edition)*, Oxford University Press, 2015, p. 255. B. Chigara, above at 362, p. 80. See also I. Buga, *Modification of Treaties by Subsequent Practice*, Oxford University Press, 2018, p. 61.

[364] On the compatibility between States' conduct and the letter and spirit of a treaty, see: R. Crootof, above at 362, p. 259. See also S. Lekkas and others, *The Interpretative Practice of the International Court of Justice*, in Max Planck Yearbook of United Nations Law, Vol. 26, No. 1, 2023, p. 354.

[365] See for example the Nigerian National Space Research and Development Agency Act No.9 A 1255 of 2010.

[366] See for example The Netherlands' Act n. 80/2007 titled 'Rules Concerning Space Activities and the Establishment of a Registry of Space Objects'.

bilateral treaty[367]. Even if it was argued that – despite these differences – the almost totality of States with a domestic space law recognised the criterion of personal jurisdiction (in one form or another) as an implementation of Article VI, there would still be a problem of compatibility with the letter and spirit of that provision.

In fact, if the expression "*national activities in outer space*" was intended to include personal jurisdiction, Article VI would require a conduct incompatible with its own text, or – more precisely – with the obligations it establishes: how would the State of nationality of a private space operator be able to supervise its activity or intervene on the control of its space object considering that the MCC would be beyond its territorial jurisdiction? How would the inspections, injunctions and other enforcement measures mentioned above be put in place by the authorising authority if the private company is only taking decisions from its territory while the implementation of such decisions occurs in a foreign jurisdiction?

The mere link of nationality does not allow a State to comply with the obligations imposed by the system of space law with regard to private space activities nor to effectively use the powers envisaged by its own authorisation system.

This is true also for those States – like Belgium – that apply the criterion of personal jurisdiction only on the basis of a bilateral agreement with the State where the national operator is concretely carrying out its space activity. Even where a bilateral agreement on jurisdiction exists, the State of nationality cannot assure the conformity of the authorised private space activity without the collaboration of the foreign authorities for verification, supervision and enforcement purposes. Moreover, the State where the private space activity is being carried out remains responsible for it at the international level towards third States, pursuant to the general principle of international law according to which a bilateral agreement does not affect the position of third States[368]. Similarly to the cases of multinational corporations violating human rights or causing

[367] For example, the Belgium's Law of 17 September 2005 on the Activities of Launching, Flight Operation or Guidance of Space Objects.

[368] See VCLT, Article 34. Such responsibility includes also the duty to authorise and supervise private space activities carried out from a State's territory. As Bin Cheng pointed out, States cannot "*avoid their responsibility under Article VI simply by alleging that some other State Party is more appropriate to provide such authorization and continuing supervision*". B. Cheng, *Article VI of the 1967 Space Treaty Revisited*, in Journal of Air and Space Law, Vol. 26, No. 1, 1998, p. 14.

environmental damages in foreign jurisdictions through localised branches, subsidiaries or outsourced services, it is the State where the activity takes place that is exposed to potential international responsibilities for not preventing their harmful conducts in its territory, not the State where they are based or registered[369].

Therefore, it can be concluded that the internal laws that use personal jurisdiction as a criterion for defining "*national activities in outer space*" have the only effect of exposing those States that authorise private space activity on the basis of mere nationality to a failure to perform the OST.

But if personal jurisdiction is contrary to the letter and spirit of Article VI, why did the majority of States include it as an additional criterion of jurisdiction in their national space legislations?

Anticipating something that is going to be further analysed in Chapter IV, it can be said that personal jurisdiction becomes a necessary criterion only if States interpret the first sentence of Article VI as establishing a direct responsibility of States for the activities of private actors in outer space, irrespective of where such activities may be managed and controlled.

With States directly responsible for their nationals, it makes sense to establish in domestic space laws a sort of extraterritorial governmental authorisation, prescribing requirements over their non-governmental activities even if they occur outside their territory, and to create mechanisms of international collaboration for controlling their activities abroad for example through bilateral agreements.

Under this light, personal jurisdiction represents the natural consequence and the necessary translation in domestic legal terms of a regime where the "*appropriate State*" is responsible for what its nationals do, wherever they do it.

However, if Article VI was interpreted as not imposing direct responsibility, then there would be no reason to include personal jurisdiction in domestic space laws. That is precisely what is argued in Chapter IV.

Exposing in brief the theory elaborated therein, the idea of holding States directly responsible for their private space activities is a misinterpretation of Article VI:

[369] In this sense, with the only exception of constructive knowledge and complicity by the home State of the wrongful acts perpetrated abroad by a subsidiary of a national corporation, see: R. McCorquodale and others, *Responsibility Beyond Borders: State Responsibility for Extraterritorial Violations by Corporations of International Human Rights Law*, in The Modern Law Review, Vol. 70, No. 4, 2007, p. 615.

the latter indicates, in reality, a more traditional form of State responsibility, which is the responsibility to prevent the use of a State's territory for activities – including private ones – which can cause harm to other States.

Reading Article VI as an expression of the general principle of States' due diligence for private space activities occurring in their territories, it becomes natural to refer only to legislative and enforcement jurisdictions, which are inherently territorial.

Thus, interpreting the regime of State responsibility applicable to private space actors with a different approach compared to the one that has dominated the debate of space law for decades, it is possible to conclude that only the widespread criterion of State's jurisdiction over the control of private space activities ensures the compliance of the authorising States with Article VI. It must be emphasised that the great majority of national space laws have adopted such criterion as the basis for their authorisation systems. This is a pragmatic evidence that the State with jurisdiction over the MCC of a private space activity must be considered the "*appropriate State*".

As for the other criterion of personal jurisdiction, it is argued here that those States that are in the process of adopting new national space laws should not include it, while the almost thirty States that already established it as one of the criteria of applicability of their authorising regime should consider amending it in the next round of amendments to their domestic space regime. In parallel, it would also be beneficial to address and clarify this matter within COPUOS, adding it to the agenda of the *Working Group on the Status and Application of the Five United Nations Treaties on Outer Space* as a "Review of the concept of 'national space activities'".

After having reached this first conclusion, it is necessary to see whether also the consequential relationship between the "*appropriate State*" and the other categories of space law – such as the "*State of registry*" and the "*launching State*" – is corroborated by the practice of States Parties to the OST.

3.7.2. The practice of registering private space objects

Starting with the registration of private space objects, three main findings were reached in the Sections above (*infra*, Sections 3.2, 3.3 and 3.4):

1) only the "*appropriate State*" has the right to register domestically a private space object over which it has jurisdiction and control and to retain them pursuant to Article VIII;
2) when a different State is considered the "*State of registry*" under the Registration Convention and it has to register that private space object, the "*appropriate State*" is still entitled to register it domestically because its national registration responds to a separate function compared with the one of the Registration Convention;
3) as for the international registration, if the "*appropriate State*" is not a launching State – and therefore it does not have the obligation to furnish information on the object launched to the UN Secretary-General in its quality of "*State of registry*" under the Registration Convention – it can still register the object at the international level together with the latter using the other mechanisms of international registration envisaged in the system of space law.

These three findings depend on a specific interpretation of the relationship between Article VI and Article VIII of the OST, in combination with the Registration Convention.

That interpretation, however, seems not to match the position of some States.

Several national space laws are structured in a manner incompatible with all this, establishing at the domestic level a duty to enter space objects into their registry only if they are launching States.

For example, the Austrian Space Law – resembled by other States such as Belgium, Brazil, Denmark, and Liechtenstein – maintains: "*All space objects for which Austria is considered to be the launching State according to Art I of the [Registration Convention] shall be entered into this registry. If other States also qualify as launching States aside from Austria, the agreement according to Art II (2) of the [Registration Convention] is relevant for the registration in Austria*"[370].

This idea of a strict and exclusive connection between domestic registration and being a launching State is incompatible with the conclusions reached in the previous Sections on the necessary link between having jurisdiction and control and being the "*appropriate State*".

[370] Austria's Outer Space Act of 2011, Article 9.

With States interpreting Article VIII as applicable only to launching States, the theory and the findings advanced in the present Chapter would be challenged by State practice.

However, a wider examination of national space laws shows that several other States – such as Portugal, the United Kingdom, the USA, Malaysia, Slovenia and others – have taken a different stance.

Among them, the Netherlands represent a particularly telling and significant example, as the Dutch approach to domestic registration can be considered as the most correct, accurate and clearly put.

The Netherlands has created "*a registry with information concerning space objects that are being used in connection with space activities*"[371], without any condition or limitation connected to its qualification as launching State.

Moreover, it has split that registry in two, openly embracing the idea that there is a difference between registering as the "*State of registry*" and registering as the "*appropriate State*". In particular, it has established that "*the registry consists of a United Nations part and a national part*"[372].

The United Nations part contains information concerning space objects for which the Netherlands is the "*State of registry*" and that have been furnished to the UN.

The second part of the registry, the so-called 'national part', contains information regarding those space objects that are used in connection with national space activities over which the Dutch State may well wish to exercise jurisdiction and control, but for which the Netherlands cannot be deemed the launching State.

The Dutch Government has specified in the Explanatory Memorandum attached to the Decree on the Registration of Space Object that: "*Examples include satellites that are managed by a company operating under Dutch law and within the Dutch legal order. Ownership and management of these satellites is usually only transferred to the Dutch party after they have been launched and brought into their definitive position. In these cases the Netherlands is not the launching State, but bears international responsibility for these space objects and lets this be known by including them in the national part of the registry*"[373].

[371] The Netherlands' Explanatory Memorandum attached to the Space Objects Registry Decree of 2007, p. 5.
[372] The Netherlands' Space Objects Registry Decree of 2007, Article 2.
[373] The Netherlands' Explanatory Memorandum, above at 371, p. 5-6.

This approach – significantly opposed to the Austrian one – appears to be perfectly in line with the conclusions summarised above.

More and more often, today, the "*State of registry*" under the Registration Convention is not the State with jurisdiction and control over the space object, a situation that determines necessarily the creation of separate entries in the national registry. Hence, the practice of establishing a separate national registry for when a State is not a launching State, but it still must authorise and supervise the private space activity concerned.

In the Netherlands, it is called the 'national part' of the registry, in the United Kingdom it is referred to as the 'supplementary registry'[374]: also the names used by national legislators underline the complementarity of such registry to the other one used when States qualify as launching States.

As far as the international registration of space objects is concerned, the question is: do States register private space objects with the UN even if they are not the State of registry and together with the latter?

As said above, the international system of registration offers the means to furnish information to the UN according to and on the basis of different international mechanisms.

When that happens, space objects fall in the so-called 'duplicate registration' of the UN Online Index, meaning that the same space object was registered by a "*State of registry*" as well as by the State that has jurisdiction over it, namely the "*appropriate State*"[375].

For example, the satellite Challenge ONE was launched from Russian territory in 2021, but it was controlled by a Tunisian private entity called TELNET. Therefore, Russia as a launching State registered the satellite pursuant to Article IV of the Registration Convention, but at the same time Tunisia – being the State with jurisdiction over the space object – informed the UN of its registration using the mechanism of Resolution 1721 B (XVI)[376].

[374] The UK supplementary register is available at the following link: www.caa.co.uk/our-work/publications/documents/content/cap2208/

[375] There are about 35 objects that are registered this way. The first duplicate registration was done before the entry into force of the Registration Convention, in 1965, when Italy's San Marco 1 satellite was launched from the territory and using the facility of the USA, but it was under the jurisdiction and control of Italy, which *inter alia* procured the launch.

[376] On the Online Index Tunisia's registration is codified as A/AC.105/INF/452 while the Russian one as ST/SG/SER.E/992. It must be underlined that Tunisia has not yet ratified the Registration Convention.

This means that also at the international level there is evidence that supports the separation between the "*State of registry*" and the State registering the object in its quality of "*appropriate State*".
Thus, as far as the practice on registering space objects is concerned, it can be concluded that – despite some opposed views – several States offer concrete examples of how the space treaties can be implemented in line with the three findings mentioned above.

3.7.3. The status of 'non-launching/appropriate State' in practice

To complete the present analysis, it is necessary to see how the relationship between the "*appropriate State*" and the "*launching State*" is translated in national space laws. In particular, do national space laws confirm the idea that the "*appropriate State*" can be dissociated from the launching State in case of privately procured launches? Do they support the thesis according to which the "*appropriate State*" is a movable concept that can shift from one State to another in case of transfers of control without undermining the position of the launching State?

3.7.3.1. Privately procured launches

Turning the attention, first, on privately procured launches of space objects, it can be said that only a few national space laws take an express position on the matter. For example, France considers itself the "*appropriate State*" in case its nationals procure the launch of a space object[377].
Luxembourg requires operators that procure the launch of a space object to provide the Minister with all information allowing to identify the space object, specifying in particular a list of elements that resemble the ones imposed by Article IV of the Registration Convention[378].

[377] French Law on Space Operations No. 518/2008, Article 2, number 3.
[378] Luxembourg's Law of 15 December 2020 on space activities, Article 15, para. 2.

New Zealand states that a person must not procure the launch of a payload unless the person has a 'payload permit' for the launch and the operation of the payload in outer space[379].

The Space Industry Act of the United Kingdom is applied *inter alia* to procuring the launch of a space object whether in the United Kingdom or elsewhere[380].

These examples show that there is practice among States to consider themselves as the "*appropriate State*" with regard to privately procured launches, imposing the requirement of their authorisations on the relative operators. New Zealand in particular has rightly connected its authorisation not only to the mere procurement but to the procurement *and* the operation of the payload in outer space[381].

While this confirms the interpretation according to which the State from where a non-governmental entity procures and controls a space activity should bear the rights and obligations of Article VI of the OST, it leaves another aspect unclear: do States apply their authorisation regime irrespective of their qualification as launching States in cases of privately procured launches?

For example, Luxembourg requires from the private operator information that is functional to comply with the obligations of the "*State of registry*" under the Registration Convention[382].

At the same time, the provisions of the Dutch Space Activities Act indicate that the mere organization of space activities "*from within the Netherlands*" does not automatically lead to liability for the Netherlands as a launching State[383].

The lack of clarity in domestic space laws is not compensated by their application in practice.

[379] New Zealand's Public Act n. 29/2017 titled 'Outer Space and High-altitude Activities Act' of 10 July 2017, Article 15 (for launches of payload from New Zealand) and Article 31 (for launches of payload overseas by a national).

[380] UK Space Industry Act of 2018, Section 2, para. 2, lett. b.

[381] New Zealand's Public Act n. 29/2017, Articles 15 and 31.

[382] Luxembourg's Law of 15 December 2020 on space activities, Article 15, para. 2

[383] The Netherlands Act n. 80/2007 titled 'Rules Concerning Space Activities and the Establishment of a Registry of Space Objects', Section 1, lett. See in particular the Explanatory Memorandum attached to the 'Decree of 13 November 2007, containing rules with regard to a registry of information concerning space objects', p. 5: "[…] national space activities over which the Dutch State may well wish to exercise jurisdiction and control, but for which the Netherlands cannot be deemed the launching State. Examples include satellites that are managed by a company operating under Dutch law and within the Dutch legal order. Ownership and management of these satellites is usually only transferred to the Dutch party after they have been launched and brought into their definitive position. In these cases the Netherlands is not the launching State, but bears international responsibility for these space objects and lets this be known by including them in the national part of the registry".

There is a notable case from the early 2000s where the United Kingdom did not consider itself as a launching State for the satellites procured by INMARSAT, a privatised organisation headquartered in the UK[384].

Also, the Netherlands and Belgium have maintained a similar standing on space objects whose launch was procured by one of their nationals.

On the contrary, with regard to the satellite Agila-II, launched in 1997 from China on a Chinese rocket, the Philippines registered it with the UN in 2003 according to Resolution 1721 B (since the Philippines has only ratified the Moon Agreement)[385]. The Philippine registration was based on the fact that the operator of the satellite, Mabuhay Satellite Corporation, was a Philippine entity which procured the launch of Agila-II. It is not clear whether this registration meant that the Philippines perceived itself as a launching State by private procurement.

Considering the inconclusiveness of State practice on the matter, it is not possible to say in decisive terms that the theory purported in the previous Sections is supported by national space laws. However, it can be said that there are no clear opposing positions, while there are elements such as the New Zealand's and Dutch national legislations as well as the INMARSAT case that point precisely in the direction of the conclusions reached in the present Chapter.

3.7.3.2. Transfers of control to a non-launching State

Moving to the last aspect, namely the transfer of control over a private space object to a non-launching State, the state of the art of national space legislations is similar.

Few States have addressed the matter.

In some legislations, all that is said is that a notification from the authorised private transferor is needed before proceeding with the transfer (e.g. Azerbaijan, Finland).

In some other legislations – which represent the majority –, private operators must obtain the prior approval from their authorities before they can complete the

[384] See S. Aoki, *Nationality for Spacecraft? Revisited: Nationality to Be Found*, in Journal of Space Law, Vol. 44, No. 2, 2020, p. 397.

[385] UN Doc. A/AC.105/INF.409 of 2 May 2003, titled 'Information furnished in conformity with General Assembly resolution 1721 B (XVI) by States launching objects into orbit or beyond - Note verbale dated 25 April 2003 from the Permanent Mission of the Philippines to the United Nations (Vienna) addressed to the Secretary-General'.

transfer, that applies both to cases of transfers *from* a foreign territory and to cases of transfers *to* a foreign territory (e.g. Denmark, France, Japan, Luxembourg)[386]. According to this second approach, it appears that States are moved by two different motivations depending on the 'direction' of the transfer.

In front of transfers *to* a foreign territory, the approval of the State that authorised the transferor can be seen under two different lights: on one hand, as an expression of the general control that States want (and must) have over national space activities; on the other hand, as a screening mechanism used by launching States for avoiding transfers that move the jurisdiction and control over the private space object to a State that may not be considered trustworthy in terms of regulatory, financial or political conditions[387].

As for transfers *from* a foreign territory, the fact that States envisage the need for their authorisation before the control over a space object falls under their jurisdiction and control is a recognition of the fact that when that happens, they consider themselves the "*appropriate State*" for the incoming activity pursuant to Article VI.

Nothing in such laws seems to connect the requirement of authorisation upon the transferee to the qualification of the transferee's State as a launching State.

For example in the French law on space activities of 2008, it is maintained that if a French operator takes control of a space object that was launched or controlled without a French authorisation, it has to be authorised by the relevant French authorities. Also Slovenia has taken a similar stance. In more simple terms, the Ukrainian Law on Space Activities of 1996 states that in case of transfers of a space object, the latter is removed from the national registry.

[386] The difference between notification and approval can be seen as a confirmation that only the transfer of control over a space object matters under international space law. In fact, it is true that some States refer to the transfer of property rights over the space object or changes of ownership (e.g. Azerbaijan and Finland), while some others to the transfer of control over the space object or change of operator (e.g. France, Japan, Luxembourg, Liechtenstein). However, when national legislations regulate changes of ownership they impose on the private transferor only to notify the national authority of the operation without any further requirement. On the other hand, in cases of transfers of control over the space object from or to a foreign territory, national legislations require their necessary authorisation. Examples of this double standard can be found in the Luxembourgish law on space activities of 2020 as well as in the Portuguese Decree on space activities of 2019. From this, it follows that in the legislative practice of States it is only the transfer of control over a private space object that triggers the application of Article VI of the OST.

[387] In the same spirit, some States, like Denmark, Liechtenstein and Luxembourg, require also a prior agreement with the State of the transferee according to which the latter takes over the liability to pay damages.

The position expressed by these States in their national laws confirms the movability of the concept of "*appropriate State*" irrespective of the qualification of launching State.

Looking at how States have applied their legislations in concrete cases, it is possible to mention the example of the satellite Azersky, formerly known as Spot-7, which was originally launched and operated by the French company Airbus Defence & Space. The launch occurred in June 2014 on top of a PSLV launch vehicle by the Indian Space Research Organisation (ISRO) from India. It was registered by France, both domestically and internationally pursuant to Article IV of the Registration Convention.

In December 2014, it was handed over to Azercosmos, the national space agency of Azerbaijan. Airbus did not transfer only the ownership, but also the control of the object, building a satellite control centre in Azerbaijan operated by Azeri engineers [388] . Thus, Azerbaijan registered the satellite (renamed Azersky) domestically and it also furnished the relevant information to the UN using Resolution 1721B (XVI)[389].

As a consequence, France removed the satellite from its national registry, notifying the fact to the UN[390].

Therefore, the Azersky story represents a concrete example of a transfer of control from an original "*appropriate State*" (France) to a new "*appropriate State*" (Azerbaijan) with a consequential removal from the former's domestic registry and inclusion in the latter's one.

While this case and the legislations mentioned above support the theoretical conclusions offered before, it is not possible to test in practice the solutions on the issue of holding non-launching States liable. In fact, international space law has yet to see a dispute on that matter either at the judicial or at the diplomatic levels. Thus, such solutions remain at the present stage on the plain of doctrinal interpretations. But despite the lack of practical confirmation on this last regard,

[388] As reported here: https://spacenews.com/42840airbus-sells-in-orbit-spot-7-imaging-satellite-to-azerbaijan/

[389] UN Doc. A/AC.105/INF/428 of 7 December 2015, titled 'Information furnished in conformity with General Assembly resolution 1721 B (XVI) by States launching objects into orbit or beyond - Note verbale dated 19 October 2015 from the Permanent Mission of Azerbaijan to the United Nations addressed to the Secretary-General'. Azerbaijan has not ratified the Registration Convention.

[390] UN Doc. ST/SG/SER.E/797 of 1 August 2017.

the present Section leaves a clear picture on the meaning that States attribute to the expression "*national activities in outer space*".

Disregarding certain views supported by a minority of States, most legislations put at the centre of their authorisation system the particular aspect of a space activity consisting in the operation and control of a space object.

Consequently, a number of common elements emerge with regard to how States apply to themselves the category of "*appropriate State*".

They see it as a category based on their power to have legislative and enforcement jurisdictions over the mission control centre of a private space operation; they consider it as a movable qualification that can be passed from one State to another following the international transfers of that control, wherever it may eventually be exercised; they understand it as inescapably linked to Article VIII of the OST, and completely dissociated from the other categories of space laws such as the launching State or the State of registry, even if – at times – they may overlap.

And for all this, – it can be added – when they see themselves as the "*appropriate States*" they accept to become the holder of international responsibility – stemming from the obligations to authorise, supervise and assure the conformity of private space activities with the applicable legal framework – and of international liability – not as launching States (unless they can be also defined as such), but as a result of the fact that space activities within their territory or under their control cause damage to other States, irrespective of whether international law permits or prohibits the activities in question.

In conclusion, while the description of what "*national activities in outer space*" are can end with the acknowledgement of the international responsibility and liability of the "*appropriate State*", the necessity to clarify the content, extent and consequences of such responsibility and liability opens the door to the next Chapter, where their review and critical analysis brings to light new findings on their concrete meaning.

CHAPTER IV

STATE RESPONSIBILITY AND LIABILITY FOR THE CONDUCT OF AUTHORISED PRIVATE ACTORS

SUMMARY: 4.1. State responsibility for private activities – 4.2. Article VI as an obligation of due diligence: revisiting the rules of attribution in space law – 4.2.1. A textual interpretation of the first two sentences of Article VI. – 4.2.2. The negotiating history of Article VI. – 4.2.3. Analogous reasoning in support of Article VI as an obligation of due diligence. – 4.2.4. State responsibility for activities conducted without or beyond authorisation – 4.2.4.1. The Swarm Technology case – 4.2.4.2. The SpaceIL case – 4.2.4.3. The DISH Network case – 4.3. The liability of the "appropriate State" – 4.3.1. State liability in public international law – 4.3.2. State liability for private space activities – 4.3.3. The application of the Liability Convention to the "appropriate State" based on analogical reasoning. – 4.4. Fault-based liability and private space objects – 4.4.1. A case-study on orbital damages – 4.4.2. The need of a reversed burden of proof.

4.1. STATE RESPONSIBILITY FOR PRIVATE ACTIVITIES

The analysis of the concept of responsibility in space law has to start from a preliminary consideration.

Just like on Earth, in outer space it is also possible to apply the generally recognized notion of State responsibility according to which "*Every internationally wrongful act of a State entails the international responsibility of that State*"[391].

In order to say that the act – *rectius*: the conduct – of a State is wrongful it is necessary to look at two elements: 1) whether such conduct is attributable to a

[391] See ARSIWA, Article 1.

State and 2) whether such conduct violated an international obligation binding upon that State[392].

There are many specifications and elaborations relating to each of these two elements, but their analysis goes beyond the purpose of the present Section.

It is sufficient here to briefly recall that – in terms of attributability – a State will be responsible only for the conduct of its organs or officials, acting as such[393]. Today, it is widely recognised that the scope of the concept 'conduct' is broad and the definition of 'organ' comprehensive, as it includes all the individual or collective entities which make up the organisation of the State and act on its behalf[394].

In addition to the acts or omissions of organs (*de iure* or *de facto*), the conduct of persons or entities exercising elements of governmental authority is attributable to the State, providing they were acting in exercise of the governmental authority conferred on them[395].

While organs and persons with governmental authority can give rise to State responsibility, the same is true for private actors only under exceptional circumstances.

In particular, there are cases where a State endorses private conduct as its own[396]; or where the conduct happened upon the instructions of State organs[397]; or where it was put in place under the effective and direct control of the latter[398].

When that happens, such private conduct is attributable to the State. However, each of these exceptions requires a certain degree of involvement of the State in the realisation of the private actions or omissions that breached an international obligation. Only then, international responsibility arises.

In all other cases, the wrongful conduct of the private actors remains their own and is irrelevant on the international plane for attribution.

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[392] For a comprehensive recollection of the doctrinal and judicial works on the elements of State responsibility see for all: J. Crawford and others, *The Character and Forms of International Responsibility*, in International Law (ed. by M. Evans), Oxford University Press, 2018, p. 424.
[393] *Ibid.*, p. 426.
[394] ARSIWA Commentary, p. 40 (commentary to Article 4).
[395] ARSIWA, Article 5.
[396] See Tehran case, para. 73-4.
[397] See ARSIWA, Article 8. See also: ICJ, *Case Concerning Application of The Convention on the Prevention and Punishment of the Crime of Genocide* (*Bosnia and Herzegovina v. Serbia and Montenegro)* ("Genocide Convention case"), Judgment of 26 February 2007, para. 389.
[398] See ICJ, *Military and Paramilitary Activities in and against Nicaragua* (Military activities case), Judgment of 27 June 1986, para. 14.

Put shortly, a State is not directly responsible for the conduct of its nationals[399]. For example, when in 2015 a group of hooligans from The Netherlands damaged a Bernini fountain in Rome, they did not trigger the international responsibility of their State of nationality[400]. Therefore, despite the requests made by Italy to the Dutch ambassador in Rome, the Netherlands had no international obligation to pay for the damages caused by its nationals abroad. On that occasion, the Dutch government merely condemned on a political level the conduct of its nationals[401].

Having said that, there is one type of international responsibility that can be placed upon States for the acts or omissions of private entities, irrespective of its involvement: the responsibility to establish measures to prevent non-governmental actors from committing an internationally wrongful act[402].

It is based on a different and autonomous obligation compared to the one breached by the private wrongful act itself, and it is called the obligation of due diligence.

Originally, this obligation was seen as a general principle simply requiring each State "*not to allow knowingly its territory to be used for acts contrary to the rights of other States*"[403].

More specifically, States were not expected to prevent all private actions under their control and jurisdiction that could cause harm to others, but it was recognised that they had to take appropriate steps to ensure that private persons would not cause such harm. The problem with the obligation of due diligence was that its contours were not defined, it was difficult to perceive a precise behaviour that was requested by that obligation.

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[399] ARSIWA Commentary, p. 38.

[400] See U. Villani, *Lezioni di Diritto Internazionale*, Cacucci Editore, 2021, p. 223.

[401] It is reassuring to remember that, out of a spirit of solidarity, the Dutch citizens raised the necessary money for reparations with a crowd-funding initiative named "*Scusa Roma*".

[402] The ICJ has made reference to this principle in different occasions, such as in the *Teheran* case at para. 66-68, as well as in the *Genocide Convention* case para. 430. See also ICJ, *Case concerning armed activities on the territory of the Congo (Democratic Republic of the Congo v. Uganda)*, Judgment of 19 December 2005, para. 300.

For doctrinal works on this topic see: A. Kees, *Responsibility of States for Private Actors*, in Max Planck Encyclopedia of Public International Law, 2011. See also: C. Chinkin, *The duty of due diligence*, in CAHVIO Documents, 2010, p. 2.

[403] ICJ, *Corfu Channel case (UK v. Albania)*, Judgment of 9 April 1949, p. 22. See also: *Trail smelter case (United States, Canada)* (Trail smelter), Award of 11 March 1941, p. 1965: "No State has the right to use or permit the use of its territory in such a manner as to cause injury by fumes in or to the territory of another or the properties or persons therein, when the case is of serious consequence and the injury is established by clear and convincing evidence".

With time, that changed: an increasing number of treaties endorsed it, its scope of application was expanded and its content was elaborated into a bundle of concrete duties for States.

For example, in the field of international environmental law, the obligation to prevent has been crucial in ensuring that States took action against environmental damages caused by activities under their jurisdiction or control. Its most significant recognition can be found in Principle 21 of the Stockholm Declaration on the Human Environment (equally restated in Principle 2 of the Rio Declaration on Environment and Development[404]) according to which: "*States have […] the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction*"[405].

As can be seen, in its environmental formulation, the concept of due diligence has been translated in a 'responsibility to ensure', whose scope of application has been extended to activities within a State's jurisdiction and to areas beyond national jurisdiction. International tribunals have interpreted it as an obligation that imposes on States a pro-active and reactive role, consisting in the adoption of specific preventive measures such as conducting an environmental impact assessment before authorising environmentally dangerous activities[406].

Another field of law where due diligence has found substantial application is human rights.

Here, its use has been especially functional in holding States responsible in cases of inter-individual human rights violations[407]. The UN Human Rights Committee

[404] UN Doc. A/CONF.151/26 (Vol. I) of 12 August 1992, titled 'Rio Declaration on Environment and Development', Principle 2.

[405] UN Doc. A/CONF.48/14 of 16 June 1972, titled 'Report of the UN Conference on human environment', p. 5 (Principle 21).

[406] See ICJ, *Case Concerning the Gabčíkovo–Nagymaros Project*, Judgment of 25 September 1997, para 140: "In the field of environmental protection, vigilance and prevention are required on account of the often irreversible character of damage to the environment and of the limitations inherent in the very mechanism of reparation of this type of damage". See also ICJ, *Certain activities carried out by Nicaragua in the Border Area (Costa Rica v. Nicaragua), Construction of a road in Costa Rica along the river San Juan (Nicaragua v. Costa Rica)* (Certain Activities), Judgment of 16 December 2015, para. 104. See also the comprehensive analysis on the prevention principle in: J. Vinuales, *International Environmental Law*, Cambridge University Press, 2018, p. 61.

[407] See the landmark case of the Inter American Court of Human Rights, *Velasquez Rodriguez v. Honduras*, Judgment of 29 July 1988, Series C no. 4, para. 172: "In principle, any violation of rights recognized by the Convention carried out by an act of public authority or by persons who use their position of authority is imputable to the State. However, this does not define all the circumstances in which a State is obligated to prevent, investigate and punish human rights violations, nor all the cases in which the State might be found responsible for an infringement of those rights. An illegal act which

has expressly recognised that a State can be held responsible for the legal consequences of such violations if it did not ensure the minimum legislative, administrative and enforcement measures necessary to avoid and punish their commitment[408].

Other applications can be found in the field of consular and diplomatic relations[409], in the field of international terrorism[410], and in the field of international investments[411].

By its inclusion in various regimes and its elaboration in several judicial decisions, the obligation of due diligence has evolved into a more precise concept, expressed in legislative and administrative regulations and implemented through various enforcement mechanisms.

Despite its developments, the nature of due diligence has not changed.

It remains a highly relative concept, being contingent upon the area of international law in which it is applied and upon the capacity of each State to put in place the measures necessary to be considered 'diligent'[412].

The relativity of the obligation of due diligence has been underlined clearly by the ILC in its commentary on the 'Draft articles on prevention of transboundary harm from hazardous activities'. Considering the relevance of the ILC's reasoning for

violates human rights and which is initially not directly imputable to a State (for example, because it is the act of a private person or because the person responsible has not been identified) can lead to international responsibility of the State, not because of the act itself, but because of the lack of due diligence to prevent the violation or to respond to it as required by the Convention".

[408] See with regard to Article 2 of the International Covenant on Civil and Political Rights, the Human Rights Committee General Comment n. 31, 2004, para. 8: "The Covenant cannot be viewed as a substitute for domestic criminal or civil law. However the positive obligations on States Parties to ensure Covenant rights will only be fully discharged if individuals are protected by the State, not just against violations of Covenant rights by its agents, but also against acts committed by private persons or entities that would impair the enjoyment of Covenant rights in so far as they are amenable to application between private persons or entities. There may be circumstances in which a failure to ensure Covenant rights as required by article 2 would give rise to violations by States Parties of those rights, as a result of States Parties' permitting or failing to take appropriate measures or to exercise due diligence to prevent, punish, investigate or redress the harm caused by such acts by private persons or entities".

[409] Discussing a breach by Iran of articles 22 and 29 of the Vienna Convention on Consular Relations, the ICJ has recognized that, under general international law, States are required "*to take any steps […] to prevent*" attacks from private actors to diplomatic premises and personnel (para. 63) as well as "*to ensure the most constant protection and security to each other's nationals in their respective territories*" (para. 67).

[410] See for example the arguments in favour of the responsibility of Afghanistan for the actions of the Talebans after the 9/11 terrorist attack to the USA, as summarised by B. Conforti, *Diritto Internazionale*, Editoriale Scientifica, 2023, p. 427.

[411] United Nations Commission on International Trade Law (UNCITRAL), *Lauder v Czech Republic* Award of 3 September 2001, ICSID Report 66, para. 308.

[412] A. Ollino, *Due Diligence Obligations in International Law*, Cambridge University Press, 2022, p. 167.

the prosecution of the discourse, it is useful to recount a full extract of its work: "*The standard of due diligence against which the conduct of the State of origin should be examined is that which is generally considered to be appropriate and proportional to the degree of risk of transboundary harm in the particular instance. For example, activities which may be considered ultra-hazardous require a much higher standard of care in designing policies and a much higher degree of vigour on the part of the State to enforce them. Issues such as the size of the operation; its location, special climate conditions, materials used in the activity, and whether the conclusions drawn from the application of these factors in a specific case are reasonable, are among the factors to be considered in determining the due diligence requirement in each instance. What would be considered a reasonable standard of care or due diligence may change with time; what might be considered an appropriate and reasonable procedure, standard or rule at one point in time may not be considered as such at some point in the future. Hence, due diligence in ensuring safety requires a State to keep abreast of technological changes and scientific developments*[413]. […] *The main elements of the obligation of due diligence involved in the duty of prevention could be thus stated: the degree of care in question is that expected of a good Government. It should possess a legal system and sufficient resources to maintain an adequate administrative apparatus to control and monitor the activities. It is, however, understood that the degree of care expected of a State with a well-developed economy and human and material resources and with highly evolved systems and structures of governance is different from States which are not so well placed*"[414].

Understood under these terms, the obligation of due diligence can be seen as a door through which the legal consequences of the actions or omissions of private actors in a variety of fields can be brought into the sphere of responsibility of States.

The requirements stemming from that obligation are context-specific, requiring different measures in different circumstances. But one rule always applies: the

[413] ILC, *Draft articles on prevention of transboundary harm from hazardous activities with commentary - commentary to Article 3* (Prevention Articles Commentary), in Report of the ILC, adopted as UN Doc. A/56/10, 2001, p. 154.
[414] *Ibid.* p. 155.

more a private activity is hazardous and potentially impactful in a transboundary context, the more critical it is to ensure the proper State's oversight[415].

Considering the inherent hazards caused by space activities, a question arise: does the obligation of due diligence apply also in the field of space law?

4.2. ARTICLE VI AS AN OBLIGATION OF DUE DILIGENCE: REVISITING THE RULES OF ATTRIBUTION IN SPACE LAW

Traditionally, scholars have interpreted Article VI as holding spacefaring States *directly* responsible for what private actors do beyond the atmosphere, referring to this provision as a unique feature of space law, an exception to the system of State responsibility under international law[416].

For example, in 1998 – when private space activities were starting to flourish – Bin Cheng wrote: "*Under Article VI of the Space Treaty, the contracting States undertake direct responsibility vis-à-vis one another not only for their own activities in outer space, including actions associated directly with such activities, but also 'national activities' in outer space carried on by non-governmental entities. Such activities are assimilated to their own insofar as compliance with the Treaty and with rules of international law is concerned.* […] *The aim is to ensure that all space activities that in international law can be controlled by one or more of the contracting parties to the Treaty are made the object of their direct responsibility and accountability in order to ensure full compliance with the Treaty's provisions by all concerned, without any loophole*"[417].

Similarly, Frans von der Dunk maintained: *"In deviation from the general law of State responsibility, States here however are directly responsible for non-state activities, instead of merely due care, as no difference is made by Article VI in respect of the kind of responsibility to be applicable in the case of 'governmental*

[415] Certain Activities case, para. 104.

[416] See M. Marcoff, *Traité de Droit International Public de l'Espace*, Cambridge University Press, 1973, p. 532; M. Lachs, above at 1, p. 113; J. Gabrynowicz, *An Introduction to Space Law for Decision Makers*, in Journal of Space Law, Vol. 30, No. 2, 2004, p. 228; S. Milwood, *The Urgent Need for Regulation of Satellite Mega-Constellation in Outer Space*, Springer, 2023, p. 37. S. O'Donnell, *International Responsibility for Activities in Outer Space in the Modern Space Age*, Doctoral Thesis, Lund University, 2023, p. 175.

[417] B. Cheng, above at 368, p. 29.

agencies' on the one hand, respectively 'non-governmental entities' on the other hand"[418].

Behind the theory of direct responsibility, there is therefore a textual interpretation of the initial part of the first sentence of Article VI, which is made of a principal clause – "*States Parties to the Treaty shall bear international responsibility for national activities in outer space*" – followed by a subordinate clause – "*whether such activities are carried on by governmental agencies or non-governmental entities*".

Because the subordinate clause depends on the concept (*rectius*: obligation) that States bear international responsibility, and because in the subordinate clause the conjunction "*or*" between public and private entities makes any distinction between them for the purpose of bearing responsibility not grammatically correct, it is concluded that States must be equally responsible for the space activities of governmental and non-governmental entities.

In addition to this textual interpretation of the initial part of Article VI, the theory of direct responsibility is also based on the negotiating history of paragraph 5 of the 1963 Declaration[419]. The latter shows that the wording of the norm was the fruit of a compromise between the position of the USSR and that of the USA. The former was opposed to the prospect of letting private undertakings embark in hazardous activities beyond the atmosphere, while the latter intended to foster and support its emerging private space industry[420]. The two opposite positions found an agreeable synthesis in the following sentence: "*States shall bear international responsibility for national activities* […] *whether carried on by governmental agencies or by non-governmental entities*"[421]. This formulation together with the idea that the USSR was against private space activities seem to suggest indeed some form of assimilation between governmental and non-governmental entities in terms of State responsibility.

Nonetheless, both the textual interpretation of the first part of Article VI as a stand-alone segment and the meaning attributed to the negotiating history of the

[418] F. Von der Dunk, *Liability versus Responsibility in Space Law: Misconception or Misconstruction?*, in Proceedings of the Thirty-fourth Colloquium on the Law of Outer Space, 1992, p. 366.
[419] Paragraph 5 of the 1963 Declaration was then replicated in almost identical terms in Article VI of the OST.
[420] See M. Gerhard, above at 238, p. 105.
[421] 1963 Declaration, paragraph 7.

provision appear to be misleading. They seem to overlook some fundamental elements in the interpretation of the provision, as it can be demonstrated by analysing its first two sentences together, by reading the proposals that brought to its drafting, and by the use of analogical reasoning with the regime of State responsibility for private activities on the international seabed.

4.2.1. A textual interpretation of the first two sentences of Article VI

As mentioned above, the theory of direct responsibility is primarily based on a textual interpretation of the initial part of the first sentence of Article VI.

Reading that part, the ordinary meaning to be given to its terms leads to the following conclusion: because States bear international responsibility for national activities, and because national activities include the activities of governmental agencies and non-governmental entities, States bear international responsibility in equal terms for both subjects.

The main problem with this interpretative approach is that it takes into consideration only a segment of Article VI, as if it contained an autonomous, stand-alone obligation. In consequence, it brings the focus on the expression which mentions governmental and non-governmental actors together, while it disregards the rest of the provision[422].

By contrast, if one looks at Article VI in the entirety of the sentences which mention non-governmental entities[423], the interpretative result changes.

In the first sentence, the main obligation is "*States ... shall bear international responsibility*". This responsibility is connected to two phrases by the term "*for*": 1) "*for national activities*"; 2) "*for assuring that national activities are carried out in conformity with the provisions set forth in the present Treaty*".

If one takes out the subordinate clause introduced by "*whether*" and the geographical specification "*in outer space*…", the provision – in its essence – reads as follows: "*States Parties to the Treaty shall bear international*

[422] Offering a critical approach to excessive 'textualism' in treaty interpretation see: O. Amman, *Domestic Courts and the Interpretation of International Law*, Brill - Nijhoff, 2020, p. 201.

[423] Except for the sentence on international organizations, which as already said goes beyond the purpose of the present analysis.

responsibility for national activities and for assuring that national activities are carried out in conformity with the provisions set forth in the present Treaty".

Reading this formulation of Article VI, it is not clear what the cause of international responsibility is for States Parties to the OST: is it national activities, as in a form of direct responsibility? Or is it assuring that national activities are carried out in conformity with international law?

These two causes of responsibility are very different, because if a State is responsible for national activities it means that it answers directly for them, while if it is responsible only for assuring that such activities are conforming to a certain legal framework it means that it has an obligation of ensuring compliance, or – as it will be seen shortly – of due diligence. The two responsibilities are triggered by different circumstances and therefore the meaning of the first sentence of Article VI – taken by itself – remains ambiguous.

Having said that, it would be logical to find some clarifications in the second sentence of the provision. However, if one interprets Article VI as creating a regime of direct responsibility for private space activities, its second sentence renders that ambiguity even stronger.

Pursuant to it, private entities are subject to a process of authorisation and supervision by the "*appropriate State*".

This obligation of authorisation and supervision would be superfluous if States were considered in any case directly responsible for private space activities. What would be the point of imposing on States an obligation to authorise and supervise non-governmental entities performing space operations if they were in any case directly responsible for the actions of such entities? Authorised or not, wrongful private space activities would trigger the responsibility of the "*appropriate State*", and would be attributed to it as if they were its own activities[424].

This specific form of attribution, or in more general terms this idea of holding States directly responsible for non-governmental entities, would be an inexplicable singularity in the system of international law that goes against the relevant rules on attribution[425] applicable in the relations between the States

[424] In this sense, see B. Cheng, above at 368, p. 29.
[425] See ARSIWA, Chapter II. See also ARSIWA Commentary, p. 39.

Parties to the OST[426]. Moreover, it would also go against the traditional and constant reluctance of States to answer for the conduct of private actors. In fact, even if in the first part of Article VI governmental and non-governmental activities are apparently placed at the same level in terms of State responsibility, it is clear that private actors cannot be considered State organs or persons exercising governmental authority, such as space agencies[427].

But if that is true, then what is the meaning of the first two sentences of Article VI?

From all that has been said so far, it is possible to interpret them as a sequence of general, explanatory and specific phrases.

The general phrase is that States are responsible for national space activities.

The explanatory phrase is that national space activities include both the activities of governmental and non-governmental entities.

The specific phrases clarify how the responsibility mentioned in the general phrase applies. More in detail, the wrongful activities of governmental agencies in outer space trigger automatically and directly the responsibility of the relative State and therefore saying that they need to conform with the obligations set forth in the OST is a superfluous specification: they are organs of the State itself and the State has to respect its international duties, *pacta sunt servanda*. However, in front of non-governmental activities, if Article VI was not there, a State may allow them without imposing that they comply with the OST. That is why the function of the phrase "*for assuring…*" is to avoid such a scenario and create that specific obligation to transfer the duty to comply with the OST to private entities. While this function is essential for non-governmental entities, it is less so for governmental agencies for the reasons just mentioned.

The other specific phrase is in the second sentence of Article VI.

Here, the drafters of the OST clarified that the "*appropriate State*" is responsible for assuring the conformity of non-governmental conduct with the applicable legal framework through the mandatory mechanism of authorisation and supervision. It functions, therefore, as a specification of the means to be used for complying with obligation mentioned in the preceding phrase.

[426] The importance of any relevant rules of international law applicable in the relations between the parties for the purpose of interpreting a treaty is maintained in the VCLT, Article 31, para. 3, lett. c.
[427] Of the same advice is: M. Gerhard, above at 238, p. 110.

In sum, Article VI establishes a general rule of responsibility which needs further specifications because the drafters of this provision included non-governmental entities in the concept of national activities in outer space. The reason why they did it can be found in the negotiating history of Article VI, which offers also a supportive argument for the confutation of the theory of direct responsibility.

4.2.2. The negotiating history of Article VI

When the USSR proposed its view on State responsibility for space activities in 1962, it expressly stated: "*All activities of any kind pertaining to the exploration and use of outer space shall be carried out solely and exclusively by States*"[428].

Because the USA did not accept the radical exclusion of private space activities, the USSR proposal was rejected. To solve the stall, the UK advanced a compromising position suggesting the following norm: "*All States shall, for themselves and for their nationals, have equal rights in the exploration and use of outer space. These rights shall be exercised in accordance with international law and with the principles affirmed in this declaration*"[429].

This formulation represented the agreeable basis to arrive – with some adjustments – at the final text of the provision, enshrined in paragraph 5 of the 1963 Declaration and replicated in Article VI of the OST, as mentioned above[430].

The sequence of proposals described above shows that during the negotiations on the topic of responsibility States were not debating whether international responsibility for private space operations applied as a form of direct responsibility or as a form of due diligence. None of the proposals in the *travaux preparatoires* ever mentions a special regime of State responsibility applicable to space activities. Rather the points of contention were: first, whether non-

[428] UN Doc. A/AC.105/L.02 of 10 September 1962, paragraph 7.
[429] UN Doc A/C.1/879 of 2 October 1962, titled 'Letter dated 4 December 1962 from the Permanent Representative of the United Kingdom of Great Britain and Northern Ireland to the United Nations addressed to the Chairman of the First Committee (Exploration and use of outer space)', paragraph 4.
[430] Paul Dembling – US Delegate to COPUOS at the time of the OST negotiations – adds that "Article VI was taken almost verbatim from Article VI of the Soviet draft, which was in turn based on Paragraph 5 of the Declaration of Legal Principles. The United States draft contained no comparable provision but the United States delegate readily acceded to the Soviet version subject to changing the term "nongovernmental bodies corporate" to "nongovernmental entities", the word "corporate" not being adequately descriptive. When the Soviet delegate accepted this minor change, debate ended on the first two sentences of Article VI". P. Dembling, above at 199, p. 437.

governmental entities had the rights to explore and use outer space; and second, assuming they did, how to make sure that such rights were exercised in accordance with international law.

Comparing the second sentence of the UK proposal with the final text adopted by COPUOS, it seems that the former left too much liberty upon non-governmental entities: they were granted the rights to explore and use outer space, but they were not the direct addressee of the obligation to exercise such rights in accordance with the applicable legal framework. With that formulation, there could have been a risk of uncontrolled private conducts in outer space. However, elaborating that sentence into a more specific obligation for States to assure the conformity of private space actors with the applicable legal framework through a process of authorisation and supervision, States became expressly obliged to overview private space activities. Thus, with a formulation that placed a precise responsibility upon States to make sure that private operators acted lawfully, the final text of paragraph 5 of the1963 Declaration represented an agreeable solution to the contentious points mentioned above.

From this recollection, it can be said that the theory of direct responsibility for private space activities is unmotivatedly inferred from the negotiating history that brought to the current text of Article VI of the OST. To the contrary, it supports its interpretation as an expression of the common regime of due diligence which generally applies between States and private actors and which can be found in several fields of international law[431].

4.2.3. Analogous reasoning in support of Article VI as an obligation of due diligence

Among the treaty regimes that regulate State responsibility for the activities of private actors, it is particularly significant that in maritime law – which it is often referred to for analogies with space law[432] – the drafters of the UNCLOS have

[431] See the fields of international law mentioned at the beginning of Section 4.1.

[432] This is particularly true for the regime of maritime law governing the high seas, where the principles of non-appropriation, free access and free use – pursuant to Articles 87 and 89 of the UNCLOS – make it a *res communis omnium* just like the cosmic domain (see above at Section 2.4.4). There is also abundant literature on the use of analogical reasoning between maritime law and space law, such as with regard to their developing phase: M. Peterson, *The Use of Analogies in Developing Outer Space Law*, in International Organization, Vol. 51, No. 2, 1997, p. 245; or with regard to liability for damages:

resorted to a provision almost identical to Article VI of the OST for the regulation of State responsibility *vis-à-vis* private activities in the seabed beyond the limits of national jurisdiction, a domain also known as the 'Area'[433].

That provision is Article 139 of the UNCLOS, which reads as follows: "*States Parties shall have the responsibility to ensure that activities in the Area, whether carried out by States Parties, or state enterprises or natural or juridical persons which possess the nationality of States Parties or are effectively controlled by them or their nationals, shall be carried out in conformity with this Part*"[434].

The similarity in the wording is evident. Using a much clearer phrasing compared to the drafters of the OST, the drafters of the UNLCOS did not use two different "*for*" after the principal clause, namely "*States Parties shall have the responsibility*", but they directly linked the latter to the obligation of ensuring conformity, clarifying within the same phrase its geographical and subjective scope of application.

The responsibility "*to ensure…*" in Article 139 of the UNLCOS and the responsibility "*for assuring…*" in Article VI of the OST are structured in analogous terms. But that by itself simply indicates that a similar regime applies, without telling however which type of regime that is.

Fortunately, the International Tribunal on the Law of the Sea (ITLOS) was asked to clarify precisely that matter in 2011, issuing an advisory opinion that interpreted Article 139 of the UNLCOS as follows:

"*It establishes a mechanism through which the rules of the Convention concerning activities in the Area, although being treaty law and thus binding only on the subjects of international law that have accepted them, become effective for*

M. Franck, *Falling stars and sinking ships: how article vii of the outer space treaty needs maritime law*, in Pace International Law Review, Vol. 35, No. 2, 2023, p. 159; or with regard to their general principles: V. Iavicoli, *The legal regime of outer space in light of the Law of the Sea*, in Ocean Sustainability in the 21st Century (ed. by S. Aricò), Cambridge University Press, 2015, p. 249.

[433] See for the definition of the Area, Article 1 of the UNCLOS. For the regulation of the Area see Part XI of UNCLOS and in particular Article 137. For a recent general overview of the legal landscape governing the Area see A. Jaeckel, *The Area and the role of the international seabed authority*, in Routtledge Handbook of Seabed Mining and the Law of the Sea (ed. by V. Campanella), 2024, p. 157.

[434] UNCLOS, Article 139. See the commentary on this provision provided in: M. Nordquist, *United Nations Convention on the Law of the Sea 1982 A Commentary Volume VI*, Brill Nijhoff, 2003, p. 118. See also the more recent analysis of the provision offered in connection to environmental matters in: G. Leite Neves da Luz, *Environmental Obligations and Liability of Private Contractors - Potential Use of Sponsoring States of Convenience in the Deep Seabed Mining Regime*, PhD Dissertation of the University of Hamburg Law Faculty, disputed on 13 December 2024, p. 140. See also the International Seabed Authority's discussion paper n. 2/2023, titled '*The rights and obligations of the international seabed authority and the sponsoring state with respect to activities in the Area*', para. 13.

sponsored contractors which find their legal basis in domestic law. This mechanism consists in the creation of obligations which States Parties must fulfil by exercising their power over entities of their nationality and under their control. […] The sponsoring State's obligation 'to ensure' is not an obligation to achieve, in each and every case, the result that the sponsored contractor complies with the aforementioned obligations. Rather, it is an obligation to deploy adequate means, to exercise best possible efforts, to do the utmost, to obtain this result. To utilize the terminology current in international law, this obligation may be characterized as an obligation 'of conduct' and not 'of result', and as an obligation of 'due diligence'"[435].

What does it mean that the consequence of the 'obligation to ensure' (or assure) is an obligation of conduct and an obligation of due diligence?

The obligation of conduct in the context at hand can be translated in an obligation to adopt regulatory or administrative measures for the oversight of private activities[436]. In other terms it consists in the duty of '*possessing*', on a permanent basis, a legal and administrative apparatus able to guarantee the respect of international norms aimed at preventing international wrongs[437].

The obligation of due diligence entails a different obligation of '*using*' such apparatus with the diligence that the circumstances require[438].

[435] ITLOS, *Responsibilities and obligations of States sponsoring persons and entities with respect to activities in the Area*, Advisory Opinion of 1 February 2011, para. 108-116. In 2015, ITLOS confirmed the same approach in another advisory opinion concerning fishing by private vessels in the EEZ of a foreign coastal State. ITLOS, *Request for Advisory Opinion submitted by the Sub-Regional Fisheries Commission*, Advisory Opinion of 2 April 2015, para. 125-135. For a commentary of both advisory opinions, see T. Scovazzi, *The Contribution of the Tribunal to the Progressive Development of International Law*, in The Contribution of the International Tribunal for the Law of the Sea to the Rule of Law: 1996–2016, Brill Nijhoff, 2018, p. 129,

[436] ICJ, *Pulp Mills on the River Uruguay* (Argentina v. Uruguay) ("Pulp Mills case"), Judgment of 20 April 2010, para. 187. On the link between due diligence as elaborated in the Pulp Mills case and the mentioned ITLOS Advisory Opinion of 2011 see: D. Konig, *The Elaboration of Due Diligence Obligations as a Mechanism to Ensure Compliance with International Legal Obligations by Private Actors*, in The Contribution of the International Tribunal for the Law of the Sea to the Rule of Law: 1996–2016, Brill Nijhoff, 2018, p. 85.

[437] R. Pisillo-Mazzeschi, *The Due Diligence Rule and the Nature of the International Responsibility of States*, in German Yearbook of International Law, No. 35, 1992, p. 26.

[438] *Ibid*. See also A. Proelss and others, *Liability under Part XI UNCLOS (Deep Seabed Mining)*, in Corporate Liability for Transboundary Environmental Harm (ed. by P. Gailhofer and others), Springer, 2022, p. 564.

Considering the almost identical wording adopted in the UNCLOS and in the OST and considering also the similar legal status of the Area and of outer space[439], it is possible to apply in analogy the same findings of the ITLOS to Article VI, OST.

Therefore, by reading the obligation "*for assuring the conformity…*" contained in Article VI as an obligation of conduct and of due diligence[440], the following conclusions can be made.

Firstly, State responsibility for the conduct of non-governmental entities in outer space is limited to the State's failure to meet its obligation to 'assure' compliance with the OST[441].

Secondly, Article VI of the OST adds something that is missing in Article 139 of UNCLOS. As mentioned, the 'obligation to prevent' implies legal and administrative guarantees in order to be fulfilled. In the system of space law, they are expressly specified in the second sentence of Article VI: they consist in establishing a mechanism of authorisation reinforced by the continuing supervision of private space activities.

An authorisation is a governmental instrument through which a public authority confers to a private entity the capacity to fully exercise a power related to a certain activity of public interest[442].

The concept of supervision, on the other hand, entails the adoption of appropriate rules and measures that allow to oversee private actors. In addition, it requires a certain level of vigilance in the enforcement of such measures through the exercise of administrative controls, such as the monitoring of activities undertaken by private operators[443].

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[439] Notably, the international seabed is a geographical area which, like outer space, is beyond the jurisdiction of any State, where freedom of access, exploration and use applies, with the only difference that such freedom is limited by the common heritage of mankind principle and by the resulting powers placed upon the International Seabed Authority.

[440] See T. Masson-Zwaan, *Article VI of the Outer Space Treaty and Private Human Access to Space*, in Proceedings of the International Institute of Space Law 2008, Eleven International Publishing, 2009, p. 537, stating that "[Article VI] implies in fact an obligation of due diligence; the state must verify for instance that activities by its nationals do not present a danger to the public health or to the safety of persons and goods, that they are not inconsistent with the State's treaty obligations, do not pose any risk for national security or have a negative environmental impact, and that they do not pose significant financial risks".

[441] Also on this regard, ITLOS in its advisory opinion of 2011 has clarified: "not every violation of an obligation by a sponsored contractor automatically gives rise to the liability of the sponsoring State. Such liability is limited to the State's failure to meet its obligation to 'ensure' compliance by the sponsored contractor".

[442] A.M. Sandulli, *Il Procedimento Amministrativo*, Giuffrè, 1964, p. 67.

[443] Pulp Mills case, para. 194.

Unlike the 'obligation of assuring', the two obligations of authorising and supervising private space activities are obligations of result: they compel States to set up appropriate legislative and administrative measures the lack of which determines a breach of Article VI[444].

This means that it does not matter how a State complies with its obligations to authorise and supervise non-governmental entities, as long as the result envisaged by the norm is achieved. In fact, from a general perspective, a duty of due diligence does not entitle other right-holder States to require the adoption of specific measures by the duty-holder State[445]. These measures are only generally "*exigible*" (French for "*due*")[446]. It is not possible to require another State to adopt a specific type of measure rather than another. The choice is an expression of its exclusive discretion.

Once a mechanism of authorisation and supervision is established at the national level and it is concretely applied to relevant space activities, the obligation contained in the second sentence of Article VI can be considered complied with.

However, when a State Party to the OST implements Article VI, there is one condition that must be respected and that is linked to the 'obligation to assure' as an obligation of conduct and of due diligence: the chosen national mechanism must be adequate to assuring the conformity of private space activities with the applicable legal framework. In fact, the obligations to authorise and supervise are functional to achieving the purpose of Article VI[447]. Therefore, States must be able

[444] As the subsequent practice of States Parties demonstrates, however, these obligations become relevant only when a State's national activities begin to include non-governmental space activities. In other terms, there is no obligation for States to adopt such measures at the moment of ratification of the OST unless among their national space activities there are also private operations, which can be seen as the source of risk that triggers a duty to act with diligence.
This has been the practice of States Parties to the OST since the entry into force of the Treaty. The national processes for authorisation and supervision of non-governmental activities are set up only when necessary, as is demonstrated by the fact that there is still a very small percentage of States Parties that have set them up compared to the number of ratifying States.

[445] In these terms with regard to environmental obligations, see J. Vinuales, *Due Diligence in International Environmental Law*, in Due Diligence in the International Legal Order, Oxford University Press, 2020, p. 119.

[446] *Ibid.*

[447] As incisively put it by Ian Brownlie: "A State is not under a duty to control the activities of private individuals (being its nationals) beyond the bounds of State territory. Thus, a State is not responsible for the delinquencies of vessels flying its flag or otherwise controlled by its nationals; and there is no responsibility for the wrongdoing of investors and others abroad vis-à-vis the host State. However, it is possible to prescribe duties to control such activities by convention (e.g. in Article VI of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space of 1967)". I. Brownlie, *System of the Law of Nations: State Responsibility - Part 1*, Oxford University Press, 1983, p. 165.

to demonstrate that the aim of Article VI can be fulfilled with the authorising and supervising processes established domestically.

The question is: how can a State know whether its system of authorisation and supervision meets the required level of diligence?

According to the ICJ, it is for each State to evaluate the aptness of its domestic system to fulfil the purpose of norm, having regard to the nature and safety implications of the activity in consideration[448].

But it is not just a matter of subjective evaluation. The discretion of States is narrowed down by a second parameter, which is the practice of other States in similar circumstances. That represents a benchmark for passing the diligence test.

In sum, the domestic implementation of Article VI is left to the reasonable discretion of each State, taking into account how other spacefaring States have set up and applied their authorisation and supervision processes.

Clearly, as mentioned before, any inquiry on the compliance with a due diligence obligation – including the one set by Article VI – is highly contextualised and can only be left to a case by case evaluation.

In view of all that has been said so far, it can be concluded that the responsibility regime of Article VI should not be interpreted as a unique case of direct State responsibility for the conduct of private actors, but rather as an elaboration in the realm of space activities of the obligation of due diligence. In other words, a State Party to the OST does not directly answer for the actions or omissions of non-governmental entities: their conduct in outer space remains their own.

States are responsible under Article VI in the limits of their obligations to set up a mechanism of authorisation and supervision and to assure – through that mechanism – the conformity of non-governmental space operations with the applicable legal framework.

This represents a change of paradigm in the approach to responsibility under international space law, with concrete and significant repercussions for States.

In fact, connecting responsibility to the national authorisation and supervision system and to whether conformity was assured has a beneficial effect on the domestic implementation of international space law: States are induced to establish more stringent, responsible and up-to-date mechanisms of control over

[448] See Pulp Mills case, para. 205. See also Certain Activities case, para. 104.

private space activities because by demonstrating their compliance with the two obligations mentioned above they can be exempted from their international responsibility.

The imposition of State responsibility predicated on due diligence is an incentive towards robust legislation and attentive control of private space activities.

On the contrary, with direct responsibility for whatever non-governmental entities do in outer space there is little encouragement for States to invest in the implementation of Article VI. Good or bad the authorisation system, their responsibility remains.

This emerges in clear terms if one considers the legal consequences of private space activities put in place in violation of the applicable national laws.

4.2.4. State responsibility for activities conducted without or beyond authorisation

Assuming that a State Party to the OST has fulfilled its obligations under Article VI with diligence, the question is: what responsibility does it bear for a private national entity that conducts an unauthorised activity in outer space? What if the private entity performs a space activity that goes beyond the purview of what was in the authorisation?

It has already been argued that if there was a direct State responsibility for private space operations under Article VI, it would be irrelevant whether the national activity at hand was authorised or not or whether it violated the limits of the authorisation. The "*appropriate State*" would still be responsible simply on the basis of the fact that the activity fell under the concept of "*national activity*"[449]. It would be exposed to repair the direct consequences of any private misdeed, as if it was committed by the State itself.

On the contrary, by applying the view that Article VI is an elaboration of the obligation of due diligence, the rules on attribution for private misconducts become more in line with the traditional position of States in public international law.

[449] See for all F. Lyall and others, above at 201, p. 96.

For example, consider a State, State A, whose rights are compromised by an 'illegal'[450] space activity of a foreign company, Company B, operating in outer space under the authorisation of State B.

Putting it in more concrete terms, imagine that Company B occupies an orbital slot different from the one assigned to it through the national authorisation process, the same orbital slot legitimately assigned to State A even if not used yet by the latter. Because of this situation, State A cannot launch its space object in outer space as planned, as it has to wait until the situation with Company B is solved, with negative repercussions on its economic and personal spheres (e.g. reputational damage). Thus, the rights of State A are impaired by the conduct of Company B.

In those circumstances, State A has a direct cause of action – domestically – against Company B for the impairments caused by the fact that the latter did not occupy the orbital slot assigned to it. However, at the same time, it can bring an action against State B for the breach of a different primary obligation: the duty to assure that its authorised private companies follow the rules imposed on them while they operate in outer space.

As can be seen, Company B and State B respond for the same impairment of a third party's rights under two separate types of responsibility.

The only primary obligation whose breach can be attributed to State B, however, is the obligation to take the measures necessary to prevent the injurious consequences of illegal private acts or omissions under its jurisdiction or control[451].

If there was no violation of due diligence, there would be no cause of action against State B as it would be unreasonable to hold it responsible for an activity that was put in place in violation of its own national laws[452].

[450] The adjective 'illegal' is used here to indicate an activity that is not in line with the laws of the authorising State.

[451] The separation between the responsibility of the State and the responsibility of the individuals under its jurisdiction has a long history of elaboration. Already in 1902, Italian jurist Dionisio Anzilotti approached the matter in the following terms: Responsibility flows from a State's own act of being unable or unwilling to take actions against the crime committed by the private person. In this sense, it is the inability or unwillingness to act that constitutes the conduct contrary to international law. Hence, responsibility can never be vicarious or indirect, for it arises solely as a result of a wrongful conduct on the part of the State. D Anzillotti, *Teoria Generale della Responsabilità dello Stato nel Diritto Internazionale*, Lumachi, 1902, p. 171. See also A. Ollino, above at 412, p. 31.

[452] See B. Conforti, above at 410, p. 427.

In addition to the obligation to prevent injurious consequences stemming from an activity under its jurisdiction or control, State B also has an additional duty that is part of the concept of due diligence: the obligation to punish private misconduct[453]. In other terms, it is not sufficient to implement with diligence a system of authorisation and supervision if, when that system is violated, there are no repercussions. A set of rules is effectively implemented only if its violation is effectively punished.

The importance of this last aspect emerges clearly from the only three cases known today of private entities violating the authorisation process of their authorising State.

4.2.4.1. The Swarm Technology case

The first case concerns a US company called '*Swarm Technologies*'.

In 2017, the latter applied to the Federal Communications Commission (FCC) for a license to operate its experimental satellites called '*Space BEEs*'[454]. Relatively tiny compared to the more traditional satellites, the Space BEEs raised the concern of the FCC because they were not going to be easily trackable[455]. In December 2017, the FCC denied Swarm's application, stating that to grant the authorisation would be contrary to the public interest.

Shortly after receiving the notice of rejection and in direct contravention of the FCC's decision, Swarm Technology had its Space BEEs launched into orbit from India on an Indian rocket. When the FCC found out that Swarm Technologies was performing unauthorised space activities, it adopted a number of sanctions

[453] The inclusion of the aspect of punishing private misconducts within the concept of 'due diligence' was recognised since the early affirmation of the latter in the relevant jurisprudence and doctrinal works. See A. Ollino, above at 412, p. 29. A concrete example can be found in the field of human rights violations, in: Human Rights Committee, *General Comment 31 - Nature of the General Legal Obligation on States Parties to the Covenant*, adopted on 24 March 2004, para. 8, where it is stated - in relation to the International Covenant on Civil and Political Rights - that "There may be circumstances in which a failure to ensure Covenant rights as required by article 2 would give rise to violations by States Parties of those rights, as a result of States Parties' permitting or failing to take appropriate measures or to exercise due diligence to prevent, punish, investigate or redress the harm caused by such acts by private persons or entities".

[454] J. Ayetey, *In Support of Global Accountability for Private Commercial Space Actors*, in Georgia Journal of International and Comparative Law, Vol. 48, 2020, p. 761.

[455] *Ibid*. See also S. O'Donnel, *Bees in space - Swarm technologies' unauthorised deployment of SmallSats and Art. VI of the outer space treaty*, in Proceedings of the International Astronautical Congress, Eleven International Publishing, 2018, p. 129.

including the payment of a fine of $900,000 and the implementation of a compliance plan[456].

In this case, the USA – as the national State of the unruly private company – had a well-established process of authorisation which was diligently applied to the activity at hand precisely with the aim of assuring its conformity with the norms of space law. Moreover, the USA rightly sanctioned the private company and ensured that the lack of authorisation would be brought back to legality through a compliance plan. Therefore, the conduct of the USA can hardly be questioned at the international level, as is demonstrated by the absence of complaints within COPUOS or in other international fora.

Going beyond these legal considerations, there is only one element of perplexity in this specific case: shortly after the monetary sanction, Swarm Technologies successfully raised $25,000,000 in a funding round which relied on the SpaceBees being launched. In other words, economically, Swarm Technologies was incentivised to go against the FCC, and *de facto* it was rewarded for it[457].

4.2.4.2. The SpaceIL case

The second case involves a lunar lander named '*Beresheet*', built by an Israeli company ('*Israeli Aerospace Industry*') and operated by a public-private Israeli organization ('*SpaceIL*'). The launch of Beresheet was sponsored by a US based non-profit organisation called the '*Arch Mission Foundation*', which in exchange of its sponsorship had placed on the lander the '*Lunar Library*': a DVD archive loaded with images of classic books, language primers, and nearly all of the English Wikipedia. A sort of legacy of humans to be placed on the Moon.

A spot was secured for Beresheet as a secondary payload on top of a Falcon 9 rocket of Space X, which was planned to be launched in early 2019.

With the launch occurring from the USA, the competent US governmental authority, namely the Federal Aviation Administration (FAA) had to authorise it, reviewing also the payload of the rocket and therefore the Israeli lunar lander.

[456] Federal Communications Commission, *Order and Consent Decree in the Matter of Swarm Technologies Inc.*, File No. EB-SED-18-00026685, adopted on 14 December 2018.

[457] C. Johnson and others, *The curious case of the transgressing tardigrades (part 1)*, published online on August 26, 2019, at the following link: https://www.thespacereview.com/article/3783/1

As the FAA conducted its review it did not find anything against its standards and accordingly it issued the necessary authorisation to launch.

Also Israel, as the "*appropriate State*", had authorised its company SpaceIL to go ahead with the Beresheet misison[458].

However, in the time between the FAA's authorisation and the actual launch, the Arch Mission Foundation, apparently in secret, attached biological materials to the Lunar Library for experimental reasons. More in detail, it tucked to the hardware a few thousand dehydrated tardigrades, microscopic life forms that are extremely resilient and unbothered by the vacuum of outer space or by the deadly background radiation of outer space[459].

A few months after the launch, at the final moment of landing, Beresheet crashed on lunar soil, causing the uncontrolled contamination of the Moon with biological material.

The accident and the spilling of tardigrades were revealed by Nova Spivak, the founder and executive director of the Arch Mission Foundation.

Even if the USA had to review the payload before approving the launch[460], Israel had the obligation to assure the conformity of its authorised private lunar mission with the applicable rules, including the ones on the forward contamination of the Moon[461]. However, what could it have done to discover the undeclared biological

[458] Israel registered the object at the UN level using the mechanism of Resolution 1721 (XVI)B. See UN Doc. A/AC.105/INF/436 of 6 August 2019, titled 'Information Furnished in Conformity with General Assembly Resolution 1721 B (XVI) by States Launching Objects into Orbit or Beyond
Note verbale dated 24 June 2019 from the Permanent Mission of Israel to the United Nations (Vienna) addressed to the Secretary-General'.

[459] See C. Johnson, above at 457.

[460] For an analysis on the possible grounds of responsibility at the national level see: C. Johnson and others, *The curious case of the transgressing tardigrades (part 2)*, published online on September 3, 2019, available at the following link: www.thespacereview.com/article/3786/1

[461] They consist in Article IX of the OST, insofar as it imposes on States to avoid the harmful contamination of the Moon; and in the guidelines adopted by Committee on Space Research (COSPAR), which for missions like Beresheet (classified as Category II) require for the preparation of a short planetary protection plan primarily to outline intended or potential impact targets, brief Pre- and Post-launch analyses detailing impact strategies, and a Post-encounter and End-of-Mission Report which will provide the location of impact if such an event occurs. See COSPAR Policy on Planetary Protection, adopted in 2017 (although the latest version was approved in 2024, the one from 2017 is the one which applied at the time of the launch of *Beresheet*; notably, the aspect reported here has not been amended in the latest version). It must be stressed that the COSPAR Policy on Planetary Protection is a non-binding document and therefore a State may not follow the *soft* rules on forward contamination contained therein. Nonetheless, considering that in practice they represent the recognised standard in regard to contamination from biological matter, non-compliance with them may represent an element for finding a State internationally responsible. For a recollection of the States that have implemented them at the domestic level, see G. Boccardo, *Planetary Protection Obligations of States Pursuant to the Space Treaties and with Special Emphasis on National Legislations Provisions*, published in 2018 at the following link www.nyulawglobal.org/globalex/Planetary_Protection_Obligations_States1.html.

material added to the mission before the launch? It seems unreasonable to say that Israel could have prevented Nova Spivak from secretly introducing tardigrades in the Lunar Archive. And if that is the case, then Israel cannot be considered responsible under Article VI of the OST[462].

4.2.4.3. The DISH Network case

Moving to the third and final case, it sees once again the involvement of the USA as the authorising State. In this instance, the American satellite-TV provider DISH Network did not deorbit properly its EchoStar-7 satellite at the end of its lifetime in space, violating the commitments taken with the FCC[463].

In February 2022, DISH determined that the satellite had very little propellant left, which meant it could not follow the original orbital debris mitigation plan in its FCC authorisation[464]. DISH ultimately retired the satellite at a disposal orbit approximately 122 km above the geostationary arc, well short of the disposal orbit of 300 km specified in its orbital debris mitigation plan[465]. Since at that lower altitude EchoStar-7 could pose orbital debris concerns to other satellites, the FCC sanctioned the company. To settle this matter, DISH admitted that it failed to operate the EchoStar-7 satellite in accordance with its authorization, accepted to implement a compliance plan and paid a $150,000 civil penalty[466].

Similar to the case of Beresheet, also here a non-governmental entity decided to put in place an activity beyond the purview of its authorisation. When that was discovered, the governmental authority reacted domestically, issuing an economic penalty and holding the private actor responsible for its misconduct.

See also L. Tennen, *The COSPAR Planetary Protection Policy and International Law*, in Space Law (ed. by T. Leclerc), ISTE – Wiley, 2023, p. 299.

[462] For a detailed analysis of the legal repercussions of the Beresheet mission see: K. Gundersen, *Beyond the Tardigrades Affair: Planetary Protection, Cospar, and the Future of Private Space Regulation*, in New York University Journal of International Law and Politics, Vol. 53,No. 3, 2021, p. 871.

[463] For a brief overview of the case under legal terms, see T. Masson-Zwaan and others, *Echostar-7: The US Imposes First-Ever Fine for Failure to Comply with Deorbiting Plan*, in Air & Space Law, Vol. 49, No. 2, 2024, p. 1.

[464] W. Wiquist, *FCC Takes First Space Debris Enforcement Action*, published online on October 2, 2023, available at the following link: https://docs.fcc.gov/public/attachments/DOC-397412A1.pdf

[465] *Ibid.*

[466] Federal Communications Commission, *Order and Consent Decree in the Matter of DISH Operating LLC.*, File No. 2018EB SED-22-00034635, adopted on October 2, 2023.

Considering the facts of the case and the subsequent governmental reaction, it can be said that the "*appropriate State*" acted with the due diligence necessary to prevent and then punish the injurious consequences stemming from the conduct of its authorised private space operator.

Overall, it can be said that in each of the three cases described above the "*appropriate State*" adopted a reasonable diligence in the authorising and supervising process to prevent possible violations of the applicable rules[467], and – when such violations occurred – it resorted to its sanctioning system to punish domestically the private misconduct. Therefore, it is hard to find any cause of action against that State for private space activities performed without or beyond its authorisation.

While this is true in the cases at hand, it cannot be ignored that similar private behaviours raise a concern on the future use of the cosmic domain. With more and more non-governmental actors embarking in space operations, the instances of private activities that are not in conformity with international space law[468] are statistically destined to increase. For as troubling as this may be, the tools of international law are limited. It is in the hands of each domestic framework to contain unruly private behaviours. All that the international community can do is to set higher standards on the content of authorisations, on the manners of supervision, and on the sanctioning of misconducts. A more stringent level of diligence can expose remiss States. The result is a wider margin of international responsibility for ensuring the conformity of national activities with the OST.

To reach this goal it is necessary to push national legislators in that direction, clarifying at the international level the elements of a diligent implementation of Article VI and thus raising the bar for all States Parties to the OST.

[467] The expression 'applicable rules' is used here to refer to the norms established in the authorisation and supervision mechanism at the domestic level. From an international law perspective, they represent the implementation of the principles of space law contained in treaties (e.g. Articles VI and IX of the OST) and in *soft law* documents (e.g. COSPAR Policy on Planetary Protection).

[468] In connection to what has been said in the previous footnote, the test of conformity with international space law is inevitably connected to State practice in the implementation of the principles established at the international level. Two parameters come into play: 1) the inclusion in the domestic authorisation and supervision mechanism of norms that are generally recognised and accepted as the diligent implementation of international space law; 2) the application of those norms in a diligent manner, including in the phase of sanctioning any unruly private conduct.

Inevitably, this is going to represent an additional burden for the space industry, but the diligence that public authorities must have in controlling private actors cannot be sacrificed on the altar of industrial growth.

4.3. THE LIABILITY OF THE "APPROPRIATE STATE"

In light of the nature of Article VI as a form of due diligence with regard to private space activities, States Parties to the OST can avoid any responsibility connected to the conduct of non-governmental entities insofar as they demonstrate that they had established and implemented a process of authorisation and supervision reasonably apt to assure the conformity of private space activities with the applicable legal framework.

If their diligence is proven, their responsibility is excluded.

With that, "*appropriate States*" are freed from the legal consequences connected to internationally wrongful acts, namely: '*cessation*' and assurances of '*non-repetition*'; when possible, '*restitution*', that is, to re-establish the situation which existed before the wrongful act was committed; '*compensation*' for the damage caused thereby, insofar as such damage is not made good by restitution; '*satisfaction*' – which consists in an acknowledgement of the breach, an expression of regret, a formal apology or another appropriate modality – when the injury caused by that act cannot be made good by restitution or compensation[469].

Among these consequences, compensation works in a special way: even if it is pushed out of the door for the lack of any international responsibility, it can come back through the window on the basis of a different legal ground: international liability.

Under public international law, State liability is not linked to the violation of an international norm, such as the duty of due diligence. It is linked only to the causation of damage and its purpose is to provide some form of economic redress through compensation to the potential victims of hazardous activities not prohibited by law[470].

[469] ARSIWA, Article 30 et seq.

[470] On the connection between liability and damage irrespective of a wrongful conduct see: ILC, *Draft principles on the allocation of loss in the case of transboundary harm arising out of hazardous*

All this has found a most proper field of application in the realm of extra-terrestrial operations, lawful and hazardous by definition.

Once an object is launched into outer space a very concrete danger is created: rockets explode, satellites collide, and more often than necessary pieces of manmade space objects fall down on Earth.

When any of these catastrophic events happens the resulting damages for everything and everyone involved can be extremely severe.

For this reason, in order to balance the inherent risks posed by space activities with the freedom to explore and use outer space, the drafters of the OST included in the system of space law a provision that ensures compensation for damages caused by space objects without regard to wrongfulness, namely Article VII:

"*Each State Party to the Treaty that launches or procures the launching of an object into outer space, including the Moon and other celestial bodies, and each State Party from whose territory or facility an object is launched, is internationally liable for damage to another State Party to the Treaty or to its natural or juridical persons by such object or its component parts on the Earth, in air space or in outer space, including the Moon and other celestial bodies*"[471].

Thus, Article VII enshrines the concept of State liability for lawful and hazardous activities in space law: it is irrelevant whether a space activity, public or private, has breached an international obligation; it does not matter whether the actions or omissions that brought a space object to cause damages were lawful or unlawful *per se*; the only relevant aspect is the mere occurrence of harm caused by a space object. In addition to being detached from any evaluation of legality, Article VII is also evidently functional to compensation. Its scope of application, in fact, has been drafted in a particularly broad manner, covering damages anywhere on Earth, in outer space and on celestial bodies, so that no victim of harm may be left out of its purview[472].

But the most interesting element of Article VII for the purpose of the present discourse is that it revolves around the special category of the launching State.

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activities, with commentaries, in Yearbook of the International Law Commission, 2006, vol. II, Part Two, 2006, p. 63. Questioning the dichotomy between 'responsibility' and 'liability' in international law, see: P. D'Argent, *Responsibility or Liability Is It Really That Simple?*, in Theories of International Responsibility Law (ed. by S. Besson), Cambridge University Press, 2022, p. 209.

[471] OST, Article VII.

[472] See A. Kerrest and others, above at 303, p. 130.

As anticipated in Chapter III, commentators have always interpreted it as placing the liability for damages caused by space objects *exclusively* upon the launching State.

There are no particular problems in the practical effects of that interpretation as long as the launching State is also the "*appropriate State*" pursuant to Article VI. However, if the two categories fall upon two different States, such as in the case of privately procured launches (see Chapter III, Section 3.5) or in the case of transfer of control over a space object to a non-launching State (see Chapter III, Section 3.6), the idea of an exclusive liability under Article VII becomes troublesome.

In such a regime, any victim of damages caused by the lawful use of a space object can only submit its claim for compensation to a State whose only link to that object is that it launched it. At the same time, the State from whose jurisdiction the same space object was being controlled, eventually causing damages, would be left unburdened by any liability.

This undesirable allocation of liability is avoided when the idea of exclusive liability is discarded and the "*appropriate State*" is also considered liable at the international level.

Considering that Article VII of the OST mentions only the launching State, the question is: on which legal basis can the "*appropriate State*" bear liability?

4.3.1. State Liability in Public International Law

In Chapter III, it was briefly stated that, according to the general principles of international law, liability must be borne for the injurious consequences which – in accordance with the natural law of causation – are traceable to activities that lie within the jurisdiction and control of a State[473].

In other terms, liability refers to situations according to which States have an obligation to take reparatory measures for the harm caused by activities carried out under their jurisdiction or control, irrespective of the lawfulness of the conduct that originated such harm.

[473] See S. Sucharitkul, above at 314, p. 835.

A first affirmation of this principle in public international law can be traced back to the Trail Smelter Award between Canada and the USA of 1941, where the Tribunal first arrived at the conclusion that "*no State has the right to use or permit the use of its territory in such a manner as to cause injury by fumes in or to the territory of another or the properties or persons therein, when the case is of serious consequence and the injury is established by clear and convincing evidence*"[474]. Then, it ruled that Canada should pay a compensatory indemnity for damages caused by the Trail Smelter from 1932 to 1937[475].

From there, it was possible to develop the idea that a State's obligations to ensure that other States' rights are not infringed by the harmful effects of things done or omitted within its territory or jurisdiction is a duty that is not limited to prevention, but that it extends to making good any harm that is fairly attributable to the lawful conduct of a lawful activity[476].

The ICJ has confirmed this conclusion in 1971 in the case concerning the control of Namibia's territory by South Africa, where – addressing the matter of the legal consequences of such occupation – it recognised that States bear liability for damages originating from a place under their control: "*The fact that South Africa no longer has any title to administer the Territory does not release it from its obligations and responsibilities under international law towards other States in respect of the exercise of its powers in relation to this Territory. Physical control of a territory, and not sovereignty or legitimacy of title, is the basis of State liability for acts affecting other States*"[477].

Another implicit confirmation can be found in the Pulp Mills case, where the ICJ, rejecting Argentina's substantive claim for damage, stated: "*It follows from the above that there is no conclusive evidence in the record to show that Uruguay has not acted with the requisite degree of due diligence or that the discharges of effluent from the Orion (Botnia) mill have had deleterious effects or caused harm*

[474] Trail Smelter case, p. 1965.
[475] *Ibid.* p. 1940.
[476] R. Baxter, *Second report on international liability for injurious consequences arising out of acts not prohibited by international law*, in Yearbook of the International Law Commission, Vol. 2, 1981, p. 112.
[477] ICJ, *Legal Consequences for States of the Continued Presence of South Africa in Namibia (South West Africa) notwithstanding Security Council Resolution 276 (1970)*, Advisory Opinion of 21 June 1971, para. 118.

to living resources or to the quality of the water or the ecological balance of the river"[478].

If international law imposed only a due diligence obligation, then the Court did not need to engage in a factual inquiry about whether the mill actually harmed the environment, as the Court could have resolved this case as a matter of law[479]. The term 'or' after "*diligence*" in the sentence reported above implies that Uruguay could have been exposed to liability for transboundary environmental damages even if it acted with due diligence.

Similarly, Judge Dalveer Bhandari, in his separate opinion on the judgement regarding the merits of the case between Costa Rica and Nicaragua in 2015, underlined that "*a logical corollary of the foundational principle under international law that each nation is sovereign over its own territory, is that if one nation deleteriously affects the territory of another, certain obligations and/or liabilities might arise*"[480].

In addition to these judicial developments, the principle of State liability for international damages has also been addressed by the ILC. In particular, an ILC Working Group established in 2002 took into consideration the transboundary harm that could occur despite compliance by the State with all its duties of prevention, that is, despite its best efforts, knowledge and means available to it[481]. The result was a set of principles called "*Principles on the allocation of loss in the case of transboundary harm arising out of hazardous activities*"[482], where the notion emerged that liability for transboundary harm could arise even in situations in which a State had complied with its prevention obligations[483].

Interestingly, paragraph 4 of Principle 5, titled "*Prompt and adequate compensation*", establishes that in cases where the compensatory measures paid by the operator of the damaging activity "*are insufficient to provide adequate*

[478] Pulp Mills case, para. 265.
[479] J. Suttenberg, *Who Pays: The Consequences of State versus Operator Liability within the Context of Transboundary Environmental Nuclear Damage*, in NYU Environmental Law Journal, Vol. 24, 2016, p. 201.
[480] Certain Activities case, Separate Opinion of Judge Bhandari, p. 794.
[481] S. Rao, *Introductory note to the Principles on the Allocation of Loss in the Case of Transboundary Harm arising out of Hazardous Activities*, in United Nations Audiovisual Library of International Law, 2023, p. 1.
[482] ILC, *Principles on the allocation of loss in the case of transboundary harm arising out of hazardous activities* (ILC's Principles), adopted as UNGA Res. 61/36 of 18 December 2006.
[483] ILC, Report of the International Law Commission on the work of its fifty-eighth session (2006), UN Doc. A/CN.4/577/Add.2 of 20 February 2007, at p. 38.

compensation, the State of origin should also ensure that additional financial resources are made available"[484].

It follows that – despite the primary liability of the operator – the final obligation to provide for adequate compensation rests with the State of origin[485].

Analogous conclusions have been reached by several publicists in their doctrinal works.

For example, examining State liability in general terms, Sompong Sucharitkul wrote: "*International liability arises out of injurious consequences which, according to the natural law of causation, must result from activities over which the State has or should have direct or indirect control or that lie within its jurisdiction. Usually, a State may be held internationally liable for harmful effects caused by activities occurring or emanating from within its territory*"[486].

Approaching the matter from the context of State liability for nuclear damages, Günther Handl noted that "*no legal or technical obstacles currently exist ... to the assertion of an extra-conventional international strict liability claim for compensation of accidental transboundary nuclear harm*"[487].

In the same context, Jeremy Suttenberg, General Attorney for the US Nuclear Regulatory Commission, based on a thorough analysis of the relevant international framework concluded that "*States should be strictly liable in international law for any cross-border damage following a private nuclear accident*"[488].

Other authors, such as Clarence Wilfred Jenks and Fred Goldie, have extended the scope of State liability for lawful conduct to the coverage of all damages caused by ultra-hazardous activities conducted from within a State's territory[489].

As seen, scholars have emphasised the connection of liability with the conduct of lawful and hazardous activities from a place under the jurisdiction and control of the State of origin.

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[484] ILC's Principles, Principle 5, para. 4.

[485] In similar terms, see A. Mackielo, *Core Rules of International Environmental Law*, in ILSA Journal of International & Comparative Law, Vol. 16, 2009, p. 266.

[486] See S. Sucharitkul, above at 314, p. 835.

[487] G. Handl, *Transboundary Nuclear Accidents: The Post Chernobyl Multilateral Legislative Agenda*, in Ecology Law Quarterly, Vol. 15, No. 2, 1988, p. 241.

[488] See J. Suttenberg, above at 479, p. 238.

[489] See C. Jenks, *Liability for Ultra-Hazardous Activities in International Law*, in RECUEIL DES COURS, Vol. 117, No. 99, 1966, p. 99. See also L. Goldie, *Liability for Damage and the Progressive Development of International Law*, in International and Comparative Law Quarterly, Vol. 14, 1965, p. 1189.

Moreover, this conclusion reflects also considerations of equity and justice for victims. Only States are in the position to cover the compensatory costs of damages caused by private activities that, although unlikely to cause harm, could result in far-reaching hazardous consequences[490]. Limiting the victims' possibility of restoration to the budget or the insurance coverage of the private operator could result in prejudicial outcomes: for example, when compensatory costs exceed the financial capacity of private operators, victims are left with partial compensation and are exposed to bear the remaining costs. For this reason, when damage occurs, the State from whose jurisdiction the activity was carried out and whose responsibility was to take preventive steps to eliminate or reduce the risk of damages appears as the only subject that can ensure the fair compensation of victims.

4.3.2. State liability for private space activities

Transposing all that has been said above to the field of space law, it can only be concluded that the "*appropriate State*" – as the State with jurisdiction over the control of private space activities – must bear the international liability for damages caused by their space objects. Therefore, victims have the right to obtain compensation from the State that has (or should have) authorised the activity and that has the more direct link to the space object that caused the harm.

The consequence of this conclusion is that the "*appropriate State*" is equated to the launching State from the perspective of bearing liability for damages caused by a space object, even if based on two different legal grounds: Article VII of the OST for the launching State and the general principle of State liability for the "*appropriate State*"[491].

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[490] See O. Penttilä, *Liability for Ultra-hazardous Activities: The Imprint of C. Wilfred Jenks on Environmental Law*, in The European Journal of International Law, Vol. 35, No. 2, 2024, p. 564.

[491] The possibility to allocate liability for damages caused by space objects on the basis of general international law, instead of space law, finds confirmation also in the report of the Legal Subcommittee of COPUOS on its forty-first session, in particular in the conclusions of the Working Group on the agenda item Review of the concept of the 'launching State', where it is stated: "The view was expressed that general law on liability would apply to space activities conducted by non-parties to the Liability Convention and the Registration Convention". See UN Doc. A/AC.105/787 of 19 April 2002, titled 'Report of the COPUOS Legal Subcommittee on its 41st session'. Another element of consideration is that in the only case where the matter of liability for space damages was the object of contention between two States, Canada and the USSR, Canada as the victim-State argued that "the principle of absolute liability applies to fields of activities having in common a high degree of risk. It is repeated in

However, to make that equation work there is one last aspect that needs to be considered.

The regime of liability in space law is not limited to Article VII of the OST, but it has been elaborated in a rich system of rules contained in the Liability Convention. The latter defined the notion of 'damage' and of 'space object'; it created a two-tier regime of liability, based on an absolute liability for damages on Earth and on a fault-based liability for damages in outer space; it regulated the cases of joint and several liability of launching States; it determined the grounds for indemnification claims between them; and it established a procedure for the presentation of inter-State claims for compensation.

The problem is that the subjective scope of application of the provisions contained therein is confined to launching States.

Hence, the question: is there a disparity between the liability of the launching States and the liability of the "*appropriate State*"? Or do the norms of the Liability Convention apply also to the latter, even if it does not fall under the definition of launching State? And if so, on which legal grounds?

It is easy to understand how arriving at the conclusion that the "*appropriate State*" is liable just as much as the launching State(s), and then applying different rules and modalities on the allocation of their liabilities creates absurd consequences.

Imagine a situation where State X launches a space object controlled by a private operator based in State Y.

State X is the launching State, State Y is the "*appropriate State*", both are liable.

Now imagine that despite all the preventive measures put in place by State Y, the space object falls on the territory of State Z causing damages therein.

State Z has the right to be compensated.

The most appropriate choice in terms of causal link would be to claim the liability of the State from whose jurisdiction the space object was being controlled, namely State Y.

numerous international agreements and is one of the general principles of law recognized by civilized nations". Even if the claim was based on the Liability Convention, Canada sustained the idea that liability had to be allocated upon the USSR also because it is a general principle of law that hazardous activities entail the liability of the State of origin.

However, in a context where the norms of the Liability Convention are exclusively applicable to launching States, State Z is always going to file its claim against State X.

Why?

Because pursuant to Article II of the Liability Convention the launching State responds for damages caused by space objects on Earth under an absolute standard of liability. This means that State X has to bear always the costs of compensation and can be exempted only to the extent that the damage has resulted either wholly or partially from gross negligence or from an act or omission done with intent to cause damage on the part of a claimant State or of natural or juridical persons it represents, as envisaged by Article VI of the Liability Convention.

The consequence is that once State Z has proven the damage and the title of launching State of State X, its right to compensation is secured[492].

As for State Y, the "*appropriate State*", considering that its liability derives from a general principle connected to lawful and hazardous activities, it can be deemed to be a 'strict' type of liability, since that is the standard generally applicable to hazardous activities in international law[493].

Under a strict liability regime, reparation is due upon the occurrence of harm, irrespective of due diligence considerations, but a causal link has to be established between the dangerous activity of the State of origin and the damage[494].

This means that State Y can be exempted from its liability relying on exceptions connected to the causal link between its acts and the damage, e.g. consent, *force majeure*, necessity, distress, and any other exception that applicable international treaties allow[495].

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[492] This is, of course, assuming its ratification of both treaties, the OST and the Liability Convention.

[493] In the words of the ILC: "Strict liability has been adopted as the basis of liability in several instruments; and among the recently negotiated instruments, it is provided for in article 4 of the Kiev Protocol (2009), article 4 of the Basel Protocol (1999); and article 8 of the Lugano Convention (2007)". See ILC, *Commentary on the "Draft principles on the allocation of loss in the case of transboundary harm arising out of hazardous activities"*, in Report of the Commission to the General Assembly on the work of its fifty-eighth session, UN Doc. A/61/10, 2006. See also D. Shelton, *Strict Liability in International Environmental Law*, in Law of the Sea, Environmental Law and Settlement of Disputes, Brill Academic Publishers, 2007, p. 1140. And J. Vinuales, above at 406, p. 49.

[494] A. Tanzi, *Liability for Lawful Acts*, in Max Planck Encyclopedia of Public International Law, 2021, para. 16. See also X. Hu, *The doctrine of liability fixation of state responsibility in the convention on transboundary pollution damage*, in International Environmental Agreements: Political Law Economics, Vol. 20, No. 1, 2020, p. 179.

[495] See Prevention Articles Commentary, p. 161. An example of this regime can be found in Annex VI to the Protocol on Environmental Protection to the Antarctic Treaty, called "*Liability Arising from Environmental Emergencies*" (adopted on June 14, 2005). Its article 6(3) establishes a regime of strict

In view of that, State Z has no interest in presenting a claim against State Y when its right to compensation may be hindered by exceptions not available to State X. Therefore, applying the Liability Convention only and exclusively to launching States creates the following situation: the launching State not only is *de facto* the principal bearer of liability, even if State Y is equally liable and has a direct link to the activity that caused the harm, but it is also in a weaker legal position against the claimant compared to the "*appropriate State*" because it has less exceptions available to negate its liability.

Clearly, from a legal perspective a situation of this kind is unbalanced and it creates inequalities between liable States *vis-à-vis* victims of space damages. Moreover, the fact that a different standard of liability applies between the launching State and the "*appropriate State*" is just one of the issues that may be raised by applying the norms of the Liability Convention exclusively to launching States. Other issues may regard the possibility for the launching State to be indemnified by the "*appropriate State*" after having sustained its liability, or the chance for victims to access the compensation procedure of the Liability Convention, which unlike diplomatic protection does not entail the previous exhaustion of domestic remedies.

It is beyond the purpose of the present analysis to discuss in detail each one of them. Overall, it can be said that it is evident that the system of liability does not function as it should if the rules applicable to the "*appropriate State*" and the ones applicable to the launching State are different. But what are the corrective measures that can ensure a coherent system of liability in space law?

It follows from the above that the problem is a normative gap: the "*appropriate State*" is not included in the scope of application of the Liability Convention; hence, its norms apply only to the launching State.

To correct the situation, it is not possible to simply extend the meaning of the Liability Convention to a subject that was not included by its drafters under its scope. This would change the plain meaning of the convention and would amount to an unjustifiable amendment of its provisions. The element "*appropriate State*" does not fall within the possible meanings of the provision because there is no

liability, which envisages (at article 8) the possibility to invoke exemptions such as distress and the occurrence of Antarctic natural disasters.

interpretation that can enlarge the formula of the text of the Liability Convention so as to comprise the "*appropriate State*" in the expression "*launching State*".
Therefore, extensive interpretation is not allowed.
However, when a norm cannot be extended, a new one can be created.
And that is the function of analogical reasoning.

4.3.3. The application of the Liability Convention to the "appropriate State" based on analogical reasoning

Starting from a general perspective, it can be said that the use of analogy presupposes that a matter is not regulated by a provision, because it is beyond the meaning attributable to that provision[496]. Nonetheless, there is a similarity between the unregulated matter and the matter covered by the existing provision. Most importantly, that similarity has relevance from a legal perspective because the novel matter falls within the *rationale* of the existing provision. Thus, a new norm can be extrapolated from the latter, and its content will resemble the one applicable to the regulated matter on the basis of their correlation in point of fact and in point of *rationale*[497].
In simple terms, using the conciseness of Latin maxims: *ubi eadem legis ratio, ibi eadem legis dispositio*[498].
In the field of space law, a similarity between the launching State and the "*appropriate State*" is not hard to find.
Their situation from the perspective of liability can be summarised as follows:

[496] There are countless doctrinal works on analogical reasoning. Among them, Aleksander Peczenik's definition of statutory analogy is eloquently put: "One applies a statutory rule to a case which, viewed from the ordinary linguistic angle, is included in neither the core nor the periphery of the application area of the statute in question, but resembles the cases covered by this statute in essential respects". See A. Peczenik, *On Law and Reason*, Springer, 1989, p. 392. See also H. Kloosterhuis, *Analogy argumentation in law: A dialectical perspective*, in Artificial Intelligence and Law, Vol. 8, p. 173. Expressing a cautious approach in the use of analogies, see: M. Lachs, above at 1, p. 19.
[497] A classical example of this type of reasoning can be found in: ICJ, *Arrest Warrant of 11 April 2000 (DRC v Belgium)*, Judgment of 14 February 2002, para. 54. On the prerequisites for the use of analogy, see S. Voneky, *Analogy in International Law*, in Max Planck Encyclopedia of Public International Law, 2008, para. 17 and 23. A comprehensive account of international judgments and of international regimes where analogy was used to fill a gap in the applicable law is offered in: S. Sivakumaran, *Techniques in International Law Making: Extrapolation, Analogy, Form and the Emergence of an International Law of Disaster Relief*, in The European Journal of International Law, Vol. 28, No. 4, 2018, p. 1116.
[498] Translatable literally as: where the same *rationale* is, there is the same rule.

1) The launching State is connected to a space object because it has launched it according to one of the criteria of Article VII of the OST.
2) The "*appropriate State*" is connected to a space object because it has jurisdiction over its control as per Article VI and VIII.
3) The launching State is liable for damages caused by a space object on the legal basis of Article VII.
4) The "*appropriate State*" is liable for damages caused by a space object on the legal basis of the general principle of international law according to which States are liable for lawful and hazardous activities carried out from a place under their jurisdiction.

Therefore, both States are connected to space objects and both are liable for damages caused by them. In other words, they bear liability for the same reason: because they are linked to an object used for a hazardous activity in outer space.

Accordingly, they have the same function: to provide a means of economic redress for the victims of damages caused by space objects[499].

This means that the purpose of their liability is to protect victims from an object to which they are – for a reason or another – connected.

That is precisely the *rationale* of the provisions contained in the Liability Convention.

As its Preamble clearly puts it:

"*Taking into consideration that, notwithstanding the precautionary measures to be taken by States and international intergovernmental organizations involved in the launching of space objects, damage may on occasion be caused by such objects,*

Recognizing the need to elaborate effective international rules and procedures concerning liability for damage caused by space objects and to ensure, in particular, the prompt payment under the terms of this Convention of a full and equitable measure of compensation to victims of such damage,

[499] Differences between the two States, of course, remain: the "*appropriate State*" is liable on the ground of a general principle of international law and for space objects whose control was performed from a place under its jurisdiction, while the launching State is liable on the basis of Article VII of the OST and because the space object that caused the harm was launched by it according to the criteria of the same provision. However, those differences are negligible for the purpose of analogy as they do not affect their position towards victims from a legal perspective.

Believing that the establishment of such rules and procedures will contribute to the strengthening of international cooperation in the field of the exploration and use of outer space for peaceful purposes"[500].

In sum, the norms of the Liability Convention are based on the idea that – because space objects can cause damage despite due diligence measures – the establishment of rules and procedures on liability can ensure compensation to victims and can strengthen international cooperation[501].

Therefore, the underlying principle of the Liability Convention is that a State in the position to take precautionary measures on the dangers raised by space objects has to bear liability according to an effective legal framework, which protects victims and enhances cooperation. All the provisions of the Liability Convention derive from there.

Considering that the "*appropriate State*" is in a position in relation to space objects and to victims, and has a function in relation to liability, that reflects the *rationale* of the Liability Convention, it can be said that the latter's rules and procedures can apply in analogy also to the "*appropriate State*"[502]. Thus, the gap left by the drafters of the space treaties on the liability of the "*appropriate State*" can be filled through the means of analogical reasoning.

As a result, also the "*appropriate State*" responds for damages as defined in Article I of the Liability Convention; also the "*appropriate State*" is liable under an absolute standard for damages on Earth and under a fault-based standard for damages in outer space; also the "*appropriate State*" is jointly and severally liable with other "*appropriate States*" for damages to third States resulting from a collision between the space objects of the first two; also the "*appropriate State*" is jointly and severally liable with the launching State(s) in front of the State

[500] Liability Convention, Preamble.

[501] See L. Smith and others, *The 1972 Convention on International Liability for Damage Caused by Space Objects (LIAB)*, in Cologne Commentary Vol. II, p. 98, commenting the Preamble of the Liability Convention as follows: It is witness to the fact that the launching risk is such that accidents and damage may nevertheless occur, despite all precautions. In other words, the inherently dangerous nature of space operations, often described as ultra-hazardous, warrants an internationally recognized liability regime for outer space activities that takes into account the inevitable risk involved in these activities, by ensuring protection of its victims through adequate compensation.

[502] The application of analogy in the interpretation of treaties functions in general terms as follows: if it can be shown that of two states-of-affairs, which are analogous to one another, one comes within the scope of application of an interpreted treaty provision, then the provision shall be understood in such a way that the other comes within that scope of application, too. See: U. Linderfalk, *On The Interpretation of Treaties*, Springer, 2007, p. 296.

sustaining damage; also the "*appropriate State*" can benefit from the causes of exemption of liability established in Article VI and VII of the Liability Convention; finally, also the "*appropriate State*" shall abide with the rules and the procedure for compensation claims determined therein[503].

Thanks to this analogy, victims of damages caused by space objects are induced to claim compensation from the "*appropriate State*" rather than the launching State, as the former is liable just like the latter, but in addition, it has a more direct link to the space object and it may also be held responsible for wrongful acts connected to the operation of the space object, if duly proven.

All this is not just important in general terms for assuring a more reasonable system of liability in space law, but it becomes decisive in case of damages caused by private space objects in outer space.

When that happens, a fault-based liability regime applies. A regime that revolves completely around the position of the "*appropriate State*" rather than that of the launching State, affecting significantly the practical compensation of victims at the international level and supporting, once more, the analogy purported above.

4.4. FAULT-BASED LIABILITY AND PRIVATE SPACE OBJECTS

In general terms, there are three possible standards of liability: 1) strict liability; 2) absolute liability; and 3) fault-based liability.

The first one, as previously stated, can be found in the majority of international sources and is based on the occurrence of damage, linked though the laws of causation to a lawful activity originating from another State[504].

The latter therefore can be exempted from liability once it is proven there is no causal link between its acts and the transboundary damages[505].

The possibility of relying on such grounds of exoneration is what separates strict liability from absolute liability.

[503] In sum, the list contains all the rules of the Liability Convention that can apply to the "*appropriate State*" because of its position in respect of the space object of a private actor under its jurisdiction.
[504] See A. Tanzi, above at 494, para. 1.
[505] The reasons for a lack of causation may be various, from consent to *force majeure*, from necessity to distress and to any other exception that an applicable treaty allows.

Repeating some of the features already described in the previous Section, when absolute liability applies, the liable State always bears the costs of compensation and can rely exclusively on causes of exemption provided for by specific conventional regimes[506]. The rationale of this standard is to favour the victims of damage caused by ultra-hazardous activities (e.g. operating nuclear plants or conducting space activities), placing a stringent burden of proof on the liable State[507].

This is the standard that the drafters of the Liability Convention decided to apply to damages caused by space objects on the surface of the Earth or to aircraft in flight[508].

However, they also envisaged in Article VI the possibility for launching States to be exonerated from absolute liability to the extent that the damage has resulted either wholly or partially from gross negligence or from an act or omission done with intent to cause damage on the part of a claimant State or of natural or juridical persons it represents. The second paragraph of the provision limits the possibility to use such exoneration by specifying that it cannot be granted in cases where the damage has resulted from activities conducted by a launching State not in conformity with international law[509].

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[506] Absolute liability is not subject to exonerations such as force majeure or act of God, or the reasonable unforeseeability and unavoidability of the harm caused. However, it can be said that one cause of exoneration is usually admitted even in front of absolute liability: the negligence, or wrongful act or omission or an act or omission done with intent to cause damage on the part of the claimant. See S. Mazaroff, *Exonerations from Liability for Damage Caused by Space Activities*, in Cornell Law Review, Vol. 54, No. 71, 1968, p. 85.

[507] The distinct victim-oriented feature of absolute liability is best described by para. 48 of the "*Exposé des motifs of the Convention on Third Party Liability in the Field of Nuclear Energy"* (Paris, July 29, 1960): "The absolute liability of the operator is not subject to the classic exonerations such as force majeure, Acts of God or intervening acts of third persons, whether or not such acts were reasonably foreseeable and avoidable. In so far as any precaution can be taken, those in charge of a nuclear installation are in a position to take them, whereas potential victims have no way of protecting themselves. The only exonerations lie in the case of damage caused by a nuclear incident directly due to certain disturbances of an international character such as acts of armed conflict and hostilities, of a political nature such as civil war and insurrection, or grave natural disasters of an exceptional character, which are catastrophic and completely unforeseeable, on the grounds that all such matters are the responsibility of the nation as a whole. No other exonerations are permitted".

[508] See Liability Convention, Article II.

[509] In addition to the exoneration indicated in Article VI, the drafters of the Liability Convention specified also the cases in which the rules and procedures contained therein do not apply at all. That is when the damage is caused by a space object of a launching State to: (a) Nationals of that launching State; (b) Foreign nationals during such time as they are participating in the operation of that space object from the time of its launching or at any stage thereafter until its descent, or during such time as they are in the immediate vicinity of a planned launching or recovery area as the result of an invitation by that launching State.

If absolute liability is the hardest standard applicable to a State causing damage, the third and final regime of liability – the one based on fault – is the one that allows the highest chance of harming, and not paying.

The reason is that the victim-State cannot obtain compensation in front of a tribunal unless it demonstrates damage, causation, attribution and an additional element: fault[510].

But what is 'fault'?

Finding a clear and precise notion of fault in international law can be elusive. In general terms, it can be described as an outgrowth of the failure to take all appropriate measures to prevent harm or minimize the risk thereof[511].

This duty of prevention is commonly regarded as a duty of care or of due diligence[512].

Therefore, a State is at fault when its conduct is less than what such duty requires. In other words, it is negligent, reckless, or imprudent[513].

This notion of 'fault' begs the question: in case of private space activities, what is the difference between the fault-based liability regime established in Article III of the Liability Convention and the responsibility regime of the "*appropriate State*" established in Article VI of the OST?

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[510] In the words of Jorge Vinuales: "It is important to note that the exercise of such diligence is not a circumstance precluding wrongfulness or a cause d'exoneration, but is part of the definition of the triggering or primary norm. In other words, in order to show that the prevention principle has been violated, the injured State must establish (i) damage, (ii) its size and scope, (iii) lack of diligence of the State of origin and (iv) a causal relationship between negligence and the injury". J. Vinuales, above at 406, p. 312

[511] See Prevention Articles Commentary, p. 153. Giuseppe Palmisano maintains that 'fault' clearly centres on the concept of risk, as well as on the need to prevent transboundary or environmental harm, and to provide compensation for damages arising out of hazardous activities, irrespective of any possible fault on the part of the operator, or any qualification of the activity in question as an internationally wrongful act. G. Palmisano, *Fault*, in Max Planck Encyclopedias of International Law, 2007, para. 20.

[512] The ICJ has addressed the notion of States' due diligence in several occasions. Notably, in the *Corfu Channel* case, p. 22. More recently, in the *Genocide Convention* case (para. 430), it decoupled the due diligence obligation incumbent on a State from being exclusively relevant to a State's control over its territory, as in the *Corfu Channel* case. It applied a more expansive notion extended to cover elements under a State's jurisdiction and control including those that fall under its power or that a State has the capacity to influence. See J. Dennerley, *State Liability for Space Object Collisions: The Proper Interpretation of 'Fault' for the Purposes of International Space Law*, in The European Journal of International Law, Vol. 29, No. 1, 2018, p. 293. See also A. Ollino, *A "Missed" Secondary Rule? Causation in the Breach of Preventive and Due Diligence Obligations*, in Secondary Rules of Primary Importance in International Law (ed. by G. Kajtàr and others), Oxford University Press, 2022, p. 116.

[513] Negligence is concerned primarily with an improper manner of doing things which are safe enough when properly carried out. See Prevention Articles Commentary, p. 96.

From a definitional perspective, they are the same. They are both based on the breach of an obligation of due diligence. However, their scope of application sets them apart.

The responsibility regime of Article VI applies only to the negligent conduct of the "*appropriate State*" and it regards the specific obligation to assure the conformity of private space activities with the applicable legal framework. Moreover, it applies anywhere, without geographical limitations. It covers every consequence deriving from a non-diligent behaviour of the "*appropriate State*", including consequences not consisting of damage. Finally, the secondary obligation triggered by the breach of Article VI can take various forms, from satisfaction to a promise of non-repetition.

As for the regime of the Liability Convention, it takes into consideration the fault of the relevant State (launching or "*appropriate*"), but also "*the fault of persons for whom it is responsible*"[514]. Put otherwise, the liable State has to pay compensation also for the fault of non-governmental entities falling under its sphere of responsibility, meaning falling under Article VI of the OST.

This is an additional confirmation of the fact that the norms of the Liability Convention should apply also to the "*appropriate State*" otherwise in case of orbital damages caused by the fault of a non-governmental entity for which the launching State is not responsible – i.e. is not the "*appropriate State*" –, the victim could not obtain compensation from the launching State because the non-governmental entity is not a person for whom it is responsible, nor from the "*appropriate State*" because it is not a launching State.

This wide scope of State liability, including damages caused by the fault of private actors, is limited however to damages "*being caused elsewhere than on the surface of the Earth to a space object of [another] State*"[515]. Moreover, it exposes liable States only to sustain the costs of compensation and nothing more.

With that said, the two regimes may overlap. However, they maintain their autonomy in the system of space law and that is particularly important *vis-à-vis* private space activities.

[514] Liability Convention, Article III.
[515] *Ibid*.

In fact, under the regime of Article VI, victims of damages caused by private actors in outer space cannot obtain any form of economic redress from the "*appropriate State*" if the latter has diligently assured the conformity of the authorised private activity with the applicable legal framework.

Consequently, the damages caused by the negligent behaviour of a private actor – put in place despite all the prevention measures imposed by its State of authorisation – would escape any form of international liability and could only be restored by winning a claim for liability at the domestic level according to national laws.

Article III of the Liability Convention serves precisely the function of preventing this gap.

Even if a State has put in place all the measures necessary to avoid its fault in relation to a private space operation that it has authorised, it may still be exposed to international liability for the damage caused by the negligence of the private operator[516].

This is a very favourable principle for victims of damages caused in outer space.

However, the efficiency of this victim-oriented approach depends on the answer to the following questions: how can we define what is negligent or diligent? What is the level of care against which the conduct of a State or of a person for whom it is responsible can be measured and then declared faulty?

In general terms, two solutions are possible:

1) looking at whether the accused State acted in compliance with guidelines, best practices or industrial standards applicable to the activity in question;

2) judging its conduct on the basis of reasonableness, appropriateness, proportionality and foreseeability of harm[517].

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[516] See P. Van Fenema, *Legal aspects of launch services and space transportation*, in Handbook of Space Law (ed. F. Von der Dunk and others), Edward Elgar Publishing, 2017, p. 407: "That launching States have to pay when things have gone wrong is both an added incentive for the State concerned to take proper precautions and a comforting idea for the potential victims". See also R. Merges and others., *Rules of the Road for Space?: Satellite Collisions and the Inadequacy of Current Space Law*, in Environmental Law Reporter, Vol. 1, 2010, p. 3: "Though such efforts would be expensive, they would likely cost less than the potential tort liability that might flow from frequent space collisions in the long term".

[517] Various authors have addressed the issues related to the definition of a standard of care. Most recently, the topic has been thoroughly analysed in the work of H. Krieger and others, *Due Diligence in the International Legal Order*, Oxford University Press, 2020, p. 9. See also the contribution of M. Monnheimer, *The Components of Due Diligence Standard*, in Due Diligence Obligations in International Human Rights Law, Cambridge University Press, 2021, p. 116.

All this requires a heavy burden of proof on the claimant State, who has to demonstrate the existence of a norm of care and that the respondent State has not followed it[518].

This *probatio* becomes especially troublesome in front of highly complex technological activities where having to establish proof of fault would require a complete understanding of the operation that caused the harm and it would necessitate access to information not available to the victim-State.

That is precisely the situation which characterises orbital collisions, where – according to Article III of the Liability Convention – liability can be attributed to a launching State only if the damage was due to its fault or the fault of persons for whom it is responsible. Thus, the risk for victims of being unable to rely on the fault-based liability regime of Article III is concrete.

It is no surprise that during the negotiations of that provision, recognising that there would be difficulties in proving fault, some delegations such as that of Japan favoured a regime of absolute liability also for third party damage caused by a collision between two space objects[519].

Nonetheless the fault-based liability regime was preferred in the end, but the scepticism on the possibility to effectively apply Article III in practice continued even after the adoption of the Liability Convention[520].

Due to the fact that there has never been a case where fault was invoked as a consequence of an orbital collision, it is not possible to have practical evidence of the inefficiencies stemming from the fault-based liability regime. If one considers that several collisions have been registered in the past fifty years, the lack of a claim is perhaps also evidence of the perceived inability of Article III to provide a reliable mechanism of compensation.

However, the concrete issues of applying fault to damages caused by foreign private space activities can still be assessed through a theoretical – but very plausible – example.

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[518] A. Capurso and others, *Questions of fault liability: A case study analysis of in-orbit collisions with debris*, in Journal of Space Safety Engineering, Vol. 10, 2023, p. 443.

[519] L. Smith and others, above at 501, p. 99.

[520] *Ibid.*, at p. 133, recalling that: "The requirement of fault has led to such critical comments as 'in orbit accidents will never be dealt with satisfactorily'. Fault has been seen to be ambiguous in the context of space law. Fault in outer space will also be difficult to prove"; and concluding that: "The decision to choose a different basis for damage occurring in orbit has had a detrimental effect on the liability system and its perception. It would have been appropriate to elaborate on a whole mechanism for compensation for damage arising from space accidents".

4.4.1. A Case Study on Orbital Damages

The present case study is built around two fictional small satellites placed in Low Earth Orbit (LEO).

One will be called 'A-sat', controlled by a private operator in State A; the other 'B-sat', controlled by the national space agency of State B.

A-sat has been authorised pursuant to Article VI of the OST by State A, which has a long history of authorising private operators and can be considered a leading State in that sense.

Despite the preventive measures imposed by State A on the operators of A-sat, and despite the active supervision of public authorities on its activities, an error on the evaluation of a collision alert is committed by the MCC of A-sat and a collision event occurs with B-sat.

Admitting for the sake of argument that the damage, the causation and the attribution to A-sat are all proven, State B is not yet in the position to claim compensation because it still has to prove that the either State A or the operators of A-sat were at fault.

As said above, a preliminary matter to any fault-based claim is to individuate the norm of behaviour that is considered violated.

The matter is usually addressed focusing on the question: what is the standard of care for satellite operations?

It is possible to individuate a considerable number of non-binding norms that define how satellite operators are expected to conduct their activities[521] (e.g. the UN Space Debris Mitigation Guidelines[522], or ISO Standards on Space systems and operations [523]). Even though these instruments are not obligatory on spacefaring States, they are implemented and followed by most of them, giving strong arguments in favour of their value as standards of practice[524].

[521] See H. Hertzfeld, *A Legal Note on Space Accidents*, in German Journal of Air and Space Law, Vol. 59, No. 2, 2010, p. 230.

[522] UNGA Res. 62/217 of 22 December 2007, titled 'International cooperation in the peaceful uses of outer space'.

[523] For the ISO Standards on space systems and space environment see: Standards by ISO/TC 20/SC 14, available at the following link: www.iso.org/committee/46614/x/catalogue/.

[524] See for all E. Kisiel, *Law as an Instrument to Solve the Orbital Debris Problem*, in Environmental Law, Vol. 51, No. 1, 2021, p. 231.

However, the purpose of the present case study is not to assess which norms define due diligence in outer space, but to examine whether a failure to perform space activities according to a certain degree of care can be proved in front of an international tribunal. In other words, it is of little use to find a specific norm or rule of behaviour that *in theory* should have been followed by a satellite operator, if the victim State has no means of obtaining evidence of its non-compliance[525].

In accordance with the well-established principle of *onus probandi incumbit actori*, it is the duty of the party which asserts certain facts – in this case, negligent conduct – to establish the existence of such facts[526].

Thus, to meet its burden of proof, State B must collect data and information that can demonstrate how either State A or the operators of A-sat failed to comply with their duty of diligence.

The question is: how can State B obtain the evidence necessary to assess whether State A or the operators of A-sat were negligent?

Put differently, what kind of data and information is available to State B when it prepares its claim?

The public sources on the private space object of a foreign State are always limited, especially for what regards its operations in orbit.

It may be possible to access information from the international and national registries of space objects – if the object was registered – and it may be possible to find the licence and its relative documents, such as the environmental impact assessment on the space activity if State A keeps them publicly available.

Other information, such as the object's functional status, its qualification and the execution of the best practices in design, development and qualification pre-launch, may also be obtained after a request submitted to the launch authority of A-sat if the latter grants it.

However, all these sources are conditional to various 'ifs'.

Thus, overall, the context of private space activities is characterised by a significant lack of publicly accessible documents.

[525] See A. Capurso and others, above at 518, p. 443.
[526] Pulp Mills case, para. 162.

It follows that even if State B can attribute the damage suffered by B-sat to the operation of A-sat, it has little knowledge of how much the operators of the latter, or potentially State A, contributed to the collision event with their fault.

Considering the nature of space technology, a request from State B for access to any significant documentation related to the programme, design, and control of A-sat can easily be denied by State A because its disclosure would undermine the protection of public interests and/or the integrity of commercial interests.

The only option left to State B is to rely on the power of disclosure that can be exercised by a judicial authority during an international proceeding[527], although this already presupposes the improbable intention to file an international claim despite the absence of a pivotal element for its defence.

When a judicial authority requires one of the parties to produce documents, exhibits or other evidence, it is of course to be expected that such party should cooperate, providing all elements that could assist the judicial authority in resolving the dispute submitted to it[528].

However, the lack of cooperation does not have serious repercussions on the outcome of the proceeding, other than allowing the judicial authority to draw an adverse inference from it[529].

Moreover, the use of powers of disclosure at the international level lacks of significant practice. For instance, if we look at the jurisprudence of the ICJ, it can be noticed that whilst the Court in fact possesses relatively broad fact-finding and

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[527] The power of disclosure is among the prerogatives of the ICJ, of the PCA and of the Liability Convention's Claims Commission. More specifically, Article 48, 49 and 62 of the Court's Statute establish the Court's statutory fact-finding powers. Article 27 of the PCA Optional Rules for Arbitration of Disputes relating to Outer Space Activities provides for the power to require the parties to produce documents, exhibits or other evidence within such a period of time as the arbitral tribunal shall determine. Finally, the Claims Commission can use the same prerogative as an implicit power.

[528] Pulp Mills case, para. 163.

[529] This principle finds application in arbitral tribunals as much as in the judgements of the ICJ. For example, in *Arthur J. Fritz & Co. v. Sherkate Tavonie Sherkathaye Sakhtemanie*, Award No. 426-276-3 of 30 June 1989, 22 Iran-US CI. Trib. Rep. 170, para. 180, it was stated: "*It is an accepted principle that an adverse inference may be drawn from a party's failure to submit evidence likely to be at its disposal*".

See also R. Von Mehren, *Burden of Proof in International Arbitration*, in Planning Efficient Arbitration Proceedings: The Law Applicable in International Arbitration (ed. by A. Van den Berg), ICCA Congress Series, Vol. 7, 1996, p. 128.

As for ICJ judgements, in the Corfu Channel case, the ICJ requested the UK to produce documents referred to in its submissions. The UK refused citing naval secrecy. The Court decided not to draw from the UK's refusal "any conclusions differing from those to which the actual events gave rise". See the comprehensive analysis and exhaustive case law cited in J. Devaney, *Fact-Finding before the International Court of Justice*, Cambridge University Press, 2016.

discovery powers, due to a number of factors it has never made use of them to any significant extent[530].

Therefore, also trying to obtain evidence in a judicial proceeding from another sovereign State is fairly problematic and unlikely to happen.

The picture depicted so far brings only to one conclusion: unless a very cooperative behaviour is put in place by the damaging State or its faulty private operator, it is *de facto* very implausible to obtain compensation for orbital damages.

Thus, Article III of the Liability Convention appears to establish a right to compensation which cannot be enjoyed by the victim.

There is however a corrective measure that can be deemed to apply in cases like the one examined here.

4.4.2. The Need of a Reversed Burden of Proof

From the analysis conducted so far, it can be said that liability for damages in outer space appears to be almost unprovable. The discouraging challenge of collecting evidence on the fault of the respondent State, or of private operators authorised by it, makes any international legal action an improvident choice.

From a technical point of view, States that possess an advanced system of space situational awareness may be in the condition to support a claim of liability for orbital damages thanks to their collection of information on orbital operations of a wide range of space objects. However, problems remain: not only space situational awareness may provide partial and non-conclusive evidence on the fault of the operators, or of its authorising State, but also it is a technical capability that is still at an early stage of development and that is possessed only buy a limited number of States.

Tackling the issue from the perspective of transparency, one may advocate for an increased accessibility to data and information on what operators do in outer space, for example through the adoption of a specific set of international norms aiming at that purpose. However, a solution of this kind is hardly going to produce

[530] One of the very few cases where the issue was raised is the *ELSI* case (USA v. Italy) of 1989 in front of the ICJ. See the commentary on the matter by J. Devaney, above at 529, p. 182.

significant results, given the natural reluctance of States and of commercial operators to disclose information on their space activities, especially if national security is involved.

Thus, to solve the evidentiary problems connected to the fault-based liability regime of Article III, it is necessary to imagine a different approach to the issue: an approach based on the procedural law applicable to international disputes.

As already stated above, the normal rule of procedure is that "*it is the litigant seeking to establish a fact who bears the burden of proving it; and in cases where evidence may not be forthcoming, a submission may in the judgement be rejected as unproved*"[531].

In a fault-based regime this means that the applicant State needs to prove the fault of the respondent. Transposing this principle in cases of orbital collisions, the situation that emerged from the case-study can be summed up as follows: the fault-based regime of the Liability Convention requires the demonstration of negligence. But the evidence that may demonstrate such negligence is not – in practice – accessible. Hence, the regime becomes inapplicable.

It is precisely this situation of inefficiency in the collection and production of evidence that allows to introduce a procedural corrective: the 'presumption of fault'.

The latter can be defined as follows: each party to a claim is presumed to be at fault for its own conduct unless it can prove that it complied with the applicable standard of diligence.

In general terms, this reversal of the burden of proof between claimant and respondent responds to a particular *rationale*.

The ICJ – in its judgement on the Diallo case between the Republic of Guinea and the Democratic Republic of the Congo (DRC) – had the opportunity to offer some indications on such *rationale*: "*The determination of the burden of proof is in reality dependant on the subject-matter and the nature of each dispute brought before the Court; it varies according to the type of facts which it is necessary to establish for the purposes of the decision of the case. […] A public authority is generally able to demonstrate that it has followed the appropriate procedures and*

[531] Military Activities case, para. 101.

applied the guarantees required by law — if such was the case — by producing documentary evidence of the actions that were carried out"[532].

To clarify the concepts expressed in this passage, judge Tomka further explained: "*Strict adherence to the [onus probandi incumbit actori] rule would have engendered significant evidentiary hurdles to the Republic of Guinea's case in establishing these violations, which [occurred] in the Respondent's State, and the DRC was therefore better situated to adduce evidence about its compliance with the relevant obligations*"[533].

Therefore, the idea of a reversed *onus probandi* is envisaged by the ICJ as an instrument to re-equilibrate an uneven procedural position of the parties to a dispute. This is true especially in cases where the full application of the normal rule of procedure creates unreasonable consequences or hinders the due process of the proceedings.

The same conclusion was reached by the ILC in its Commentary on the "*Draft principles on the allocation of loss in the case of transboundary harm arising out of hazardous activities*" of 2006[534]. Here, tackling the problems related to the collection of evidence, it suggested: "*In the case of operations involving highly complicated chemical or industrial processes or technology, fault liability could pose a serious burden of proof for the victims. […] the burden of proof could be reversed requiring the operator to prove that no negligence or intentional wrongful conduct was involved*"[535].

Looking back at the realm of disputes arising out of orbital damages, three determining factors point toward the application of the same procedural corrective:

1) the Liability Convention revolves around a victim-orientated approach, based on the idea that space activities are inherently ultra-hazardous;

2) the current level of space technology does not allow to access and control the space environment for monitoring activities and investigating accidents;

[532] ICJ, *Case Concerning Ahmadou Sadio Diallo* (Diallo case), Judgment of 30 November 2010, para. 54.
[533] H. Tomka, *The Evidentiary Practice of the World Court*, in Liber Amicorum: in honour of a modern renaissance man His Excellency Gudmundur Eiríksson (ed. by J. Sainz-Borgo), UPeace Press, 2017, p. 383.
[534] UN Doc. A/61/10 of 2006, titled 'Report of the International Law Commission 58th session'.
[535] *Ibid.*, p. 160.

3) the status of international regulations does not guarantee sufficient transparency and openness of data related to foreign space operations.

In sum, space activities are ultra-hazardous and highly technological activities, where third parties have little or no access to information and data regarding the conduct of other operators.

In view of all this, it is possible to sustain that in such situations a judicial authority may consider the presumption of fault to be the most equitable rule on evidence production.

On this last regard, it must be stressed that being the presumption of fault a rule of procedural law, and lacking any reference to it in the space treaties, it can only be recognised by a judicial authority.

In addition, the application of a reversed burden of proof in case of orbital damages finds a strong argument also in a consideration based on the purpose of the liability regime.

Considering that the primary goal of the system of liability is to encourage State to perform space activities so as to avoid the causation of damages, the acceptance of the presumption of fault would also be beneficial for a radical change of paradigm in the behaviour of spacefaring States.

If – due to the nature and evidentiary condition of orbital operations – such presumption were recognised as the rule of procedure for space disputes, the risk of compensation for negligent activities would become a concrete reality.

Each State to a dispute will be required to produce all the evidence necessary to demonstrate its own lack of fault.

The applicant will be released from the *probatio diabolica* of obtaining data and information under the jurisdiction of a foreign space authority. However, despite the fact of being the victim, it will have to demonstrate first its diligence in operating the asset involved in the collision, producing the relevant evidence in its possession proving that from its part its space object was being used correctly. Only then, it will be in the position to obtain compensation.

This clearly creates a strong incentive for diligent behaviours, becoming the lack of own negligence a necessary pre-condition for seeing a favourable outcome of an international legal proceeding.

In other words, to claim compensation pursuant to Article III of the Liability Convention, a victim-State would have to prove: damage, causation, attribution, and lack of own fault.

Similarly, the respondent State will be exempted from liability if – other than any exceptions related to damage, causation and attribution – it will produce sufficient evidence on its diligent conduct as well as on the diligence of the non-governmental entity that it authorised to control the damaging space object.

It follows that it will be its *onus* to collect and produce all data and information necessary to that end. Thus, the position of the party closer to the evidence is enhanced in the spirit of collaboration amongst the parties of a dispute.

Therefore, a presumption of fault for orbital damages can assume also the function of motivating States to effectively ensure their compliance and the compliance of their authorised non-governmental entities with international norms of behaviour related to space activities, even if nonbinding.

With that, the fault-based liability regime of space law can become a true incentive for the responsible behaviour of spacefaring States, providing an effective judicial safeguard for the allocation of liability and for the compensation of orbital damages.

CHAPTER V

THE AUTHORISATION OF NEW SPACE ACTIVITIES

SUMMARY: 5.1. Introductory remarks – 5.2. New definitions: "space object" – 5.2.1. Defining waste in space – 5.2.1.1. Legal issues of the technical definition of space debris – 5.2.1.2. The legal category of waste in outer space – 5.2.2. The regulatory uncertainties of suborbital vehicles – 5.2.2.1. The legal boundaries of outer space – 5.2.2.2. Two approaches: functionalist vs spatialist – 5.2.2.3. Applying space law to suborbital space objects – 5.3. New definitions: "private paying passengers" – 5.3.1. The concept of astronauts in space law – 5.3.2. A similar but different category: spacecraft personnel – 5.3.3. Finding a definition of private paying passengers – 5.3.4. The safety of private paying passengers – 5.3.5. The compensation of private paying passengers – 5.4. New activities: in-orbit services – 5.4.1. The preparatory phase: jurisdiction and consent – 5.4.2. The operational phase: responsibility and liability – 5.4.2.1. Responsibility towards third States – 5.4.2.2. Liability towards third States – 5.5. New activities: private lunar missions – 5.5.1. The international legal framework applicable to the Moon – 5.5.1.1. Unclear and insufficient norms – 5.5.1.2. Inapplicable norms – 5.5.2. Regulatory initiatives for a lunar legal framework – 5.5.3. The essential elements of a lunar authorisation – 5.5.3.1. National laws on space resources – 5.5.3.2. Environmental considerations and supervising mechanisms – 5.6. Concluding remarks.

5.1. INTRODUCTORY REMARKS

The analysis conducted in the previous Chapters has delved into the rights and obligations of States involved or connected to private space activities.

It looked at the interrelation between the "*appropriate State*", the launching State and the State of registry, analysing their jurisdiction, responsibility and liability.

It examined the most relevant provisions on the regulation of private endeavours, with a focus on their content, *rationale* and correlation.

In sum, it reviewed the international law applicable to the activities on non-governmental entities in outer space from a general perspective. More specifically,

it offered an analysis that holds relevance not just for certain specific types of private space operations, but for all of them indistinctly.

In the present Chapter, on the contrary, the discourse moves from the general to the specific, as it transitions to the challenges posed by individual, emergent private activities.

In particular, the focus is brought on what nowadays is termed ‘new space’, as contrasted with ‘traditional space’.

‘Traditional space’ refers to domains of outer space activity that originated in the early stages of space technology and that have been characterised by a strong governmental presence. Classic examples are satellite radio communications, navigation satellite systems, and remote sensing. From a legal perspective, they have a long history of development and have evolved into a mature framework of international and national regulations, supported by a consistent State practice. In view of those features, they have experienced less radical changes from a regulatory perspective and have demonstrated to be more resilient and adaptable to natural technological progress and advancements. Because of that, they are not included within the scope of the present Chapter.

Conversely, the expression ‘new space’ can be used to indicate the paradigm shift in the utilisation and exploration of outer space created by innovative private activities.

The protagonists of this trend have not just brought disruptive changes to the manner in which space operations are managed and performed – both economically and technologically –, they have also created new kinds of space activities, such as suborbital flights, active debris removal and mining operations. However, unlike ‘traditional space’ these changes and creations are happening in the absence of a well-established regulatory architecture.

Conventional approaches to the regulation of private space activities are in need of a re-evaluation, formulating novel regulatory constructs to address the challenges posed by ‘new space’ activities.

As described in Section 5.2, the traditional notion of ‘space object’ is questioned by the advent of suborbital vehicles and by the aggravating problem of space waste. All this necessitates a redefinition that can bring clarity on the applicable legal framework and that can capture the complexities of modern space dynamics.

Similarly, Section 5.3 shows how the classical concepts of 'astronaut' and 'spacecraft personnel' must be reconceptualised to encompass private paying passengers, which are increasingly becoming a reality in outer space. In other words, the framework of space law needs to reflect the diversifying cadre of individuals participating in space travel.

The problem, however, is not just of notions and definitions.

Private actors are developing new models of carrying out space activities. The creation of new markets and commercial applications is evident in the case of in-orbit services and lunar activities, which are respectively examined in Sections 5.4 and 5.5. In both instances, private operators are pressingly calling for updated regulatory responses, and therefore a recalibration of traditional space law concepts is necessary to better align them with the new context in which they are applied.

Thus, from new definitions to new activities, the next pages address the most important legal questions concerning private 'new space' activities, looking in particular at the problems faced by States in assuring their conformity with the applicable legal framework, while ensuring their own compliance with international obligations.

Some concluding remarks are offered at the end of the Chapter in Section 5.6.

5.2. NEW DEFINITIONS: "SPACE OBJECT"

When the international space treaties were drafted, States came up with a simple but encompassing definition of space object: "*The term 'space object' includes component parts of a space object as well as its launch vehicle and parts thereof*"[536].

The tautological nature of the wording used therein has always been evident: the only clarifying elements on what constitutes a space object are that the "*launch vehicle*" – such as a rocket with respect to its payload – and the "*parts*" of a space object – such as its fragments after a break-up event – are considered as the space object itself.

[536] Liability Convention, Article 1(d).

Nonetheless, a determining factor for identifying space objects can be found in the use of the word "*space*" as the qualifying element of the word "*object*", sometimes replaced by an even more expressed wording, such as "*object launched in outer space*"[537] or "*object launched into Earth orbit or beyond*" [538].

This allows to deduce that being sent to outer space is the decisive criterion for becoming a space object.

In light of that, it can be understood why the definition has not raised many problems in the past, considering that the objects used at the time of the drafting of the space treaties – such as rockets, satellites, probes and lunar landers – were evidently 'objects in space'.

It was not necessary to have a more precise definition as long as they posed no doubts on their qualification as space objects. It was clear that they were objects in outer space, or launched into Earth orbit, and that they were different from other objects such as an air balloon or a civil aircraft[539].

Thus, a crucial question behind that definition was left open: where does outer space legally begin? Or put in other terms: is the definition of "*space object*" linked to a certain demarcation level in the atmosphere?

While these questions remained theoretical exercises for decades[540], the situation has drastically changed in recent times with the advent of private 'new space' activities.

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[537] See for example in the OST, Articles VII and VIII.

[538] Registration Convention, Articles II and V.

[539] The definition of space object showed its first cracks already in 1981 with the advent of the US space shuttle: the question – reduced to its bare essentials – was whether the shuttle was an aircraft, a space object, or both, because it took off with a vertical rocket-propelled system, but it derived support in the atmosphere from reactions of the air during its descend back to Earth. The majority opinion was that space law applied to it, based on the argument that the only things that could equate it to an aircraft were the fact that it had wings and that it glided back on Earth during landing. And that was too little to attract the shuttle's operations under the regime of air law. See S. Gorove, *Legal Aspects of the Space Shuttle*, in International Lawyer, Vol. 13, 1979, p. 153. And S. Gorove, *Definitional Issues Pertaining to Space Object*, in Proceedings of the Thirty-Seventh Colloquium on the Law of Outer Space, 1994, p. 88. See also S. Footer, *Legal Issues and Answers for Commercial Users of the Space Shuttle*, in Transportation Law Journal, Vol. 13, No. 1, 1983, p. 87.

[540] The position expressed by the USA in 2022 on the matter was clear: "To define or delimit outer space would be an unnecessary theoretical exercise that could unintentionally complicate existing activities and that might not be able to adapt to continuing technological developments. The current framework has served everyone well, and we should continue to operate under it until there is a demonstrated need and a practical basis for developing a definition or delimitation". See Statement of the US Head of Delegation at COPUOS under Agenda Item 7, 29 March 2022. Available at the following link: https://vienna.usmission.gov/2022-copuos-lsc-u-s-on-the-definition-and-delimitation-of-outer-space/. Already in 1970, when the boundary issue was being discussed at COPUOS, this approach was formulated in the following terms: "an argument is advanced that because of the lack of experience and the difficulty to assess how the interests of underlying States may be affected by 'outer

The latter brought old unanswered problems back at the centre of legal discussions and exposed the ill-phrased definition of "*space object*" to new impending issues. In particular, considering that the majority of objects in outer space are now space debris[541] and considering that precisely those objects are the main reason behind the creation of a new legal framework on space sustainability as well as the surge of a new commercial market based on in-orbit services (*infra*, at 5.2.3), it is necessary to clarify in legal terms what is a space object and when a space object becomes something else, usually called space debris. Moreover, activities such as suborbital flights have put into question whether the regime of space law can apply to vehicles that only briefly touch the altitude where satellites orbit, without ever entering into orbital trajectories around Earth.

All this clearly affects the position of States, called to authorise and supervise activities conducted or connected to objects whose legal nature is uncertain.

5.2.1. Defining Waste in Space

Wherever humans go, pollution follows[542].

Outer space is no exception, as it is demonstrated by the presence in space of an enormous amount of abandoned space objects, generally called 'space debris'.

In general terms, they consist in discarded space objects or pieces of them, left abandoned in outer space to orbit until they will naturally fall back on Earth.

They are in far greater numbers than objects actively used for space services.

As of March 2025, the data collected by the European Space Agency indicated 11.200 functioning satellites in orbit[543]. At the same time, they estimated about 40.500 space debris objects greater than 10 cm, arriving at hundreds of millions if taking into consideration also smaller ones[544].

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space activities' attempts to define outer space should be postponed until more experience has been gained and further clarification of the implications of various types of outer space activities has been provided". UN Doc. A/AC.105/C.2/7 of 7 May 1970, titled 'The question of the definition and /or delimitation of outer space – Background paper prepared by the Secretariat', p. 8.

[541] See the European Space Agency's data collection called Space Debris by the Numbers, available at the following link: www.esa.int/Space_Safety/Space_Debris/Space_debris_by_the_numbers

[542] A. Capurso, *Proposal for a Legal Definition of Space Debris*, in Proceedings of the International Institute of Space Law, Eleven International, 2022, p. 53.

[543] The Space Debris User Portal can be consulted at the following link: https://sdup.esoc.esa.int/discosweb/statistics/

[544] *Ibid.*

Other than being the most common thing that one would find nowadays in cis-terrestrial space, space debris are also the source of various problems for satellite operators, from frequent avoidance manoeuvres, to interference with ordinary operations, from risk of catastrophic collisions to potential liability claims.

The degradation of the cosmic environment has occurred not just because of the prolonged unsustainable behaviour of space users, but also because the framework of the space treaties did not provide sufficient safeguards for that to happen[545]. Resorting to the principles of international environmental law – such as the polluter-pays principle[546] or the principle of sustainable development[547] – did not result in an effective means to invert this trend of cosmic pollution[548].

In light of all this, it is no surprise that in recent years the UN and other international entities have been actively working on the creation of new measures to tackle the problem of space debris[549].

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[545] The only provision of the OST strongly linked to environmental protection is Article IX. However, the obligations contained therein – such as the duty to avoid the harmful contamination of outer space – have not been translated in concrete sustainable conducts whose violation could lead to the attribution of international responsibility. Looking at the other most ratified space treaties, it is not possible to find any provision that tackles the issue at hand. For example, the Liability Convention cannot effectively be used for the purpose of incentivising sustainable behaviours due to the uncertainties on the notion of space object and to the inefficiency of the fault-based liability regime for orbital collisions. Among the several authors who have analysed the inaptness of the space treaties for environmental purposes, see: M. Gillet and others, *Lex ad astra: Non-State Actor Accountability for Space Pollution*, Brill Nijhoff, 2025, p. 71; Y. Radi, *Clearing up the Space Junk: On the Flaws and Potential of International Space Law to Tackle the Space Debris Problem*, in Esil Reflections, Vol. 12, No. 2, 2023, p. 4; R. Popova and others, *The Legal Framework for Space Debris Remediation as a Tool for Sustainability in Outer Space*, in Aerospace, Vol. 5, No. 2, 2018, p. 61; P. Stubbe, *State Accountability for Space Debris*, Brill Nijhoff, 2018, p. 145.

[546] It indicates that the costs of pollution should be borne by the subject responsible for causing the pollution. It can be traced back to some of the first instruments establishing minimum rules on civil liability for damage resulting from hazardous activities, such as the Paris Convention on Third Party Liability in the Field of Nuclear Energy of 1960. See P. Sands and others, *Principles of International Environmental Law – Fourth Edition*, Cambridge University Press, 2018, p. 240.

[547] Since the Burtland Report of 1997, it has been defined as '*development that meets the needs of the present without compromising the ability of future generations to meet their own needs*'. The term now appears with great regularity in international instruments of environmental, economic and social character. It has been invoked by various international courts and tribunals, and is established as an international legal concept. See P. Sands and others, above at 546, p. 218.

[548] See J. Long and others, *The Concept of Long-Term Sustainability of Outer Space Activities as an Emerging Source of International Law*, in Journal of Space Law, Vol. 45, No. 1, 2021, p. 50. See also B. Sandeepa Bhat, *Application of Environmental Law Principles for the Protection of the Outer Space Environment: A Feasibility Study*, in Annals of Air and Space Law, Vol. 39, 2014, pp. 340. See also L. Viikari, *The environmental element in space law: assessing the present and charting the future*, Martinus Nijhoff Publishers, 2008, p. 203.

[549] A. Handmer and others, *The Use of Law to Address Space Debris Mitigation and Remediation: Looking through a Science and Technology Lens*, in Journal of Air Law and Commerce, Vol. 87, 2022, p. 377. For a comprehensive recollection of international instruments addressing the environmental aspect of space activities see: T. Masson-Zwaan and others, *Introduction to space law – Fifth Edition*, Wolters Kluwer, 2025, p. 127.

Some are called mitigation measures, as they aim at mitigating the creation of new space debris in the future. They take the form of international guidelines, best practices and industrial standards that – if implemented – can help reduce the amount of debris produced by new space missions[550].

Others are called remediation measures, as their goal is to remediate the presence of debris left in orbit in the past. Because the main method of achieving that goal is to remove such debris, the operations of this kind are called 'active debris removal' (ADR)[551].

As the name suggests, they consist in the active removal of a targeted space object from its orbit using several possible technologies: laser-based, tether-based, magnetic-based, or satellite-based (e.g. capturing them with nets or harpoons)[552]. The final objective, in simple terms, is to deorbit them, eliminating the threat they pose to other space operators and to the stability of the cis-terrestrial environment.

All these international measures addressing the pollution of outer space[553] pose significant challenges for engineers, who either have to reimagine the design and operations of spacecraft in case of mitigation measures or have to find the technological means to interact with space objects moving at high orbital velocity and often with uncontrolled trajectories in case of ADR operations.

However, despite any engineering challenge, the reason why today fighting pollution in outer space is still particularly troublesome is not to be found in a technical factor. The first obstacle to all the measures described above is legal and revolves around one question: what is the definition of 'space debris'[554]?

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[550] A notable example is the UN Space Debris Mitigation Guidelines, adopted as UNGA Res. 62/217, of 22 December 2007. Another relevant normative measure is the LTS Guidelines. See also the ITU Recommendation ITU-R S.1003-2 of December 2010, titled '*Environmental protection of the geostationary-satellite orbit*'. In parallel, there are also initiatives based on voluntary commitments such as the ESA's Zero Debris Charter. See T.Masson-Zwaan and others, above at 549, p. 129.

[551] See Z. Tian, *Legal aspects of Active Debris Removal (ADR): regulation of ADR under international space law and the way forward for legal development*, Meijers-reeks, 2024. See also A. Martin and others, *Exploring the Legal Challenges of Future On-Orbit Servicing Missions and Proximity Operations*, in Journal of Space Law, Vol. 43, No. 2, 2019, p. 196.

[552] For a comprehensive account of the methods currently envisaged for ADR operations see: C. Priyant and others, *Review of Active Space Debris Removal Methods*, in Space Policy, 47, 2019, p. 194 et seq.

[553] Others may be found in other fields of international law and applied to space activities through systemic integration. See R. Virzo, *Le droit international de l'environnement et les débris spatiaux*, in L'espace extra-atmosphérique et le droit international - Colloque de Toulouse, Éditions Pedone, 2021, p. 333.

[554] Additional problematic considerations concern aspects such as the dual-use of the technology and the question of payment, but they all focus on a specific object, space debris, which needs to be defined first.

Without a proper answer in point of law, the actual implementation of any measure becomes uncertain.

Starting from a basic assumption, the space treaties recognise only one category of object in outer space: a "*space object*"[555].

Therefore, for the purpose of States' rights and obligations with regard to objects launched in outer space there is no difference between an active satellite and a broken piece of it. Under the space treaties, they are treated the same: the jurisdiction over them remains intact, the responsibility for activities involving them still applies, and so do the liabilities for damages caused by them.

Lacking a legal distinction between a space object and a space debris, it is difficult to assess when a State has violated the norms applicable to the management of space debris: a State may argue that a foreign space debris has violated the norms on mitigation measures, but the State with jurisdiction on it may except that it is not a space debris, but still a space object according to its discretion and therefore there is no breach as the object of contention falls out of the scope of application of the relevant norms.

From this, a couple of questions arise: how can a State ensure the compliance of authorised private activities with the applicable mitigation measures if international space law does not establish when a space object becomes a space debris? Equally so, how can private operators put in place remediation services if any target debris remains legally a "*space object*" for the purpose of jurisdiction, responsibility and liability of the "*appropriate State*"[556]?

In light of the context just described, it follows that any prospect of success for the elimination of pollution in outer space depends inevitably and primarily on a clear separation between the category of "*space objects*" and a sub-category of it, called 'space debris', defined in law.

5.2.1.1. Legal issues of the technical definition of space debris

[555] Other objects are envisaged in the space treaties but as human artefacts on celestial bodies, such as stations or installations in Article XII of the OST.

[556] By space object is intended here the space object controlled by a non-governmental entity authorised by the "*appropriate State*".

The first step in the search of a legal definition of space debris is to look at the international initiatives that first tackled the pollution problem introducing the mitigation and remediation measures mentioned above.

In 1989, the UN addressed the matter of space debris for the first time, calling it "*a concern to all Nations*"[557].

Soon after, in 1993, twelve of the major national space agencies of the world together with ESA created the Inter-Agency Space Debris Coordination Committee (IADC). In nine years, they elaborated a set of voluntary technical guidelines for space debris mitigation[558], later endorsed by the UN General Assembly[559] and considered today as the main point of reference for any discussion on space debris, including its definition[560].

According to Guideline 3, space debris are defined as "*all man-made objects including fragments and elements thereof, in Earth orbit or re-entering the atmosphere, that are non-functional*"[561].

By 'non-functional', it is meant that an object "*can no longer fulfil its intended mission*"[562].

Thus, the IADC has slightly re-elaborated the definition of 'space object' contained in the space treaties, adding a decisive factor for qualifying certain objects as debris: their functionality[563].

The choice to put such an emphasis on whether an object is functional or not was inspired by Article IV of the Registration Convention, which – in listing the information that a State of registry has to submit to the UN Secretary General – mentions "*the general function*" of the space object[564].

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[557] See UNGA Res. 44/46 of 12 August 1989, titled 'International co-operation in the peaceful uses of outer space'.
[558] IADC, *Space Debris Mitigation Guidelines*, vers. 02-01 rev. 4, 2025.
[559] UNGA Res. 62/217 of 22 December 2007.
[560] See D. Zannoni, *Out of sight, out of mind? The proliferation of space debris and international law*, in Leiden Journal of International Law, Vol. 35, 2022, p. 297.
[561] See IADC, above at 558, Guideline 3.1.
[562] *Ibid.* Guideline 3.2.1.
[563] In reality, already in 1995 the UN COPUOS STSC offered a first definition of space debris similar to the one endorsed by IADC. At its thirty-second session, the following notion was suggested: "Space debris are all manmade objects, including their fragments and parts, whether their owners can be identified or not, in Earth orbit or re-entering the dense layers of the atmosphere that are non-functional with no reasonable expectation of their being able to assume or resume their intended functions or any other functions for which they are or can be authorized". UN Doc. A/AC.105/605 of 24 February 1995, titled 'Report of the Scientific and Technical Subcommittee on the Work of its 32nd Session', p. 18.
[564] UN Doc. A/AC.105/C.1/2012/CRP.16 of 27 January 2012 titled 'Active Debris Removal an Essential Mechanism for Ensuring the Safety and Sustainability of Outer Space', p. 30.

Building upon this provision, the IADC considered whether the function of an object could be performed or not as the most indicative of its nature and the most easily verifiable from a scientific perspective.

In better terms, given that there is a large variety of types and sizes of objects which can be seen as possible space debris, the aspect of non-functionality represents a qualification which encompasses and is applicable to them all, without the risk of creating dozens of subsets with confusing classifications[565].

Moreover, the status of being functional or not can usually be determined with ease either by the operator of the space object itself or by third party actors possessing the right technical capabilities.

Thanks to these advantageous features, the functionality test has been widely used by the international space community and it has been included by other international entities in their own definitions of space debris[566].

However, even if the scientific soundness of this definition is undeniable, its appropriateness from a legal perspective appears questionable.

The main problem with the functionality test is that it risks to be unreliable[567].

A satellite that – because of a software malfunction, a shortage of fuel or because of damage suffered in orbit – has become non-functional, may become functional again if duly restored. As a matter of fact, the technology of the time is moving in that direction (see Chapter V, Section 5.4) and as a consequence, using only the criteria of its functionality, there would be space objects whose legal status changes depending on their reparation or restoration.

Furthermore, a space object that is irreparably non-functional may still hold value to the owner, who may not want to see it removed from outer space. A notable example is that of the first Ecuadorian satellite, which was launched in 2013 and

[565] Y. Kim and others, *Proposal for improved mitigation procedures and guidelines*, in European Commission's RedSHIFT, Document Ares (2019)2154321, 2019, p. 6.

[566] Notably, the EU in its Space Programme Regulation of 2021 has defined space debris as: "Any space object including spacecraft or fragments and elements thereof in Earth's orbit or re-entering Earth's atmosphere, that are non-functional or no longer serve any specific purpose, including parts of rockets or artificial satellites, or inactive artificial satellites". See Regulation (EU) 2021/696 of the European Parliament and of the Council of 28 April 2021 establishing the Union Space Programme and the European Union Agency for the Space Programme and repealing Regulations (EU) No 912/2010, (EU) No 1285/2013 and (EU) No 377/2014 and Decision No 541/2014/EU, OJ L 170, 12.5.2021, Article 2(1). Sometimes, space debris have been defined as including other elements other than the lack of functionality: for example, being non-manoeuvrable, being inactive, or not being under control. However, these additional elements have been questioned for various reasons, as reported by: Y. Kim and others, above at 565, p. 7.

[567] See the critical analysis reported in UN Doc. A/AC.105/C.1/2012/CRP.16, p. 31.

fatally damaged in orbit shortly after. Despite its inoperability, official statements of the Ecuadorian government have referred to it as a precious symbol of Ecuador's technological capability and therefore a valuable historical asset[568]. Similarly, the objects left by the Apollo missions on the Moon are technically space debris[569]. But it would be injurious to the USA to remove them in the application of remediation measures[570].

Finally, the functionality test does not solve the most problematic issue of space debris remediation: the fact that any intervention on a space debris has to be allowed by the State with jurisdiction on it. In other words, the centrality of the latter is completely discarded by the IADC definition, which limits its assessment to a technical element[571].

But legal definitions, as already argued elsewhere, should not be made dependent on a set of criteria that can be neutralized due to their origins in a technical area in full development.

This means that the IADC technical definition of space debris was acceptable in a context where private space activities were just emerging and where the feasibility of remediation measures was still far from reality.

But today, it is necessary to provide legal certainty for States and for private operators on which things are "*space objects*" and which ones belong to a sub-category of the latter, upon which special rules about mitigation and remediation may apply.

5.2.1.2. The legal category of waste in outer space

[568] See the report of the Ecuadorian Space Agency on the accident of its satellite "*The Pegasus Incident: the Loss of the First Ecuadorian Satellite and Its Recovery*", presented by R. Nader and Dr. T.S. Kelso at the 65th International Astronautical Congress 2014. See also the press release of the Ecuadorian Space Agency on 5 September 2013 available at the link: http://exa.ec/bp54/index.html.

[569] See A. Zeiden, *What Have We Left on the Moon?*, published on Encyclopedia Britannica, 2019, available at the link: www.britannica.com/story/what-have-we-left-on-the-moon.

[570] There are actually vocal proponents of creating cultural heritage sites on the Moon to protect those objects as historically valuable memories of human's space exploration. See A. Froelich, *Protection of Cultural Heritage Sites on the Moon*, Springer, 2020.

[571] As explained also by ESA on its webpage on active debris removal at the link www.esa.int/Space_Safety/Space_Debris/Active_debris_removal: "legal constraints dealing with the ownership of space debris objects, and the validation thereof, cannot be neglected. Firm agreements with the owners of the object is required".

Lacking any indication in the space treaties, a possible solution to the legal definition of space debris may be found taking a step back from outer space and looking at the matter from a more general perspective, namely the regulation of residuals created by human activities on Earth, also known as 'waste law'.

Among the various layers of regulation of waste at the domestic, regional and international levels, a particularly interesting legal framework is offered within the context of the EU.

The latter has created a compound system of legislation on the matter of waste, with as main document the '*EU Waste Framework Directive*' of 2008[572].

Article 3 thereof defines "*waste*" as follows: " *'waste' means any substance or object which the holder discards or intends or is required to discard*"[573].

Before delving into the analysis of the terms used, it is already possible to highlight how this definition – by emphasizing the role of the holder – captures the essence of pollution. As the former president of the European Council for Environmental Law A. Kiss said: "*In the widest sense, a major proportion of pollution consists of introduction into the environment of substances of which one wishes to rid oneself*"[574].

Going back to Article 3 of the EU Waste Framework Directive, each word used by the legislator here holds particular significance.

First, the definition applies to "*any substance or object*".

Therefore, its scope of application is quite vast and, in fact, the Court of Justice of the European Union (CJEU) dismissed any attempt to interpret this definition restrictively[575]. In particular, according to the CJEU settled case law, "*the term "waste" must be interpreted in the light of the aim of Directive 2008/98, which, in the words of recital 6 thereof, is to minimise the negative effects of the generation and management of waste on human health and the environment*"[576].

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[572] Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives, OJ L 312, 22.11.2008. The relevance given to an instrument of EU law in the context of international law is justified by two considerations: firstly, it is not taken as a regime to be applied in outer space, but only as a point of reference whose norms can be used for inspiration in the creation of norms of international space law; secondly, it is chosen because of its legal robustness and because of the presence of consolidated jurisprudence on its interpretation.

[573] *Ibid.*, Article 3.

[574] A. Kiss, *La reparation de dommages catastrophique*, Oxford, 1995, p. 301.

[575] See, to that effect, CJEU, *Openbaar Ministerie v Tronex BV*, Case C-624/17, Judgment of 4 July 2019, paragraph 18. See also CJEU, *Shell Nederland*, C-241/12 and C-242/12, Judgment of 12 December 2013, para. 38 and the case-law cited therein.

[576] *Ibid*.

Moving to the next term of the definition – "*holder*" – it is possible to formulate the following consideration.

The EU legislator decided to put at the centre of its regulation of waste not the owner, nor the possessor, but the person who has a direct connection with the actual use of the substance or object: the holder.

In the following words of Article 3, it is possible to find the actions that trigger the application of EU waste law: "*discards or intends … to discard*".

The crucial element of the definition is in the intention of the holder.

In the words of the CJEU: "*the classification of a substance or object as waste is to be inferred primarily from the holder's actions*"[577].

The CJEU made this point very clear in the *Arco v. Elpon* judgment (Case C-418/97), where paragraphs 64-67 and 94 suggest that the critical factors in deciding whether a certain material is "*waste*" are not whether it has economic value, nor whether processing it may endanger human health or the environment, nor whether such material has undergone a complete recovery operation[578]. All these aspects are irrelevant. Similarly, it is not important what the biological, chemical or industrial condition of the material is. In other words, to know whether a substance or an object is "*waste*", the question should not be posed to a scientist, an engineer or an economist, but to a lawyer. It is only the legal investigation on the conduct of the holder that can define whether something is waste or not.

Having said that, what does the verb "*discard*" exactly mean?

Undoubtedly, "*discard*" implies a specific *mens rea* or psychological attitude towards the object or substance on the part of its holder[579]. Once again, the CJEU provides us with guidance: "*Particular attention must be paid to the fact that the object or substance in question is not or is no longer of any use to its holder, such that that object or substance constitutes a burden which he will seek to discard. If that is indeed the case, there is a risk that the holder will dispose of the object or substance in his possession in a way likely to cause harm to the environment, particularly by dumping it or disposing of it in an uncontrolled manner*"[580].

[577] See CJEU Judgment of 4 July 2019, above at 575, para. 17.
[578] ECJ, joined cases C-418/97 ARCO Chemie and C-419/97 Hees/ EPON, Judgement of 15 June 2000. See the commentary made by A. Waite, *The Definition of Waste: The Riddle of the Sands*, in Frieden in Freiheit - Peace in liberty - Paix en liberté, 2008, p. 800.
[579] See D. Wilkinson, *Time to Discard the Concept of Waste?*, in Environmental Law Review, 1.3, 1999, p. 179.
[580] See CJEU Judgment of 4 July 2019 above at 575, para. 22.

An interesting interpretation has been proposed by J. Fluck, who suggested that 'discard' should be defined not just as getting rid of something, but as relating to a decision to change the purpose of a substance or object, or to release it from its original purpose without immediately reallocating it to any new purpose, or rededicating it to recovery or disposal[581].

The 'purpose' given by the holder to a certain thing becomes then the main element of inquisition in determining the meaning of "*waste*" under the Waste Directive[582].

In this sense, according to Andy Waite, it is possible to delineate a test in three steps:

1) If the true purpose of the holder is to re-utilise the material or have it re-utilised by a third party, it is not waste.

2) If, however, his purpose is to get rid of the material, it is waste.

3) Where n. 2 applies, the material is waste even though the waste management route may lead to its subsequent re-utilisation[583].

This interpretation of the EU's definition of waste captures the essence of the terms used by the legislator. It is only the person who has a direct use of any substance or object who can – through its conduct and through its manifest intention to get rid of it – determine whether it is waste or not.

In view of this brief description of the main elements of "*waste*" in EU law, what can be said about 'space debris'?

Leaving aside the element of functionality, and looking at the actual legal problems faced by States and private actors on the implementation of mitigation and remediation measures, the following reflections can be made.

To know whether a space object has become debris it is essential to assess: 1) if a mitigation measure was effectively put in place; and 2) if the object can be removed from outer space, for example with an ADR operation.

The uncertainty on the legal status of a space object can be ultimately linked to the position held, according to the space treaties, by the State that launched it and/or that authorised the private activity conducted with it.

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[581] J. Fluck, *The Term Waste in EU Law*, in European Environmental Law Review, 79, 1994, p. 81.
[582] See A. Waite, *Crucial Need to Understand the Meaning of Waste*, in Institute of Wastes Management, Law and the Waste Industry, 1994, as cited by D. Wilkinson, above at 579, p. 179.
[583] *Ibid.*

On this point, the findings of the Report of the International Interdisciplinary Congress on Space Debris Remediation and On-Orbit Satellite Servicing of 2012 are still relevant:

"*The State that holds jurisdiction and control over a space object is the State on whose registry an object launched into outer space is carried. If a State, or a State-licensed actor, remediates a space object, it can only legally do so if it has legal jurisdiction and control over that space object or permission from the State of registry.*

The rules establishing State jurisdiction and control over space objects provide certainty in a situation where States may not exercise sovereignty in outer space.

[…] It is important to note that the nexus to jurisdiction and control over space objects continues ad infinitum.

[…] The legal regime was not constructed to deal with [the space debris] issue and discourse is only just beginning. The international community needs to think about what mechanisms will facilitate the seeking and granting of permission and establish rules respecting both the jurisdiction and control issue and consent"[584].

From this passage, it is evident that the issues related with waste in outer space are connected to the role that the State with jurisdiction and control over space objects has in the system of space law.

It is only that State which is entitled to determine the legal status of space debris[585]. This is also true in the case of private space activities since the legal status of a space object is a matter of international law and therefore a prerogative of States[586].

Having said that, the questions are: how can such legal status be determined? Is it possible for a State to discard a space object? And if so, with what consequences in terms of international law?

Considering that the national and international registries are the places where States can indicate relevant information on their space objects, it is possible to imagine the simple insertion of an update on the status of the relevant object, both

[584] See UN Doc. A/AC.105/C.1/2012/CRP.16 of 27 January 2012, titled 'A Report of the International Interdisciplinary Congress on Space Debris Remediation and On-Orbit Satellite Servicing', p. 32.
[585] See for all P. De Man, above at 81, p. 372.
[586] Logically, a State with jurisdiction over the control of a private space object would have to consider the matter on its legal status in consultation with the private actors controlling it. But that is a matter of domestic law.

at the national and international level, using for example the expression: "*object discarded*".

With that, each State can change the legal status of an object carried on its own registry into a 'space waste'.

As a consequence, jurisdiction on the object is not affected but a clear distinction can be drawn between objects falling under the general regime of space objects, and objects for which the special rules on mitigation and remediation measures apply.

Thus, once an object is indicated as 'space waste', it can be assessed whether the applicable mitigation measures were put in place correctly or not.

At the same time, that object enters into the scope of application of the rules on disposal, which are centred on either autonomous de-orbiting manoeuvres or ADR operations.

Providing clarity on the legal status of space objects can also be advantageous to States as it incentivises possible interventions aimed at removing them without the risk of targeting the wrong object.

Implementing the concept of discarded object in international space law does not require any convoluted intervention on the current legal framework, but merely its embracement in States practice using the tools available in the registration system.

Eventually, a new legal definition of 'space waste' may be suggested for the consideration of and consensus agreement by COPUOS, possibly followed by its adoption by the UN General Assembly as a dedicated resolution or other action.

In particular, 'space waste' can be defined as: "*All human-made objects including fragments and elements thereof, in outer space or re-entering the Earth's atmosphere, that are discarded by the State on whose registry they are carried".*

With that, measures to combat space pollution can find a stronger adherence and a more verifiable application.

This is particularly important with regard to private space activities.

The "*appropriate State*" can include in the authorising process a special set of rules on the classification of an object as 'discarded'.

The consequence of such change of status is that non-governmental entities know exactly when their compliance with mitigation measures is going to be evaluated and when the duty of putting in place remediation measures, such as de-orbiting

manoeuvres or, when the latter are unfeasible, for setting up ADR operations, is triggered.

A system where the change of status of a space object into a space waste gives rise for the private operator to a number of public verifications (i.e. on the mitigation measures) and to a new set of obligations on remediation can produce a virtuous cycle of sustainable behaviour in outer space.

Most importantly, it can create a regulatory-induced market of ADR operations if the legislator imposes on space operators to either de-orbit or remove their space objects once their legal status has changed to space waste.

In conclusion, re-thinking the definition of space object *vis-à-vis* the problems raised by private space activities can be a fruitful occasion to update the legal framework of space law, rendering it more robust and incentivising its advancement.

5.2.2. The uncertain regime of suborbital vehicles

The definition of space object is not only troubled by the presence of space waste in outer space, but also by the launch towards outer space of new assets, such as suborbital vehicles.

Suborbital activities can be defined as controlled flights of objects moving at a speed lower than that required to put a satellite into orbit[587]. Therefore, they arrive at an altitude where an object like a satellite may be in orbital trajectory around Earth, but they do not accelerate significantly to start orbiting, and thus, they simply fall back to Earth.

The aim of a suborbital operation is, for example, to make a 'suborbital traveller' experience the weightlessness effect given by the decreased gravitational pull of Earth, but also to see Earth as well as outer space from above the denser layers of the atmosphere. It can be used for scientific experiments, for delivering payloads in outer space or as a new transportation system, departing from one point on Earth

[587] See UN Doc. A/AC.105/C.2/2022/CRP.24 of 6 April 2022, titled 'Definition and delimitation of outer space', p. 4. In analogous terms: ICAO Working Paper no. LC/36-WP/3-2 20/10/15, 2015, p. 2: "A sub-orbital flight is a flight up to a very high altitude which does not involve sending the vehicle into orbit".

and landing in another with a substantially reduced time of travel compared to other means of transportation[588].

In general, it is possible to identify a diverse array of suborbital vehicles, each distinguished by its method of take-off, method of landing and propulsion systems[589].

This diversity will increase in the future as new discoveries unlock new possibilities to travel to outer space. For example, the company Dawn Aerospace is in the test phase of a new suborbital vehicle called '*Mk-II Aurora*', which is presented as a rocket-powered aircraft[590]. In other words, it takes off and lands following a horizontal trajectory with the help of its wings, but its engine is powered like a rocket and so it is able to travel in outer space. Interestingly, its State of jurisdiction – namely, New Zealand – has certified it as an aircraft[591].

The choice to regulate a certain suborbital vehicle under one regime or another depending on its inherent technical characteristics can result in a confusing legal framework for suborbital operations, where certain suborbital vehicles are space objects while others are aircraft based, for example, merely on the presence of wings or on the manner of take-off and landing[592].

For this reason, scholars and commentators have always favoured a uniform and all-inclusive regime for all objects performing suborbital operations[593]. The question is: which one?

There are two options currently available: 1) applying the regime of air law; 2) applying the regime of space law.

The air law regime is often favoured because of its completeness and detailed rules.

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[588] There are of course other possible applications of suborbital operations, such as scientific experiments or military uses, but they are not relevant for the purpose of the present discourse.

[589] Concrete examples are provided by private companies engaging in suborbital services, such as Virgin Galactic – which uses an aircraft called White Knight Two and a rocket-engine propelled space object called Spaceship Two to reach an altitude of about 80 km performing a horizontal take-off and landing – or Blue Origin – which uses a rocket called New Shepard to vertically ascent to outer space and descent back to the landing pad.

[590] For more information, see here: www.dawnaerospace.com/spacelaunch

[591] See the link: www.dawnaerospace.com/latest-news/certified-and-ready-for-rocket-powered-flight

[592] See F. Von der Dunk, *Legal aspects of private manned spaceflight*, in Handbook of Space Law (ed. by F. Von der Dunk and others), Edward Elgar Publishing, 2017, p. 672.

[593] See S. Freeland, *Fly Me To The Moon: How Will International Law Cope With Commercial Space Tourism?*, in Melbourne Journal of International Law, Vol. 11, 2010, p. 13. See also T. Masson-Zwaan, *Private Law Aspects of Suborbital Flights: Second- and Third-Party Liability and Insurance*, in Journal of Air Law and Commerce, Vol. 87, No. 3, 2022, p. 413.

Aspects, such as registration, certification and liability in the field of aviation are today regulated with a detailed international framework built upon the centennial experience of flights in the air[594].

Nonetheless, applying the entire regime of air law to suborbital vehicles opens the door to new issues: it is not easy to apply *sic et simpliciter* a whole system of rules and procedures imagined for aviation to an intrinsically different type of activity, especially when suborbital vehicles are launched leveraging on rocket engines more akin to space launchers than to traditional aircraft operations. In addition, the convenience of relying on the regulatory framework of air law is questionable considering that – as put by Tanja Masson-Zwaan – "*applying that very detailed body of law to an emerging industry may also cause a showstopper as an incident of overregulation*"[595].

Irrespective of the difficulties in applying air law to the nascent industry of suborbital flights, the legal grounds for its application can be found in the fact that suborbital vehicles perform the major part of their flight in the air and only briefly touch the area where satellites can orbit around Earth. Because so much time is spent below orbital altitude, it can be argued that they should be attracted under the regime of air law[596]. Moreover, doubts are raised on the application of the definition of space object to suborbital vehicles because they may not be considered as being "*launched into outer space*"[597]. Even less so as being "*launched into Earth orbit or beyond*"[598], meaning that an important part of the regime of space objects contained in the Registration Convention would not apply to suborbital operations.

Thus, how can a suborbital vehicle, which is '*sub*- orbital' by definition, be considered as falling under the regime of space law?

Clearly, the solidity of those arguments depends on the understanding of the expressions "*Earth orbit or beyond*" and "*suborbital*".

[594] See R. Moro Aguilar, *National Regulation of Private Suborbital Flight*, in FIU Law Journal, 2015, p. 695.
[595] See T. Masson-Zwaan, above at 593, p. 419.
[596] See the arguments in that sense reported in T. Masson-Zwaan and others, *Regulating private human suborbital flight at the international and European level: Tendencies and suggestions*, in Acta Astronautica, Vol. 92, 2013, p. 243.
[597] This terminology is used in several provisions of space law such as in Article VIII of the OST or in Article 5 of the Rescue and Return Agreement. See F. Von der Dunk, above at 592, p. 679.
[598] Article II of the Registration Convention.

Contrary to what may be perceived at first reading, being in orbit does not refer to being in a wide geographical area around Earth where all satellites are orbiting.

It is a technical expression that refers to moving at a velocity necessary to complete one or more orbits around the globe without falling back on Earth. As such, "*Earth orbit*" can be considered as referring to the lowest Earth orbit, and "*beyond Earth orbit*" to anything beyond that lowest point[599].

Under these terms, an object can be seen as sub-orbital in the sense that it has reached and passed the area where other objects are in orbit but, notably, it has not entered in an orbital trajectory. Thus, it is '*sub-* orbital' as in below orbital velocity, but "*beyond Earth orbit*" as in higher than the lowest Earth orbit.

In light of that, the provisions of the Registration Convention can be considered as applicable also to suborbital vehicles. However, this conclusion depends ultimately on the definition of what the 'lowest Earth orbit' is. Just as much as the argument that a suborbital vehicle is not "*launched in outer space*" depends on the understanding of what 'outer space' is.

As a result, to discard the application of the air law regime as legally unfounded and to champion the regime of space law, it is necessary to first provide an answer to the oldest problem of space activities: the definition of the boundary of outer space.

5.2.2.1. The legal boundaries of outer space

Space law is a legal framework specific to and exclusive of a physical environment: outer space[600].

Its scope of application therefore is confined by the boundaries of such environment: an internal one, towards the Earth; and an external one, towards the so-called 'deep space'[601].

Starting with the latter, it is necessary to make a preliminary consideration.

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[599] F. Von der Dunk, *Beyond What? Beyond Earth Orbit?...! The Applicability of The Registration Convention to Private Commercial Manned Sub-Orbital Spaceflight*, in California Western International Law Journal, Vol. 43, No. 2, 2013, p. 320.

[600] This includes activities that from Earth are directed towards outer space, such as launches of space rockets.

[601] The term "*deep space*" is used in article 1.177 of the ITU Radio Regulations where it is defined as "Space at distances from the Earth equal to, or greater than, 2×10^6 km" (i.e. 2 million km). Considering that the minimum distance between Mars and our planet is about 50 million km, it can be said that "deep space" – in cosmic distances – begins just outside Earth's backyard.

There is no physical border where the Universe ends: outer space – as far as we know – is infinite.

Hence, there is no limit to where space law applies in the cosmic environment. Once humans step out of the Earth, their actions are regulated by space law. This is true in the cis-terrestrial area[602] and anywhere else in the Solar system and beyond[603].

This broadness of scope is reflected in the wording used in space norms. The principles of the OST, for example, apply to "*outer space, including the Moon and other celestial bodies*" [604] and to "*objects launched into outer space*"[605]. The rules of the Registration Convention use a similar expression: "*objects launched into Earth orbit or beyond*"[606], while, for instance, the UN Guidelines for the Long-Term Sustainability of Outer Space Activities ('LTS Guidelines') refer more broadly to: "*activities in outer space*"[607].

Therefore, the scope of application of space norms is meant to include everything that humans do in the cosmic domain. There is no reference in the treaties and in the other international sources of law to a smaller perimeter of application, such as the Earth-Moon System or the Solar System[608].

For this reason, any external limit to the scope of space law must be excluded[609].

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[602] The cis-terrestrial area corresponds to the part of outer space where space objects orbit around Earth.

[603] The only distinction that may be articulated within the cosmic environment is between three different 'zones': 1) outer space; 2) the Moon; 3) other celestial bodies.
From a physical perspective, all the natural space objects with mass, such as planets, satellites, asteroids and stars, i.e. the celestial bodies, are something different from the black void between them, or outer space. An additional distinction may regard the Moon.
From a human perspective, Earth's natural satellite is different from all the other celestial bodies due to the special importance it has always held for earthlings in terms of vicinity, gravitational influence and historical value.
From a legal perspective, these distinctions have only little relevance, considering that most space norms, starting from the principles of the OST, are meant to apply to the cosmic environment at large. Although, some norms are specific to one or the other zone, such as Article IV, para. 2, of the OST which applies only to the Moon and other celestial bodies.

[604] Other than in the title of the OST, this formula can be found in its articles I, II and III.

[605] OST, Article VIII. See also Rescue and Return Agreement, Article 5.

[606] See Registration Convention, Article II.

[607] LTS Guidelines, p. 50.

[608] This is leaving aside the Moon Agreement, which is not taken into consideration here due to the low number of ratifications as explained in Chapter II.

[609] Within this overarching ambit of application, it is possible to find specific rules that apply only to particular areas of outer space. That is the case of provisions referring exclusively to "*the Moon and other celestial bodies*" (see OST, Articles IV(2) and XI), or the ones referring separately to either only the Moon or only celestial bodies (see Moon Agreement, Article 4 or 11, referring only to "*the Moon*". See also OST, Article IV(1), referring only to "*outer space*" and then only to "*celestial bodies*"), or the provisions peculiar of certain zones in outer space, such as the geostationary orbit of Earth (see ITU Constitution, Article 44). They specify the obligations applicable to those areas in addition to the

Turning now to the internal limit of space law, it is a matter of defining when the latter begins to apply as human activities move upwards in the atmosphere[610].

It would be ideal for the purpose of clarity in the application of the respective regime to have a precise line in the sky that marked the physical entrance into outer space: a geographical demarcation between the two environments, the earthly one and the cosmic one. This is for example what can be found in maritime law, with the line of the coast marking the separation between land and sea. Unfortunately, a line of this kind does not exist in the sky.

In fact, the transition from Earth to outer space is rather smooth, with the atmosphere simply getting thinner and thinner in the upper layers. Notably, the air density of Earth can still exercise a so-called 'atmospheric drag' on satellites up until approximately 2000 km above sea level[611].

Thus, to determine when an object is in space – and more in general to determine the scope of application of space law – it is impossible to rely on a clear physical separation.

In the absence of a natural boundary, the internal limit of outer space has to be found in a legal solution. However, the treaties and the other international provisions on the matter (e.g. UNGA resolutions) have never provided an answer to the issue.

With space law silent, different theories have been suggested by scholars and States[612]. Among them, the 'functionalist' approach and the 'spatialist' approach have become dominant.

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underlying body of space law, which remains the applicable framework for any matter not touched by such provisions.

[610] The very first evidence of a legal analysis of space activities dealt precisely with such matter. It appeared in the French magazine '*Revue Juridique Internationale de Locomotion Aerienne*'. Here, in 1910, a Belgian legal expert by the name of Emile Laude wrote about a future where, with the progress of science and technology, the activities of humans would inevitably go beyond the sky into a different domain, which he called the "*ether*". In his work, Laude suggested that, even though it was too soon to start regulating that domain, nevertheless it was already possible to imagine the creation of a specific body of law, different from the ones applicable to the airspace above the ground. E. Laude, *Comment s'appellera le droit qui régira la vie de l'air*, in Revue Juridique Internationale de la Locomotion Aérienne, Vol. 1, 1910, p. 16. The matter was also among of the demarcation of outer space was also among the first ones debated at the UN level, as can be seen in UN Doc. A/4141 of 14 July 1959, titled 'Report of the Ad Hoc Committee on the Peaceful Uses of Outer Space', p. 25, where Part III, Sec. A ('Question of determining where outer space begins') recounts the various possible solutions presented by the States Members of the Committee.

[611] E. Gaposchkin and others, *Analysis of Satellite Drag*, in The Lincoln Laboratory Journal. Vol. 1, No. 2, 1988, p. 203.

[612] See the discussion of COPUOS Legal Sub-Committee under the agenda item on matters relating to the definition and delimitation of outer space. As for the copious literature on the topic, see: L. Perek,

5.2.2.2. Two possible approaches: functionalist vs spatialist

The 'functionalist' approach regards the altitude reached by an object to be irrelevant to determine whether it is a space object or not, focusing instead on the nature or purpose of a given activity performed with that object: if the activity is meant to be conducted in outer space it is a space activity and therefore space law applies[613].

A classic reproach to this position is that some activities are not so easily determined in their nature and purpose, leaving the determination of the applicable regime left to a case-by-case evaluation[614].

But a more relevant critique is that to answer the question of whether the function of an object is to perform a space activity, it is first necessary to know when an activity is a space activity. In other words, to say that a space object is an object that performs a space activity leaves unanswered the question from which the problem originated, namely what does the term "*space*" mean?

That is where the 'spatialist' theory comes into play, offering a possible solution to the dilemma.

Its supporters argue that – in the absence of a natural clear-cut delimitation – it is necessary to adopt a conventional line in the sky: a *fictio iuris* that artificially creates what nature does not provide, namely an exact boundary between Earth and outer space[615].

With that, a space object becomes an object launched beyond that line.

Scientific Criteria for the Delimitation of Outer Space, in Journal of Space Law, Vol. 5, No. 1, 1977, p. 111; G. Oduntan, *Sovereignty and Jurisdiction in Airspace and Outer Space Legal Criteria for Spatial Delimitation*, Routlede, 2011, p. 350; O. Bittencourt Neto, *Defining the Limits of Outer Space for Regulatory Purposes*, Springer, 2015; T. Gangale, *How High the Sky?*, Brill Nijhoff, Leiden, 2018.

[613] Among scholars, Maurice Lemoine is considered to be the first author advancing the idea of a functional approach. In 1947, he wrote that air law was the field of law which determined and studied the laws and legal norms that regulated the traffic and use of aircraft as well as the relations which they brought about and that cosmic law was oriented towards navigation in space. M. Lemoine, *Traite de Droit Aerien*, Paris, 1947, p. 79. See also R. Quadri, *Droit International Cosmique*, Sijthoff, 1959, p. 509. More recently, see P. Dempsey and others, *Suborbital Flights and the Delimitation of Airspace vis-à-vis Outer Space: Functionalism, Spatialism and State Sovereignty*, A Submission to the United Nations Office of Outer Space Affairs by The Space Safety Law & Regulation Committee of the International Association for the Advancement of Space Safety, 2017, p. 16.

[614] See S. Hobe and others, *Space Tourism Activities - Emerging Challenges to Air and Space Law*, in Journal of Space Law, vol. 33, no. 2, 2007, p. 359.

[615] See C. Newman, *The Never-Ending Problem of Demarcation: Addressing the Air/Space Boundary Issue in International and Domestic Law*, in International Space Law in the New Space Era: Principles and Challenges (ed. by B. Sandeepa), Oxford University Press, 2024, p. 21.

For example, according to the Australian Space Act of 2018, the authorisation and supervision system for private space activities applies to objects launched in outer space, intending by 'launch' the sending of "*the whole or a part of the object into an area beyond the distance of 100 km above mean sea level*"[616].

When an activity controlled under Australia's jurisdiction reaches that distance, Australia becomes the "*appropriate State*" with all the relative obligations in terms of responsibility, liability and registration.

This is irrespective of any consideration in terms of type of vehicle used, time spent above the line, or purpose of the activity.

The question however is: why choosing the 100 km line as the conventional altitude after which outer space begins?

Despite the existence of other suggested altitudes[617], the strength of the 100 km approach can be easily tested starting from the concept of sovereignty in the air.

A firmly established and longstanding tenet of customary international law is that sovereignty extends to the airspace above the territory (and territorial waters) of States[618]. Hence, flying over another State's territory without permission is a violation of its territorial sovereignty[619]. The vertical extension of the latter is not defined in any norm of international air law.

However, some indications can be found in the actual exercise of sovereign powers by States in the column of air above their territories[620].

[616] Australia's Space (Launches and Returns) Act 2018, Section 8. The choice of the 100 km altitude is based on the so-called Karman line, theorised by Theodore Von Karman in T. Von Karman and others, *The Wind and Beyond: Theodore Von Kármán, Pioneer in Aviation and Pathfinder in Space*, Little Brown, 1967, p. 343.

[617] While Australia, Denmark, Kazakhstan, Indonesia, and Slovakia have all embraced the so-called 'Karman Line' which sets the limit of outer space at 100 km, the national law of the United Arab Emirates has adopted the 80 km boundary line. There has even been a proposal by some equatorial States led by Colombia to declare the column of air up to 36.000 km as part of the sovereign airspace of the underlying States in the Bogota Declaration, see above at 142. See also J. McDowell, *The edge of space: Revisiting the Karman Line*, in Acta Astronautica, Vol. 151, 2018, p. 668.

[618] Chicago Convention of 1944, art. 1. This principle has been recognized by the ICJ as a "firmly established and longstanding tenet of customary international law" in its *Military activities* case, para. 212.

[619] Chicago Convention of 1944, art. 3(d).

[620] For instance, in 2020 the EU started working on the regulation of so-called "higher airspace". In the first proposal issued in 2023, the latter was described as "the volume of airspace typically above altitudes where the majority of air services are provided today" (about 16 km above sea level).

In general, within the altitude of approximately 20 km above sea level[621], States apply their rules of the air[622], provide air traffic services[623] and implement closures of their airspace, in conformity with the obligations set forth in the Chicago Convention of 1944.

Moreover, within the same range of altitude, States have a long-established practice of considering unauthorized foreign aircraft as intruders of their sovereignty. Already in 1960, when the American spy plane known as U2 flew over Soviet airspace at an altitude of about 21 km above sea level it was shot down by the Soviet Union on the basis of a violation of its airspace[624]. More recently, in 2023, a Chinese balloon drifted over the US territory at an altitude of about 18 km above sea level without permission. It was taken down shortly after the incursion[625]. The fact that the drift over American airspace was justified by China on grounds of *force majeure* is an implicit recognition that, were it not for *force majeure*, China would have been considered internationally responsible for a violation of the US national airspace[626].

Therefore, in the portion of the sky up to at least 20 km above sea level, sovereignty is generally accepted.

Whether the sovereignty of States continues in the airspace beyond that edge remains unclear.

However, it is possible to refer to another consolidated principle of international law: the passage of satellites over foreign territory cannot be considered a violation of sovereignty due to the height where the passage occurs[627].

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[621] In the USA, the controlled airspace is divided in classes. Among them, there is Class A, which is well defined and arrives up to 18 km above sea level. But there is also Class E, which is still a class under controlled airspace but that starts from 18km and the upper limit is undefined. See here www.faa.gov/air_traffic/publications/atpubs/aim_html/chap3_section_2.html

[622] See Annex 2 of the Chicago Convention of 1944.

[623] See Annex 11 of the Chicago Convention of 1944.

[624] See Q. Wright, *Legal Aspects of the U-2 Incident*, in The American Journal of International Law, Vol. 54, No. 4, 1960, p. 836.

[625] See the statement from US Secretary of Defense Lloyd J. Austin on 4 February 2023.

[626] G. Pratama, *Shooting down Chinese high-altitude balloon: Unlawful use of force?*, on Leiden Law Blog, 2023. Other examples of violations of national airspace for unauthorized foreign flights at similar altitudes occurred in Lebanon and in Mali, where respectively Israeli and French aircrafts entered the national airspace without permission. The matters were brought to the attention of the UN Security Council as reported in S/2009/544 and in S/2022/622.

[627] States have recognized that satellites should not be put in the same category as conventional aircraft. For example, they cannot be regarded as uncrewed aircraft whose flight over the territory of a foreign State would require under article 8 of the Chicago Convention the consent of the underlying Stat (A.AC/C2/7).

Already when Sputnik-1 orbited over the globe at an altitude of 577 km above sea level, it was evident that space objects were well beyond any national airspace. This idea was not put into question by satellites orbiting at much lower altitudes. For example, one of the lowest satellites orbiting Earth was the Japanese "*SLATS*", which in 2019 maintained an altitude of 167.4 km for a week to perform remote sensing operations[628]. More recently, NASA's satellite "*ASTRE*" has been reported to be in its lowest orbit at 130 km of altitude[629]. No protests were raised against Japan or the USA by underlying States for the overflight of their territories. Moreover, satellites in elliptical orbits reach their perigee (lowest point) at about 100 km above sea level passing over several States each day without any objection at the international level[630].

Therefore, in view of consistent State practice and considering the lack of protests by underlying States, it can be concluded that activities at an altitude of about 100 km fall under the scope of application of space law.

The resulting picture depicts two uncontested altitudes, at 20 km and at 100 km, far apart from each other, where the applicable regime can be considered certain and supported by consolidated State practice.

What is left in between is an undefined area lower than the lowest satellite and higher than the highest aircraft where the applicable regime remains unsettled.

It may be argued that the presence of this unsettled area below the 100 km line may raise problems for the application of space law to suborbital vehicles.

In fact, the crossing by space objects of that unsettled area above a foreign State's territory during their departure to, or re-entry from, outer space may concern the underlying States.

In reality, the departure and re-entry of space objects generally follow trajectories that only cross the airspace above the launching State's territory or, more often,

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Moreover, The International Radio Consultative Committee (CCIR) of the ITU, the duty of which is, inter alia, to study technical questions relating to radio-communications, has defined in its Report 204-3 (p. 17 of vol. IV of the CCIR XIII Plenary Assembly, Geneva, 1974) the terms concerning space radio-communications, in particular: "Space craft: A man-made vehicle which is intended to go beyond the major part of the Earth's atmosphere".

[628] See the Japan Aerospace Exploration Agency's press release on the SLATS program, available at the following link: https://global.jaxa.jp/press/2019/12/20191224a.html

[629] R. Pfaff and others, *The Atmosphere-Space Transition Region Explorer (ASTRE) – a Low Perigee Satellite to Investigate the Coupling of the Earth's Upper Atmosphere and Magnetosphere*, in NASA TP–20220018963, 2022, p. 2.

[630] J. McDowell, above at 617, p. 671.

the airspace above international waters. There are indeed records of space objects overflying foreign territories at an altitude inferior to 100 km during re-entry[631]. However, they have not caused international frictions. According to the views collected by COPUOS on the matter[632], due to the paucity of the events and to their irrelevance for the interests of underlying States, it was deemed unnecessary to specify whether a violation of national airspace occurred[633].

It follows that the crossing of the unsettled area above foreign State's territories by space objects – including therefore suborbital vehicles – is not felt as a problem in the practice of States.

An additional clarification on the existence of the unsettled area is necessary.

The 100 km rule does not entail that at lower altitudes air law applies: the unsettled area between 20 and 100 km can remain 'unsettled' without undermining the function of the 100 km rule. That is because having set a limit after which a certain regime applies, does not mean that also the rules applicable outside that limit are decided: below 100 km of altitude, the regime of air law may apply just as much as a new regime established appositely for the unsettled area.

The point of a fixed conventional line in relation to outer space is to identify the rules applicable to objects that are in outer space or that are aiming at a point above that line, not to regulate everything that happens above *and below* the line.

In addition, it is important to underline that also objects 'aiming' to reach outer space must be considered space objects in the context of space activities.

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[631] The re-entry of space objects mentioned here does not include the uncontrolled re-entry of space objects, such as rocket parts or non-functional satellites that fall back on Earth.
Rather it refers to objects such as the space shuttle or re-usable rockets. The position expressed by the Russian Federation to COPUOS on the topic is quite telling: "In March 1990 the United States of America communicated to the USSR information regarding the final flight stage of the Atlantis multi-use craft. The information furnished contained general data on the trajectory of the planned flight of the shuttle above a specific swathe of eastern regions of the USSR and indicated the period of time during which the craft was expected to be located above the territory of the Soviet Union during its descent from orbit, its minimum flight altitude in that airspace before its entry into the Earth's atmosphere above open sea, and technical details of the craft's state. Information received only a few hours before the overflight took place was transmitted as a courtesy. An agreement was reached establishing that the fact that this information was furnished should not be deemed to set a precedent". UN Doc. A/AC.105/635/Add.1 of 15 March 1996, titled 'Questionnaire on Possible Legal Issues with Regard to Aerospace Objects: Replies from member States', p. 6.

[632] See the views collected by COPUOS through its Working Group on the Definition and Delimitation of Outer Space of the Legal Subcommittee, available at:
www.unoosa.org/oosa/en/ourwork/copuos/lsc/ddos/index.html

[633] Some States have put forth the thesis that they were not objected simply because they were not known. However, even the States that, thanks to their tracking capabilities, have knowledge about foreign space objects crossing the column of air above their territories during re-entry have never raised a complaint. See T. Gangale, above at 612, p. 344.

As correctly phrased by Australia's national space law, what matters for the application of space law is the launching of an object "*into an area beyond the distance of 100 km above mean sea level, or attempt to do so*"[634].

In other terms, because to get to that line it is inevitably necessary to traverse a portion of the sky which does not fall under the regime of space law, the rules applicable to space objects can only depend on the aim of the launch in terms of altitude, and not on the mere position of the object during its flight.

Thus, even if an object is in the airspace or in the unsettled area below 100 km, if its launch is targeting a point above that line, it must be considered a space object. Otherwise, three different regimes would apply to it: air law while below 20 km, an undefined regime between 20 km and 100 km, and space law above 100 km, with confusing, inconsistent and burdensome consequences for States and private operators.

Therefore, from the elements analysed above, it can be concluded that the 100 km line is based on solid legal grounds that make it the best solution to the old problem of defining what "*space*" in "*space object*" is.

Building upon this conclusion, what can be said on the regime applicable to suborbital vehicles?

5.2.2.3. Applying space law to suborbital space objects

The debate on whether suborbital vehicles are to be regarded as space objects or not has always been deeply connected to scientific and technical considerations.

That is where the problem lay.

Searching for legal answers in the fields of technology and science is always detrimental and troublesome to the solidity of any answer thus found: technology changes and science advances with new discoveries, rendering what was once considered a valid assumption a completely obsolete belief or a mistaken evaluation.

[634] Australian Space (Launches and Return) Act of 2018, Section 8.

For that reason, only by detaching the answer from the ever-changing nature of such fields is it possible to construct clear and long-standing regulatory solutions[635].

The 'spatialist' approach moves precisely from this premise: it offers a solution inspired by technical and legal evaluation, but ultimately based on a solution of conventional nature. For that reason, setting a fixed, fictional line to legally determine the boundary of outer space represents the only solution that can ensure clarity and soundness in the regime of space law.

With a legal boundary set at 100 km of altitude, private operators that are launching their suborbital vehicles above that line can benefit from knowing that their vehicles are, by law, space objects and that the regime of space law applies to their entire activities.

However the benefit of clarity in embracing a conventional line also presents some inconveniences of regulating suborbital vehicles as space objects.

There are in particular three aspects that can affect the suitability of space law for this type of activities: 1) the registration of the vehicle; 2) the authorisation and certification system for the activity, the vehicle and the operator; 3) the rules on liability.

The international registration of space objects, as mandated by Article IV of the Registration Convention, requires the submission of specific information pertinent exclusively to objects in orbit[636]. Consequently, this data is inherently unavailable for suborbital operations, which do not involve orbital activities. Therefore, the absence of such information in the registration documentation for suborbital vehicles, when launched into outer space, does not constitute a breach of the Registration Convention.

Another problem with the system of registration envisaged for space objects is the fact that in State practice information on space objects is submitted after the launch and with a certain degree of discretion by the State of registry[637].

This can create problems of transparency and of coordination of operations at the international level, considering that to avoid any issues of safety and interference

[635] A notable example in this sense can be found in the international regime of maritime law.

[636] See Registration Convention, Article IV(1)(d), requiring the submission of: "Basic orbital parameters, including: (i) Nodal period; (ii) Inclination; (iii) Apogee; (iv) Perigee".

[637] The Registration Convention uses the expression "*as soon as practicable*" in Article IV, which in theory allows the submission of information also before the launch.

it is logically necessary to know in advance where and how a certain operation will be put in place.

As for the authorisation and certification systems in space law, there is only a general obligation for the "*appropriate State*" to authorise and supervise the space activity of its non-governmental entities. Any further detail is left to the discretion of each State.

This means that at the international level, there are no rules that can guarantee a uniform set of standards and procedures on the conduct of suborbital activities. That can be problematic if one considers a number of factors specific to such activities: the already-mentioned variety of vehicles usable, the innovativeness of the technology involved, the potential presence of international passengers on board in case of crewed commercial flights and the eventual transition to an international means of transport.

All this requires the establishment of common rules that can ensure the safety of suborbital activities, wherever they may be put in place. For example, the certification of the vehicle in terms of aptness to launch or the ability of pilots and passengers to sustain this type of flights are aspects that need agreed international standards[638].

Finally, looking at the liability regime, the space treaties establish a State-based set of rules that does not fit well with damages caused by suborbital vehicles: the centrality of States as the subjects with active and passive legitimation of legal action is incompatible with an activity that is going to be performed mostly by private operators. Moreover, the principle of unlimited absolute liability for damages to third parties on the ground may appear excessive for a nascent industry, while the exclusions of liability for damages caused to persons involved in the suborbital flight as well as for nationals of the launching State are inadequate for an activity that is already open to the general public.

In light of all these considerations, the application of the regime of space law cannot be applied simply as it is.

In order to avoid the problems raised by the inadequacies of certain provisions of the space treaties, States can and should resort to corrective measures.

[638] In similar terms, see F. Von der Dunk, *Space Tourism, Private Spaceflight and the Law: Key Aspects*, in Space, Cyber, and Telecommunications Law Program Faculty Publications, Vol. 60, 2011, p. 148.

A first aspect where there is a need of correction is that of traffic management.

Irrespective of the legal qualification of suborbital vehicles, one may say that it is more convenient and more reasonable to attribute the control of their traffic in the air to aviation authorities, rather than to space authorities.

In fact, the innovative thing about suborbital operations is that they are not planned to remain just domestic activities in terms of trajectory, taking off from the spaceport of a certain State, reaching orbital altitude, and landing back where they departed. The most promising economic prospect of developing suborbital technologies is to create a new international way of transport for persons and cargo, also known as suborbital point-to-point flight[639]. This means that eventually suborbital vehicles will intentionally and frequently pass through the portion of the sky below 100 km going from the airspace of one State to the airspace of another, even if they reach orbital altitudes during the journey.

This is what makes suborbital flights unique compared to any other space object used in the past[640].

The presence of suborbital vehicles during their operations in airspace and the unsettled area above one or multiple States requires consideration of the repercussions of that presence on air traffic control.

In the regime of air law, States must provide air traffic services for the territories over which they have jurisdiction[641]. Air traffic services consist in air traffic control, flight information and alerting services, which together are used to prevent collisions between aircraft; prevent collisions between aircraft on the manoeuvring area and obstructions on that area; expedite and maintain an orderly flow of air traffic; provide advice and information useful for the safe and efficient conduct of flights; and notify appropriate organizations regarding aircraft in need of search and rescue aid, and assist such organizations as required[642].

Irrespective of the nature of suborbital vehicles, building upon the purpose of air traffic services, it is evident that the national authorities in charge of those services

[639] See D. Webber, *Point-to-point sub-orbital space tourism: Some initial considerations*, in Acta Astronautica, Vol. 66, No. 11, 2010, p. 1645.

[640] The only similar technological concept is that of intercontinental ballistic missiles, or ICBMs, but due to their purpose of exploding at their point of arrival and, more in general, due to their military character, they are not investigated in the present discourse.

[641] Chicago Convention, Article 37 and Annex 11.

[642] *Ibid.* See also here: https://applications.icao.int/postalhistory/annex_11_air_traffic_services.htm

have the obligation to ensure that also such vehicles do not impair the traffic in the air[643].

Moreover, at the time of writing, any argument in favour of giving the competence to space authorities would be hard to sustain: the development of 'space traffic management' is still at its embryonic phase, lacking agreed rules, lacking technological maturity, and most importantly lacking the actual infrastructural capabilities among spacefaring States.

It is therefore possible to conclude that the inevitable presence of suborbital vehicles in the air together with their upcoming internationalisation make it not only convenient, but also necessary for States to attribute the competence for their traffic control to national aviation authorities[644].

The idea of applying the regime of space law to suborbital vehicles but at the same time resorting to corrective measures has inspired also a recent proposal put forth by the International Law Association (ILA) in its Resolution 05 of 2024, containing the Rules on Non-orbital Spaceflight Activities[645].

The latter consists of a short document of seven articles, where concepts such as 'authorisation', 'registration' and 'liability' are reviewed in light of the specificities of suborbital activities. That is done, in particular, by making an express reference to rules contained in the regime of air law, namely in the Chicago Convention and its annexes.

Through such reference, a selected number of standards and principles applicable to aviation are transposed – as far as possible – to the field of space law for correcting the aspects of space law that are not well-suited to activities involving suborbital objects.

For example, Article 3 identifies the mandatory elements that a private operator has to submit to the "*appropriate State*" for obtaining its authorisation pursuant to Article VI of the OST. Among them, there is the proof of compliance with

[643] See N. Ozgur and others, *On Increasing Commercial Space Operations and Global Integrated Airspace Safety Governance*, in Journal of Space Law, Vol. 47, No. 1, 2023, p. 1.

[644] The same conclusion, corroborated by extensive technical arguments, is put forth by the Italian Civil Aviation Authority (ENAC), in the position paper authored by G. Di Antonio, *Towards the Integration of Higher Airspace Operations in the European ATM Network*, 2023**,** noting *inter alia* that in the USA, existing air traffic management resources are used to accommodate early operations.

[645] International Law Association (ILA), Resolution 05 of 28 June 2024 adopting the "Rules on Non-orbital Spaceflight Activities".

Annexes 6 and 16 of the Chicago Convention, respectively on the operation of aircraft[646] and on environmental protection[647].

Another example worth mentioning is Article 5 where the principle of State liability is complemented by the international liability of the operator for any personal injury or death of the crew or participants in the non-orbital spaceflight activity. In particular, it is established that such liability is regulated with reference to Articles 17 and 20 of the Montreal Convention on International Civil Aviation[648]. This means that the operator is recognised as internationally liable up to a certain cap, above which the State is called to compensate any exceeding costs.

In sum, thanks to the integration of some useful aspects of the regime of air law into the regime of space law, the ILA adopted an approach to the regulation of suborbital activities that can represent the key to providing a satisfactory and embraceable solution for the much needed legal clarity on suborbital operations[649].

While the ILA's approach is commendable, it is inevitably limited by the non-binding nature of its rules.

States which promote and invest in the development of national suborbital activities should consider the implementation of the ILA's rules in their national space laws.

However, some key aspects such as the necessary allocation of international liability upon the operator instead of the authorising State, with absolute liability up to a defined cap for damages to third persons and a fault-based liability with a reversed burden of proof for damages to passengers, crew and freights, cannot be simply stated domestically.

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[646] Annex 6 in particular addresses flight operations; performance operating limitations; aeroplane instruments, equipment and flight documents; aeroplane communication and navigation equipment; aeroplane maintenance; flight crew; flight operations officers/flight dispatchers; manuals, logs and records; cabin crew; security; lights to be displayed in the air and on the ground during operations; contents of an operations manual; and flight time and flight duty period limitations.

[647] Annex 16 provides standards and recommended practices on two main aspects of flying activities: aircraft noise and aircraft engine emissions.

[648] *Convention for the Unification of Certain Rules for International Carriage by Air*, 2242 UNTS 309, 4 November 2003.

[649] ILA's Resolution 05/2024 is also complemented by a commentary that further explains the *rationale* and applicability of each article, available at the following link: www.ila-hq.org/en_GB/documents/ila-draft-rules-on-suborbital-spaceflight-2024-06-03-complete-and-final-for-athens-1

Certain rules contained in ILA's Resolution 05/2024 depend on their adoption in an international treaty.

Therefore, while it is possible to see the correct way forward in the approach indicated by the ILA, namely a regulation based on space law integrated by elements of the aviation legal framework, that approach can be fully efficient only with the adoption of an international binding instrument on suborbital operations[650].

This should not be seen as a whole new regime detached from space law, but as an integration of the rules of space law already applicable to those space objects that perform suborbital space activities[651].

Until then, authorising States have to make sure that the private suborbital operations put in place under their jurisdiction are in conformity with the applicable international norms, knowing that – despite the uncertainty of the law – efforts such as the one of the ILA may be considered as indicative of the emergence of new standards for suborbital operations.

5.3. NEW DEFINITIONS: PRIVATE PAYING PASSENGERS

5.3.1. The concept of astronauts in space law

The concept of space object is not the only one that was put in crisis by new private space activities.

A similar condition was suffered by another pillar notion in the system of space law: the concept of astronaut.

In general terms, astronauts belong to a very unique group of people, which was traditionally selected among the most prepared members of a State's armed forces. Today, they are identified as persons operating in outer space in a professional capacity. In more legal terms, an astronaut can be considered as a citizen of a State, selected by a governmental entity or licensed by a public authority in accordance

[650] The idea of a new regime specific to suborbital operations has been analysed by: T. Masson-Zwaan, above at 593, p. 441. See also T. Masson-Zwaan and others, above at 596, p. 247.

[651] This means that COPUOS should be the one negotiating its adoption, if necessary in coordination with other international organisations such as ICAO.

with professional requirements for space flight activity, for design, testing and operation of space technology, for space research, as well as for the use of outer space and celestial bodies[652].

From this understanding, it follows that the distinguishing element of an astronaut is his or her professional requirements, professional selection, professional training, professional activity, and finally, the professional title it holds at the national level.

As some authors have summarised, astronauts are "*human beings traveling into outer space for professional reasons*"[653].

In even more precise terms, and to avoid confusing them with human beings travelling to outer space for any other possible professional reason, e.g. filming a movie, it should be added that they travel into outer space for professional reasons strictly related to the performance of space activities.

Because of their uniqueness and particular professional features, astronauts were made the object of a special regulation in the OST.

Article V thereof establishes in its first paragraph the legal status of astronauts: "*States Parties to the Treaty shall regard astronauts as envoys of mankind in outer space*"[654].

More questions than answers have traditionally resulted from the use of the expression 'envoys of mankind': what does it mean to be an envoy, not of a State, but of mankind? What legal implications are attached to the qualification of an astronaut as an envoy? Does the title of envoy confer international immunities or other privileges?

Already when the expression appeared in the 1963 Declaration, scholars commented: "*Presumably an 'envoy of mankind' can act as such only on behalf of mankind; he cannot therefore, in his capacity as an 'envoy of mankind', exercise the public authority of a particular State on its behalf, by any symbolical taking of possession as an assertion of a claim of sovereignty (in any case prohibited elsewhere in the Declaration) or in any similar way*"[655].

[652] See Y. Baturin, *The Astronaut's Legal Status*, in Advanced Space Law, Vol. 5, 2020, p. 6.
[653] F. Von der Dunk, *Article V*, in Cologne Commentary I, 2009, p. 96.
[654] OST, Article V, para. 1.
[655] W. Jenks, *Space Law*, Stevens London, 1965, p. 194.

The matter of immunities and privileges has also brought commentators to conclude that any assimilation with the status of envoys of States would be an unjustified extension of a specific title belonging to specific subjects of international diplomatic law[656].

Article V does not only obligate States Parties to regard astronauts as envoys of mankind, but it also adds two positive obligations of conduct that concern the treatment of astronauts: first, States must render assistance to astronauts in case of accidents; second, they must inform other States Parties of any phenomena in outer space which could constitute a danger to the life or health of astronauts[657].

The first obligation can be interpreted in analogy with the parallel obligation stemming from the field of maritime law.

In the latter's system, the duty to render assistance to mariners in distress has been authoritatively regarded as a "*manifestation of fundamental considerations of humanity*"[658].

The same *rationale* brought the drafters of the OST to include in Article V the obligation to assist astronauts in the event of accidents[659].

The analogy with the law of the sea is useful not only to understand the *rationale* of the norm, but also to identify the implications for States on ensuring compliance with that obligation.

In particular, according to Article 98(2) of UNCLOS, a specific legal effect is derived from the duty to render assistance to a person in distress at sea:

"*Every State shall promote the establishment, operation and maintenance of an adequate and effective search and rescue service regarding safety on and over the sea and, where circumstances so require, by way of mutual regional arrangements co-operate with neighbouring States for this purpose*".

Should a similar obligation be implied in Article V of the OST?

Despite the lack of an analogous provision in the OST, something similar has been envisaged in the Rescue and Return Agreement – which elaborates on Article V of the OST – for accidental landings in territories under the jurisdiction of a

[656] A. Cocca, *Prospective Space Law*, in Journal of Space Law, Vol. 26, No. 1, 1998, p. 54.

[657] OST, Article V, para. 1 and 3. Para. 2 establishes a duty of assistance for astronauts among themselves while they are in outer space.

[658] T. Heidar, *The Duty to Render Assistance at Sea under International Law*, in IFLOS Maritime Talks, 2018, p. 2, available at the following link: www.iflos.org/wp-content/uploads/Presenation-Tomas-Heidar-1.pdf

[659] See F. Von der Dunk, above at 653, p. 100.

Contracting Party, on the high seas, or in territories beyond the jurisdiction of any State[660].

Therefore, even though it would be farfetched to maintain that States Parties to the OST are obliged to have in place such Search and Rescue (SAR) mechanisms, it is nonetheless advisable for States to create them at the domestic level in order to ensure an effective procedure of assistance to astronauts in distress[661].

As for the obligation to inform other States Parties on dangerous phenomena in outer space, a first point of consideration is that the originator of the danger or an observer of the danger has to immediately notify all States through the UN of any danger it observes. In practice, the notification can come also from the State whose astronauts are in danger. For example, when the satellites of the US private company Starlink were at risk of collision with the Chinese Space Station putting in danger the astronauts on board, China notified the UN Secretary General in December 2021 pursuant to Article V[662].

This obligation must be considered a relative obligation, meaning that its compliance depends necessarily on the capabilities of each State to observe and discover phenomena in outer space. It should therefore be carefully taken into consideration by those States that have so-called space situational awareness technologies.

Having analysed the content of Article V, it must be underlined that its scope of application is limited only to astronauts.

However, astronauts are not the only category of humans who may travel to outer space.

5.3.2. A similar but different category: spacecraft personnel

[660] Rescue and Return Agreement, Articles 1-4.

[661] Advocating for the importance of SAR systems related to space activities, see: International Association for the Advancement of Space Safety, *Need for international cooperation and collaboration for safe and sustainable Moon operations*, 2023, available at the link: www.unoosa.org/documents/pdf/copuos/stsc/2023/TPs/wednesday-8feb-pm/Item_12_-_IAASS.pdf
See also: G. Kyriakopoulos, *Search and rescue in space activities: is there a specific legal regime?*,in Proceedings of the 6th IAASS Conference: 'Safety is Not an Option', 2013, p. 715.

[662] UN Doc. A/AC.105/1262 of 6 December 2021, titled 'Notification by China under Article V of the Outer Space Treaty concerning preventive collision avoidance between the China Space Station (international designation 2021-035A) and United States' Starlink-1095 (international designation 2020-001BK) and Starlink-2305 (international designation 2021-024N) satellites'.

The drafters of the OST individuated another group of humans which they envisaged as possible 'space travellers': the personnel of a spacecraft.

This category was first included in the system of space law by an express mention in Article VIII of the OST, which has been discussed widely in the present work in relation to the jurisdiction and control of States over space objects. It can be added here that the same provision includes under its purview not only objects registered domestically, but also "*personnel thereof*"[663].

In other words, the drafters of the OST created this other category for the purpose of ensuring a jurisdictional link between the State of national registry of a space object and the personnel on board of it[664].

As the two expressions – astronauts and personnel – are used in different provisions with different legal implications they must be defined in different terms.

The generally accepted view is that the concept of 'astronauts' is narrower than the concept of 'personnel'[665].

But how wide is the latter? Does it include all humans going to outer space?

In its ordinary meaning, the word "*personnel*" refers to someone employed as a member of an organisation.

Thus, the distinctive element here is the 'employment', which implies a relationship between the personnel and an organisation which pays for its service.

It follows that in the context of space activities, the drafters of the space treaties used the expression "*personnel of a spacecraft*"[666] to include persons that the organisation in charge of the space flight could decide to put on board of the spacecraft with a different role compared to professional astronauts: for example, a scientist, a doctor or a space flight attendant.

These are all possible subjects that could fit in the notion of "*personnel*".

Legally, they benefit from a regime which resembles that of astronauts, but that does not completely overlap with the latter.

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[663] OST, Article VIII.

[664] See B. Schmidt-Tedd, above at 303, p. 157.

[665] See S. Gorove, *Legal Problems of the Rescue and Return of Astronauts*, in International Lawyer, Vol. 3, No. 4, 1969, p. 898.

[666] This is the formulation used in the Rescue and Return Agreement, while the OST (Article VIII) and the Liability Convention (Article II) use the expression 'personnel thereof', referring to space objects instead of spacecraft.

More specifically, the legal status of "*envoys of mankind*" must be considered as a prerogative of astronauts only, due to its *rationale*.
The other two obligations of Article V can be interpreted extensively.
In fact, there is no reasonable justification why the personnel of a spacecraft should not be assisted if they suffer an accident and why phenomena in outer space putting them in danger should not be notified.
In any case, in the spirit of expressly providing the necessary levels of protection to spacecraft personnel, States have created a specific set of obligations on this regard in the Rescue and Return Agreement.
As mentioned above, the latter elaborated the obligations of Article V of the OST into a comprehensive system of duties of notification, rescue, assistance and return in cases of accident, distress, emergency or unintended landing.
Even if the full title of the agreement refers to "*astronauts*", the provisions thereof speak of "*personnel of a spacecraft*".
Therefore, it is possible to conclude that both astronauts and spacecraft personnel – despite their definitional and regulatory differences – are ensured a regime of protection while they embark in space travels.
Interestingly, this regime reflects the main concern that, during the Cold War, States had on humans flying into outer space: assuring their rescue and repatriation wherever they may land, even if in the territory of the enemy.
For as important as that may still be today, it does not represent anymore the only nor the most important concern of contemporary human spaceflight. In fact, new legal needs – untouched by the space treaties – have emerged as a result of a novel category of persons going to outer space: private paying passengers.

5.3.3. Finding a definition of private paying passengers

In the absence of an official definition of this category in international law, the notion of 'private paying passenger' can only be obtained *a contrario*, in contraposition with the two classes of human space travellers envisioned in the space treaties, namely astronauts and spacecraft personnel.
Two distinctive elements define the latter: respectively, their profession and their employment by the organisation in charge of the spacecraft.

Therefore, a private paying passenger can be seen as someone who is going to outer space non-professionally, without being employed within said organisation, and paying for the service of space transportation[667].

There have been already some concrete examples of private paying passengers.

The International Space Station (ISS) has seen a considerable number of wealthy private citizens going there for several days, starting with the American Dennis Tito in 2001[668].

Their type of spaceflight is similar to a trip to a hotel, where they orbit for days on board the ISS.

Others have chosen a different type, the one offered by suborbital companies[669]. Since 2021, the possibility of going to outer space on board a suborbital vehicle and, just like a tourist on a safari, experience for a brief period of time (usually just a few minutes) what it feels like to be in outer space, has been opened to the general public, even if it is not yet a regular thing[670].

Another prospect is the one offered by companies such as SpaceX or Axiom Space, which allow private paying passengers to go on orbital flights on board of a space capsule[671]. That means carrying them around outer space for several days remaining inside the capsule for the whole time of the trip; something similar to a cruise[672]. The prospect is to expand that market to long distance journeys around the Moon and potentially beyond.

Next to these spaceflight experiences, which have already happened, there are new ones that are being developed for the future.

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[667] Building upon these features, the only State who is at the moment actively dealing with actual activities involving private paying passengers – namely the USA – has coined the term: "*spaceflight participant*", as opposed to "*crew members*". See US Code of Federal Regulations, Title 14 – Aeronautics and Space, Part 460 – Human Space Flight Requirements. See S. Freeland, above at 593, p. 9.

[668] See F. Von der Dunk, above at 638, p. 147. A list of station visitors – including so-called space flight participants – is available at the link: www.nasa.gov/international-space-station/space-station-visitors-by-country/

[669] See the flying opportunities offered by companies such as Virgin Galactic or Blue Origin.

[670] See the comprehensive recollection of suborbital tourism experiences reported and analysed in: B. Musselman and others, *Point-to-point suborbital space tourism motivation and willingness to fly*, Annals of Tourism Research Empirical Insights, Vol. 5, 2024, p. 1.

[671] For more information see respectively here: www.spacex.com/humanspaceflight/; and here: www.axiomspace.com/human-spaceflight.

[672] This has been done, most recently, with the mission Polaris Dawn in September 2024 during which the passengers on board were given the opportunity to conduct extra-vehicular activities.

The most futuristic ones are space hotels, either as stations placed in orbit around Earth or as fixed facilities built on the Moon[673].

In view of the current situation and prospective developments of flights with private paying passengers in outer space, a review of the traditional idea of human spaceflight is necessary, starting from the rules applicable to it.

It is clear that private companies offering this kind of opportunities are not acting in a complete legal vacuum from the perspective of international space law.

In fact, for as innovative as it can look, flying private paying passengers is nothing more than an "*activity in outer space*". Hence, it falls under the scope of application of space activities, starting from Article VI of the OST, meaning that the "*appropriate State*" must authorise and supervise it.

Moreover, since a space object is used to carry such passengers in outer space all the norms on space objects apply to the vehicles that carry them beyond the atmosphere as well.

But despite these general applicable rules, the presence of private paying passengers in outer space requires to rethink the scope of application of the rules applicable to humans in outer space according to the space treaties.

Although it is certain that a private paying passenger is neither an astronaut nor spacecraft personnel, some of the rules applicable to them may apply nonetheless also to it.

Starting with the regime of assistance in case of adverse events (i.e. Article V of the OST and Articles 1-4 of the Rescue and Return Agreement), a restrictive interpretation of its scope of application would be inconsistent with the *rationale* of the regime itself.

In fact, the express reference only to the two categories of astronauts and spacecraft personnel is a mere contingency of the time, as there were no other humans going to outer space when the regime was drafted.

However, its *rationale* goes beyond the mere qualification as either one of the two categories contemplated therein. Behind it, there were considerations of safety and cooperation among States, which have nothing to do with being an astronaut or spacecraft personnel.

[673] See A. Jones, *Looking ahead to the next 25 years of private space stations*, published online on Space.com, 2024, available at the link: www.space.com/commercial-space-stations-next-25-years.

That is evident in the preamble of the Rescue and Return Agreement which states that the regime established therein was "*prompted by sentiments of humanity*"[674]. After all, if this were not the case, its provisions would only extend to some of those on board a space tourism flight – for example the crew – but not the paying passengers[675].

It follows that the whole set of rules on the assistance of humans in outer space can only be interpreted as applying to all persons involved in a flight in outer space.

A similar argument can be followed with regard to Article VIII of the OST.

The jurisdictional link between a State on whose registry a space object is carried and the personnel thereof was not meant to be limited to a certain category of humans in outer space. To the contrary, the expression "*personnel thereof*" was meant to allow the widest possible scope of application of the norm for the time when it was drafted, being the larger category compared to astronauts.

Now that the categories of humans in outer space have expanded, the norm on the jurisdiction of a State on the personnel of a spacecraft must be interpreted as applying in analogy to all humans going to outer space. That is because the *rationale* of the norm is to guarantee the existence of State jurisdiction in a quasi-territorial manner on objects launched in outer space. Therefore, limiting this guarantee to the personnel would mean that personal jurisdiction applied to private paying passengers, creating an inconsistent and confusing overlap of jurisdiction on board the same object. For all these reasons, also Article VIII of the OST must apply to private paying passengers while they are on board of a space object.

That said, it is possible to conclude that the norms of the space treaties on State jurisdiction and on the international measures of assistance apply analogically to the once unforeseen category of private paying passengers.

But is that sufficient for ensuring the proper international regulation of the latter?

5.3.4. The safety of private paying passengers

[674] Rescue and Return Agreement, Preamble.

[675] S. Freeland., *Up, up and...Back: The Emergence of Space Tourism and Its Impact on the International Law of Outer Space*, in Chicago Journal of International Law, Vol. 6, No. 1, 2005, p. 10.

There are two main concerns that are raised by the presence of private paying passengers on board a space object: 1) their safety; 2) their right to compensation in case of damages.

The first looks at how States licence non-governmental entities that offer space such spaceflight services pursuant to Article VI of the OST.

More specifically, the concern derives from the lack of international norms on the safety of humans in outer space. In other words, there are no agreed norms that can serve as a standard against which the conformity of the authorisation issued by a State is assessable.

At the moment, the flying of private paying passengers is concretely performed only in the USA and it is under a so-called "*learning period*", which has been extended to October 2031[676].

That means that according to the USA, although private paying passengers can already be launched in outer space, the human spaceflight industry is still not robust enough to be the object of strict safety standards and therefore the regulation imposes on licensees to openly declare that the Government has not certified the launch vehicle as safe[677].

The idea behind this approach is that only once private commercial spaceflight will be considered a mature industry, it will become appropriate to start developing statutory and mandatory approaches to safety certification[678].

Nonetheless, the US legislation envisages some initial safety requirements, such as the need for licence applicants to submit evidence of medical examinations on the persons participating in the flight; evidence of specific training imparted on them; and general security and safety requirements on the vehicle and crew[679].

All this represents a possible term of comparison for evaluating the licences eventually issued by other States.

Another possible source to take into consideration – even if more relevant for spacecraft personnel than private paying passengers – is the 'Principles Regarding Processes and Criteria for Selection, Assignment, Training and Certification of

[676] US Congressional Research Service, *Commercial Human Spaceflight Safety Regulations*, published on 12 March 2024, available at the link: https://crsreports.congress.gov/product/pdf/IF/IF12508

[677] US Code, Title 14, § 460.45, - Operator informing space flight participant of risk, para. (b).

[678] F. Von der Dunk, *The Regulation of Space Tourism*, in Space Tourism: The Elusive Dream (ed. by E. Cohen), Emerald Publishing, 2019, p. 291.

[679] US Code of Federal Regulations, Title 51 – National and Commercial Space Programs, para. 50905 - License applications and requirements, para. (b) and (c).

ISS (Expedition and Visiting) Crewmembers' (ISS Crew Principles) of November 2001, which provide general guidelines for selection, medical requirements, behavioural suitability, assignment and training of ISS crewmembers and defines certain criteria with regard to the certification of crew flight readiness[680].

The US legislation and the ISS Crew Principles contain the only norms that may be used as standards to determine the conformity of an authorisation issued by another State for activities involving private paying passengers.

It is evident how this is an unsatisfactory condition for the international protection of humans in outer space.

Therefore, as the market of private paying passengers grows, the international community is going to have to fill this normative gap providing a set of rules on the requirements necessary to assure their safety.

Until then, States are free to implement Article VI of the OST with regard to human spaceflight as they see fit, deciding autonomously the requirements necessary to authorise the presence of private paying passengers in outer space[681].

That comes with a risk: it may induce a race to the bottom in terms of safety measures, until the first tragedy will occur and – as it is often the case – the international community will respond with a regulatory intervention to prevent it from happening again.

5.3.5. The compensation of private paying passengers

As for the second concern, the right to compensation for damages suffered by private paying passengers on board of a space object finds several obstacles in the current regime of space law[682].

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[680] ISS Multilateral Crew Operations Panel, *Principles Regarding Processes and Criteria for Selection, Assignment, Training and Certification of ISS (Expedition and Visiting) Crewmembers*, 2001. See also A. Martin and others, *A Round Trip to the Stars?: Considerations for the Regulation of Space Tourism*, in Air & Space Law, Vol. 47, No. 2, 2022, p. 279.

[681] For a critical analysis of the use of 'informed consent' as a solution see: S. Hobe and others, *Legal aspects of human orbital and suborbital spaceflight: Some legal, medical and ethical considerations*, in REACH - Reviews in Human Space Exploration, Vol. 7, 2017, p. 1

[682] The issues raised by the liability towards private paying passengers leaves out of the analysis the so-called third-party liability, meaning the duty to compensate damages caused both in outer space and on Earth to persons or property not involved in the activity. This type of liability is regulated by the Liability Convention, which applies irrespective of the activity performed with the space object.
Since it regards space objects in general, without any specific peculiarity linked to the fact that tourism are inside it, it is not discussed any further.

The Liability Convention does not apply to "*nationals of the launching State*" and to "*foreign nationals during such time as they are participating in the operation of that space object from the time of its launching or at any stage thereafter until its descent*"[683].

This means that private paying passengers launched in outer space do not have the right to be compensated on the basis of the Liability Convention.

The *rationale* of the exclusion is that space activities are considered ultra-hazardous and therefore if a person decides to embark in a spaceflight and be exposed to the hazards of space activities, it cannot then claim compensation for the damages suffered as a consequence of its own voluntary decision[684].

This exclusion of the liability of the launching State – and/or of the "*appropriate State*" as discussed in Chapter IV – is not to be regarded as misconceived.

In fact, the liability of States is less acceptable in an era of purely private space transportation[685].

The crucial point, however, is that Article VII of the Liability Convention regards only claims between States on the basis of such convention.

It does not apply to the relationship between the passenger and the operator of the spacecraft. This aspect, called second-party liability, is not touched by any rule at the international level.

Therefore, the only applicable legal framework at the moment is the one established at the national level, together with the contract of service signed between the operator and the passenger.

As mentioned above, States that started to regulate the matter – such as the USA – have resorted to the principle of 'informed consent', which requires the licensee to allow individuals to take part in a spaceflight activity only if they signified their consent to accept the risks involved in such activity[686].

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[683] Liability Convention, Article VII.

[684] L. Smith and others, *Article VII (No Application to Nationals and Foreign Participants in Launching State(s)) LIAB*, in Cologne Commentary II, p. 152.

[685] See S. Hobe, *Legal Aspects of Space Tourism*, in Nebraska Law Review, vol. 86, no. 2, 2007, p. 450.

[686] See the UK Space Industry Act of 2018, Section 17. See also the US Code of Federal Regulations, Title 51 – National and Commercial Space Programs, para. 50905, lett. (b)(5). The regulatory approach based on 'informed consent' is a temporary solution in the USA, which however has been extended periodically. Lastly, on 7 December 2024 the so-called 'Servicemember Quality of Life Improvement and National Defense Authorization Act for Fiscal Year 2025', Sec. 5702, extended its application until 1 January 2028.

With that, the private paying passenger stipulates that they want to participate in the hazardous spaceflight at their own risk and waives the licensee from any liability[687].

Despite the fact that humans have been going to outer space since the time of Yuri Gagarin's first flight in 1961, the concept of human spaceflight is still at an early stage of development, especially if one considers the innovative vehicles used by the private industry. It is therefore understandable why national regulators used a light regulatory touch on liability, favouring the industry rather than the users.

However, with the number of private paying passengers growing, with the frequency of flights increasing, and with the elements of internationality expanding, it won't be long before the matter of the licensee's liability will become a concrete problem of international space law.

The possible regulatory solutions have to be created *ex novo* as they cannot be based on the text of the space treaties. But they can be inspired by other fields of international law that have dealt with a similar problem in the past, namely maritime law and aviation law.

Both regimes are based on the carrier's liability.

In maritime law, the Athens Convention of 1974 establishes an inversed burden of proof in favour of the passengers through a twofold liability system: one for damage sustained by passengers as a result of an individual accident and one for damage arising from a shipping incident, such as shipwreck, capsizing, collision, stranding, explosion, fire, or a defect in the ship[688].

In cases where personal injury is caused by an individual accident, the carrier is subject to fault-based liability, with the burden of proof resting on the passenger[689]. This allocation of liability is premised on the limited control the carrier exercises over the passenger's movement on board the vessel, given the passenger's relative freedom of movement[690].

Similarly, if passengers suffer damage to their luggage due to an individual incident, the carrier bears strict liability for non-cabin luggage and fault-based

[687] See T. Masson-Zwaan, above at 593, p. 439.
[688] *Athens Convention relating to the Carriage of Passengers and their Luggage by Sea (Athens Convention)*, 1463 UNTS 19, 1987 as amended by the Athens Protocol of 2002.
[689] *Ibid.* Article 3.
[690] N. Giannakou, *From Yachts to Spacecraft: Legal aspects of space tourism ventures in comparison with the legal regime governing marine tourism*, in Acta Astronautica, Vol. 219, 2024, p. 392.

liability for cabin luggage, depending on the degree of supervision the carrier exercises over different categories of luggage during transportation[691].

Conversely, in the event of a shipping incident, any damage to persons or property aboard the ship is attributed to the carrier's absolute liability, from which the carrier cannot be exempted up to a certain limit[692].

This reflects the principle that a shipping incident, which typically causes widespread damage to most passengers, is logically attributed to the carrier's failure to control the ship[693].

As for aviation law, the regime of air carrier liability was initially established in 1929 in the Warsaw Convention [694] and then reviewed in the Montreal Convention[695] in 1999.

In the early days, aviation was considered to be a new industry which necessitated protection of the market entrants, leading to a system of limited liability[696]. When the industry matured, the Montreal Convention changed the applicable regime, establishing a system of unlimited liability for carriers in cases of passenger's injury or death and a system of limited liability if the damage was not due to negligence or other wrongful act or omission of the carrier, its servants or agents, or if it was solely due to the negligence or other wrongful act or omission of a third party[697].

Both the maritime and the aviation regimes envisage the requirement of compulsory insurance of the carrier as it ensures that claimants are sufficiently protected against its bankruptcy or similar situations, allowing them to effectively enforce their rights[698].

Building upon the norms described above, it is possible to imagine a similar regime becoming a reality also for private paying passengers in spaceflights.

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[691] Athens Convention, Article 3.
[692] *Ibid.*
[693] See N. Giannakou, above at 690, p. 392.
[694] *Convention for the Unification of certain Rules relating to International Carriage by Air (with Additional Protocol)*, 137 LNTS 11, 1933.
[695] *Convention for the Unification of Certain Rules for International Carriage by Air* (Montreal Convention), 2242 UNTS 309, 2003.
[696] T. Masson-Zwaan, above at 593, p. 428.
[697] Montreal Convention, Article 17 and 20.
[698] For the maritime regime, see article 4bis of the Athens Convention, establishing a mandatory insurance requirement for ships licensed to carry more than twelve passengers on board; as for air carriers, States shall require them to maintain adequate insurance covering their liability. In the EU, the mandatory insurance requirements for air carriers and aircraft operators is the object of a specific regulation, namely Regulation (EC) n. 785/2004 of the European Parliament and of the Council.

Following the evolution of air carrier's liability, the initial regime may include a limited liability of the spacecraft operator for damages to passengers on board.

The most appropriate standard of liability is that of fault, considering the hazardous nature of the activity itself. However, it should be based on a reversed burden of proof imposing on the licensee to demonstrate that it acted with the diligence necessary to avoid the occurrence of damage (see Chapter IV, Section 4.4).

In addition, the principle of compulsory insurance is also a useful norm to transpose in a space law regime.

In conclusion, the emergence of a new category of space traveller, called private paying passenger, poses new legal issues to the international community.

Some of them, such as the rules on their assistance, can be compensated by an extensive interpretation of the norms of the space treaties envisaged for astronauts and spacecraft personnel.

Some others, such as the safety measures and second-party liability regime, are simply not contemplated in the system of the space treaties.

Leaving these matters to the domestic regulation of each State is a dangerous approach which brings with it two main risks: a race to the bottom for the purpose of attracting investments, and the creation of a patchwork of national regimes which may leave victims of damages without legal protection.

Thus, it is necessary to advocate the negotiation of measures on both matters at the international level, aiming at the creation of a regime on private paying passengers, built upon the rules already in place in similar fields of international law.

5.4. NEW ACTIVITIES: IN-ORBIT SERVICES

The matters discussed in the previous Sections analysed how certain traditional concepts of space law – such as outer space, space object, and spacecraft personnel – were challenged by the emergence of new elements linked to private 'new space', i.e. suborbital vehicles, space waste and private paying passengers.

In the present and next sections, the discourse moves from single concepts to entire new private space activities, looking at how they are challenging the system of rights and obligations contained in the space treaties.

More specifically, the present section delves into the realm of in-orbit services (IOS) while the next one takes into consideration private lunar activities.

The expression in-orbit servicing refers to a wide range of space activities characterised by their 'relative nature', meaning that they exist because another space object requires them and so they are activities put in place in relation to another object.

In general, they include non-contact support, orbit modification (relocation) and maintenance, refuelling and commodities replenishment, upgrade, repair, and debris remediation[699].

The idea behind them is to render outer space more sustainable and profitable, extending the life of satellites in orbit and removing them from outer space once they become nothing more than a risk to other users. In sum, in-orbit services represent the way to achieve a circular economy of space activities, where only irrecoverable space objects are disposed.

In the past, States have put in place a few in-orbit servicing operations to their own space objects. For example, in the 1980s, the American Skylab station and Solar Maximum Mission (SMM) received the first on-orbit repairs to fix some of their components necessary to complete their mission in outer space[700].

The Hubble Space Telescope was serviced five times between 1993 and 2009 to replace limited-life items such as batteries, gyroscopes and electronic boxes, and to install state-of-the-art science instruments, leaving it each time as a more capable and more productive space observatory[701].

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[699] See European Space Policy Institute (ESPI), *On-orbit servicing, assembly, and manufacturing - Full Report 87*, ESPI Report, 2023, p. 6. See also J. Davis and others, *On-Orbit Servicing: Inspection, Repair, Refuel, Upgrade, and Assembly of Satellites in Space*, published online on the Aerospace Center for Space Policy and Strategy, 2019, p. 2, available at the following link: https://csps.aerospace.org/sites/default/files/2021-08/Davis-Mayberry-Penn_OOS_04242019.pdf

[700] See respectively, B. Craddock, *Saving Skylab*, 2023, available at the following link: https://airandspace.si.edu/stories/editorial/saving-skylab, and J. Uri, *40 Years Ago: STS-41C, the Solar Max Repair Mission*, 2024, available at the following link: www.nasa.gov/history/40-years-ago-sts-41c-the-solar-max-repair-mission/.

[701] For more information consult Hubble website at the following link: https://hubblesite.org/mission-and-telescope/servicing-missions.

More recently, the Defense Advanced Research Projects Agency (DARPA) demonstrated with its spacecraft called 'Orbital Express' a full end-to-end robotic satellite servicing mission that included autonomous docking, fuel transfer, and orbital relocation, essentially removing humans from the equation[702].

While these in-orbit activities have been performed by governmental agencies – with NASA being the most prolific developer and user of the technology – the commercial space sector is beginning to move toward the creation of a market of in-orbit servicing[703]. The difference from the past is that private actors are investing in the activities mentioned above with the aim of transforming them into a proper service that can be acquired from an operator on the market.

At the present stage, it is still possible to see the main interest for this business coming from governments which are expected to be the initial customers of in-orbit services and which are supporting their development with public funds[704].

However, a case of business-to-business contract for in-orbit servicing can be found in the agreement between the American company Orbit Fab and the Japanese company Astroscale to enable the latter to dock its own LEXI satellite servicer to Orbit Fab's fuel depot in order to be refuelled[705]. Orbit Fab's device is expected to be installed into the LEXI servicer to ensure that refuelling is possible. Orbit Fab also signed a partnership with the Swiss company Clear Space to equip Clear Space's debris-removing satellites with Orbit Fab's in-orbit refuelling interface[706].

This trend indicates that the market is quickly expanding.

As of 2024, most companies are still in the research and development phase of their business concepts, with some exceptions already in the demonstration phase[707]. Overall, it is therefore likely that the private business of in-orbit services will require some years before it becomes an ordinary reality of space activities.

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[702] See J. Davis and others, above at 699, p. 2. Another notable example is the Mission Extension Vehicle of the company Northrop Grumman, with two ongoing commercial missions called MEV-1 and MEV-2, as reported at the following link: https://cdn.northropgrumman.com/-/media/wp-content/uploads/Mission-Extension-Vehicle-MEV-fact-sheet.pdf?v=1.0.0.

[703] Some of the most notable companies in the sector include Astroscale, ClearSpace, Orbit Fab, Space Machine Company, Thales Alenia Space.

[704] See ESPI, above at 699, p. 1.

[705] For more information consult Astroscale's website at the following link: https://astroscale.com/astroscale-u-s-and-orbit-fab-sign-first-on-orbit-satellite-fuel-sale-agreement/

[706] For more information consult Clear Space's website at the link: https://clearspace.today/clearspace-orbit-fab-partnership/

[707] ESPI, above at 699, p. 8.

The reason is commonly associated with the technological complexities of orbital servicing missions, which require reaching another space object going at orbital speed in space; interacting with it despite its possible non-cooperating nature; and finally successfully performing the required service without damaging either of the two space objects involved or the ones of third parties.

The inherent difficulty of all this is evident.

However, there is also another aspect of in-orbit services which – if left unsolved – is going to block any possibility for the market to take off: the identification of the applicable regime[708].

In order to understand the legal problems raised by in-orbit services, it is useful to make a distinction between two phases of servicing operations:

1) a preparatory one, during which the servicing operator and the serviced client collect all the governmental authorisations necessary to put in place the activity;

2) an operational one, during which the actual in-orbit service is performed in outer space.

The first phase raises problems associated with matters of jurisdiction and consent.

The second phase is problematic for the purpose of allocating State responsibility and liability.

Providing a solution to the challenges posed by both phases is a necessary step to remove any legal barrier and to ensure an effective and clear application of the system of space law to this emerging private business.

5.4.1. The preparatory phase: jurisdiction and consent

Not all in-orbit services raise problems of international space law in the preparatory phase.

In fact, a servicing operation may be completely national, meaning that the target/serviced object and the servicing object are both under the jurisdiction of the same State. In such cases, any legal challenge of the preparatory phase is

[708] The conduct of IOS, especially in case of ADR operations, raises also concerns in terms of security, as the same technology can be used also for hostile purposes to adversely interfere with other space objects, but as this aspect is more closely related to political consideration is not further addressed here. For an analysis of the matter, see: A. Handmer and others, above at 549, p. 400.

solved at the domestic level and any issue of international space law may only be connected to the operational phase if things go wrong, as shown below at 5.4.2.

Thus, the present discourse deals only with international in-orbit services, where the two objects involved in the operation are under the jurisdiction of two different States.

Having clarified that, the main problem for a private in-orbit service provider and for the State authorising its operation is to know that the service can be performed without violating another State's jurisdiction over the target object.

Consider a fictional example where State A is the "*appropriate State*" of Company A.

Company A offers in-orbit services and has found a customer in Company B.

The latter needs refuelling for its space object, controlled from a place under the jurisdiction of State B, its "*appropriate State*".

In order to perform the space activity consisting in the servicing operation agreed with Company B, Company A needs firstly to be authorised by State A in accordance with Article VI of the OST.

Besides the specific complexities of the operation, taking into account that a refuelling operation (as any other in-orbit service) involves interacting with a foreign space object, it is legally fundamental to include among the authorisation requirements – as a *condition sine qua non* – the obtainment of consent from State B[709].

There are three possible ways for Company A to obtain such consent:

1) submitting a request directly to State B's authorities;

2) letting Company B handle the procedure domestically and then sending the letter of consent to Company A or State A's authorities;

3) activating the diplomatic channels between the two States.

If consent is not obtained, an authorisation given to Company A's activity would amount to a violation of State B's jurisdiction and to the international responsibility of State A.

Thus, from the perspective of State A the main legal concern is to obtain the other State's consent.

[709] The requirement of prior consent has been included, for example, by Japan in its national *Guidelines on a License to Operate a Spacecraft Performing On-Orbit Servicing*, adopted on 10 November 2021. See, in particular, Section 4.1.1, titled 'Confirmation of title to the client object'.

From the perspective of State B, it is a matter of deciding on giving that consent.

Despite the silence of the space treaties on the matter, the idea of having to obtain a foreign State's 'consent' before putting in place activities in that State's territory is a common principle in international law: 'consent' is generally required when the acts or omissions of an entity are performed in a place or on an object under the jurisdiction of a foreign State[710].

It is an expression of the latter's position of power over the object of the activity. Thus, even if not explicitly provided in a treaty provision, 'consent' can be regarded as an inherent right connected to the power of jurisdiction. In fact, without 'consent' the same activity would amount to a wrongful act[711].

There are treaties that expressly regulate 'consent', giving guidance also on the manner in which it can be given.

For example, Article 246 of UNCLOS requires States to obtain the consent of the coastal State for performing marine scientific research in its exclusive economic zone and on its continental shelf[712]. Furthermore, the same provision establishes that coastal States "*shall, in normal circumstances, grant their consent for marine scientific research projects*" of other entities when they are compliant with UNCLOS, peaceful and aimed at increasing scientific knowledge for the benefit of all mankind[713].

It also adds that "*coastal States shall establish rules and procedures ensuring that such consent will not be delayed or denied unreasonably*"[714]. Finally, it sets out a list of conditions on when a coastal State can withhold its consent[715].

While it is unlikely to see anything similar in the near future at the level of binding treaty provision in the field of space law, it is advisable to consider the inclusion of analogous norms in national space laws for the purpose of transparency and eventually in soft law measures for the purpose of setting a harmonised international standard on State's consent for in-orbit services.

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[710] See A. Orakhelashvili, *Governmental Activities on Foreign Territory*, in Max Planck Encyclopaedia of Public International Law, 2021, para. 7.
[711] ARSIWA, Article 20.
[712] Maritime law envisages also other instances where consent is required, such as in case of operations involving the repairing of submarine cables and pipelines therein, or in case of enforcement operations on board of foreign vessels.
[713] UNCLOS, Article 246, para. 3
[714] *Ibid.*
[715] *Ibid.*, para. 5.

Even though ‘consent’ is not regulated in the space treaties, there is a provision of the OST that can provide the ground for attributing importance to it in the context of private in-orbit services: Article VI of the OST.

When an “*appropriate State*” is consenting to an orbital service over a space object controlled from a place under its jurisdiction, it is demonstrating a form of supervision over the activity of the non-governmental entity that purchased that service. In fact, ‘consent’ implies a preliminary review of the operation consented. Thus, the procedure and the manner in which it is given can represent evidence of a diligent implementation of the duty of supervision.

For that reason, it is important for States to include in their national space laws a clear regulation of consent in case of foreign orbital servicing operations. With that, States can obtain two benefits: its authorised private space companies are eased in the conclusion of in-orbit services contracts with foreign providers which can rely on a transparent regime on consent; and, at the same time, States themselves may be released from potential international responsibilities based on Article VI of the OST thanks to the evidence of a proper procedure of review on the servicing operation before their consent was given.

To conclude the analysis of the preliminary phase, one last consideration is important.

Everything that has been said so far is applicable to cases where the serviced space object remains in orbit, meaning that it simply receives refuelling, or maintenance, or upgrading, and then continues to conduct its space activity under the same legal regime as before.

However, what happens if the serviced object is ‘waste’ and the foreign in-orbit service consists in removing it from orbit?

When an object is categorised as waste, it is not always possible to trace it back to the jurisdiction of a particular State, either because it is just a piece of an unknown space object or because it has no marks or orbital data history that allow to understand which State had jurisdiction on it before it became waste.

In both instances, lacking a State that can express its consent, the in-orbit service provider can proceed with its activity based only on the authorisation of its own “*appropriate State*”.

In any case, for the purpose of avoiding miscalculations or incidents in the assessment of the apparent lack of jurisdiction, a good practice can be to replace

at the national level the requirement of 'consent' with a condition enhancing transparency. More specifically, an advisable practice would be to impose a stand-still period before the authorised private actor proceeds with the orbital service, starting from the moment when the "*appropriate State*" has submitted a notice of the planned operation at the international level based on Resolution 1721 B of 1961.

That said, it is quite unlikely for a State to authorise a waste removal operation of an unknown waste.

Considering the technological complexities of in-orbit services and the lack of an entity rewarding the operator for it, there are no incentives to perform the removal. By authorising it, the "*appropriate State*" would only expose itself to the responsibilities and liabilities that may arise from an accident during the course of the operation.

The only imaginable case where a State may have an interest to authorise – or even autonomously proceed – with a removal of foreign waste is in front of a state of necessity, such as when the targeted waste is posing a concrete risk of collision with an asset of the authorising State.

Things change, however, when the object categorised as waste is under the jurisdiction of a known State.

In that case, 'consent' is once again necessary.

Moreover, the State with jurisdiction over an orbital waste is incentivised to give its consent to and pay a foreign in-orbit service provider since the latter can eliminate the possibility that such waste causes damages, triggering that State's international liability.

Thus, 'consent' represents the key aspect of the regulation of private in-orbit services. Its regulation can be left to national space legislators, as they are the ones that need to define under which conditions and following which procedure they are going to give their consent to foreign orbital services.

Nonetheless, it is in the interest of creating an international market that States should start negotiating the terms of an international procedure of consent, similar to the one currently in place for marine scientific research under Article 246 of UNCLOS.

With a transparent and harmonised regime on the national requirements for authorisation and consent, the preliminary phase of orbital servicing operations

can become an enhancer of the circular space economy, benefitting both States and private operators.

But the legal solutions discussed so far do not solve all the problems raised by in-orbit services as the most troublesome ones are in the operational phase.

5.4.2. The operational phase: responsibility and liability

Once the two parties of an international in-orbit service agreement – in the example above: Company A and Company B – have obtained the necessary authorisations and permissions from the relevant governmental authorities, the actual service can be performed.

As was mentioned above, all orbital servicing operations are risky; they require advanced technological capabilities and, consequently, the chances of mistakes are knowingly high.

Hence, the question: what legal consequences derive from in-orbit services that fail?

Always, when orbital servicing goes wrong legal repercussions arise at the international level.

Leaving aside any matter related to the contractual agreement between the two international parties of the servicing operation, the State that authorised the orbital service and the State that consented to its performance – respectively, State A and State B in the example above – may have a cause of action against each other on grounds of international responsibility or liability.

Thus, the first issues of international nature that may arise from failed orbital services are between the two States that allowed them.

If every time an orbital servicing operation is allowed, there was a risk of reciprocal claims between the States behind it, then authorisation and consent would become quite rare.

That is why a solution has been found in so-called waivers of claims.

With them, States renounce to claims of responsibility or liability against each other in relation to the servicing operation.

In practical terms, they can be included as requirements in the procedure of authorisation and consent.

More specifically, the State that authorises the in-orbit service activity (State A in the example above) can include in its authorisation a waiver of claims in favour of the State with jurisdiction over the serviced object (State B), with one condition: the obtainment from that State of a declaration containing an analogous waiver in its favour.

This condition is necessary to avoid a unilateral waiver from State A, not corresponded by a waiver from State B.

At the same time, the State that has jurisdiction over the serviced object, State B, can include a waiver in favour of the authorising State in the letter of consent. But to ensure the same reciprocity, it can establish in its national space law that its consent for foreign in-orbit services is given on the condition that the authorising foreign State has formally declared a waiver of claims in its favour.

This way, when a State receives a request for consent, the request is presented with a conditioned waiver of claims in its favour.

If that State consents to the operation, it must include in the letter of consent its own waiver of claims in favour of the other State.

With that, the condition of the first waiver is fulfilled and it enters in full force.

Thus, at the end of the procedure of authorisation and consent, the two conditions on the respective waivers are always going to match and the two States involved in the in-orbit service operation can benefit from the elimination of possible claims against each other[716].

While this solves their potential exposure to reciprocal claims, it does not shield them against injuries to third parties.

Both of them, in fact, can be considered internationally responsible or internationally liable, with some notable differences between their respective positions.

5.4.2.1. Responsibility towards third States

[716] It must be noted that the extent of the waiver depends on the way it is formulated. To make sure that the two waivers of the two States are in line with each other it is a recommended practice to publicly include in the national legal framework on in-orbit services a model waiver. This can avoid potential incongruences and therefore delays in the preliminary phase.

Starting with the "*appropriate State*" of the in-orbit service provider, its role is to authorise and supervise the orbital servicing activity assuring its conformity with the applicable legal framework as per Article VI of the OST.

Unlike other private space activities, in-orbit services require a particularly attentive implementation of Article VI because the diligence in implementing it has to be adequate to the level of danger of the activity itself.

This means that, if international injuries result from the servicing operation, the State authorising the service has to pass a higher test of diligence.

It can be exempted from its international responsibility only if it proves that it has put in place a procedure of authorisation and supervision adequate to the operation, and therefore more stringent than the one it would have used for a traditional satellite activity, such as the placement in orbit of an earth observation satellite.

Does the same discourse apply to the State of the serviced object?

Generally, the serviced object is passively receiving the in-orbit service or, at most, it performs small adjustments that are functional to receiving the service without putting in place any particular 'activity' *per se*.

It follows that there is no actual "*activity in outer space*" to be authorised.

That is why the State of the serviced object simply gives its consent to a foreign space operator to operate on a space object under its jurisdiction, but it does not assume the role of the "*appropriate State*" with regard to the in-orbit service operation.

As a result, only if the cause of the injuries is traced back to an aspect linked to its authorisation or supervision, its responsibility under Article VI of the OST comes into play. In that case, what matters is its negligence in the authorisation of the original space activity put in place with serviced space object and the manner in which it supervised its use in outer space.

But in all the other cases – where the injuries are the effect of the way in which the in-orbit service is performed – the State that consented to the operation is not exempted from international responsibility.

In fact, since its consent is linked to its duty of supervision, the diligence with which it reviewed the request to perform the servicing operation is relevant for the attribution of responsibility.

It is true that the "*appropriate State*" of the service provider is the one responsible to review the dynamics of the operation and to control, for example, that the activity is put in place with due regard to the activities of other space actors, without causing interference with them.

But it is also the responsibility of the State that consents to the operation to review the foreign authorisation, making sure that it was issued with the proper diligence and that the specificities of the serviced objects under its jurisdiction have been taken in due consideration.

Under this light, its responsibility stems from its power to deny its consent. Once consent is given, and the outcome is harmful, the State of the serviced object is responsible together with the "*appropriate State*" of the service provider.

Therefore, it is possible to speak of a 'shared responsibility' of the two States, which *strictu sensu* refers to situations where the contributions of each individual State cannot be attributed to them based on causation[717].

In fact, at the moment of consent the State of the serviced object can be said to have contributed to the realisation of the orbital servicing operation by non-preventing its occurrence.

This system of shared responsibility for in-orbit services functions as an incentive for States to use the utmost care in the review of the requests to consent to such operations. That is thanks to the qualification of consent as more than just an approval for a foreign operation over an object under a State's jurisdiction: consent must be regarded as an expression of the duty of supervision, passible of exposing a careless 'consenting State' to international claims under Article VI of the OST.

5.4.2.2. Liability towards third States

Moving to the analysis of liability, similar considerations apply with regard to damages to persons or objects of third States in outer space.

As established in Article IV of the Liability Convention, "*in the event of damage being caused … to a space object of one launching State … by a space object of*

[717] A. Nollkaemper and others, *Shared Responsibility in International Law*, in Michigan Journal of International Law, Vol. 34, 2013, p. 367.

another launching State, and of damage thereby being caused to a third State …, the first two States shall be jointly and severally liable to the third State"[718].

The same provision specifies also that "*their liability to the third State shall be based on the fault of either of the first two States or on the fault of persons for whom either is responsible*"[719].

It follows that for the purpose of compensating damages to third States the fault of one of the two States involved in the in-orbit service is sufficient to trigger the joint and several liability of both of them.

This means that the State which consents to the in-orbit service is not only liable for its own faulty behaviour with regard to the authorised space object and with regard to the procedure of consent.

It is also liable in case of damages resulting from the fault of the other State, even if they could not be known by the State consenting to the operation.

Moreover, under Article IV each State involved in the in-orbit service is exposed to claims of compensation even if, despite its diligence in the authorisation and supervision mechanism, the negligence of its authorised non-governmental entity or the negligence of the authorised non-governmental entity of the other State causes damages to third parties.

In sum, States' exposure to international liability claims is particularly broad in front of in-orbit services[720].

As for damages caused on Earth or to aircraft in flight, Article IV simply re-states the general principle of absolute liability for both States.

Having said that, one specification is key: the regime established in Article IV is applicable only if damage is first caused to one of the two space objects involved in the in-orbit service.

It is clear that in the classic example of a failed in-orbit service between two space objects, which results in their explosion or their collision, and of parts of either

[718] Liability Convention, Article IV.
[719] *Ibid.*
[720] This may be seen as a disincentive for paying ADR services. However, if the risk of compensation claims for damages caused on Earth or in outer space is higher than the risk of accidents during ADR operations, then the disincentive may be less strong. In the end, lacking a duty to remove space waste from orbit, the economic feasibility of ADR operations depends on the reliability of the industry, which has the arduous task of demonstrating that the technology used is safe and the chances of accidents are low.

one of them colliding with a third space object, there is no doubt on the application of Article IV.

However, in all the other cases where the space object of a third party is damaged but one of the two space objects involved in the servicing operation remains unharmed, then Article IV does not apply.

This may happen, for example, if one of the two objects performing the in-orbit service made a mistake during an orbital manoeuvre functional to the service itself and, because of that, solitarily went on to cause damage to a third space object; or if one of the same two objects caused an interference with a close-by satellite damaging its antennas, even if such interference did not affect or damage the other object involved in the servicing operation.

In cases like these, Article IV prevents the third State victim from claiming the joint and several liability of the two States of the in-orbit service.

To conclude, it is possible draw the following considerations on the way that this 'new space' activity affects the system of rights and obligations in space law.

The emergence of in-orbit services represents a profound shift in the landscape of space activities, posing significant challenges to the established system of international space law. As private actors take on increasingly complex operations, such as satellite servicing, maintenance, and waste removal, it becomes evident that existing treaties, drafted in a time when space activities were almost exclusively governmental, do not fully address the legal intricacies of these evolving commercial ventures.

Issues of jurisdiction, consent, responsibility, and liability are especially prominent, as States must navigate the complexities of authorizing private activities that engage with foreign space objects.

While innovative solutions such as procedures on consent and reciprocal waivers of claims between States offer a pragmatic approach to mitigating the risks inherent in the in-orbit servicing business, the latter's development and expansion call for a review of the position of States based on a reinforced standard of diligence together with an increased attention to transparency.

To achieve that, it is necessary to incentivise the adoption of rules at the national level drafted in that spirit, either with responsible States setting the example or with international initiatives pushing States in that direction.

Only then is it possible to imagine the concrete affirmation of the market of in-orbit services and, as a result, the creation of a circular economy of space activities.

5.5. NEW ACTIVITIES: PRIVATE LUNAR MISSIONS

At the beginning of the previous Section, it was said that in-orbit services were already done in the past by governmental agencies and that the novelty of recent times was the transformation of those services into a commercial market led by the private space industry.

A similar situation can be seen as timidly appearing with regard to space activities on the Moon.

Governmental lunar missions have always been a reality of space exploration, with periods of high and periods of low frequency[721].

In the last years, since the early 2000s, the interest for the Moon has grown with increasing momentum. Every year, States record new achievements.

Mentioning only some of the most recent milestones, in January 2024 Japan became the fifth State to land a space object on the lunar surface[722]; in February of the same year, the NASA's Commercial Lunar Payload Services initiative rendered possible the arrival of the first lunar lander built and operated by a private company[723]; in June, China's Chang'e-6 mission returned to Earth with two kilograms of materials from the far side of the Moon[724]. Overall, estimates are

[721] Since the so-called 'Moon Race' between the USA and the USSR in the 1960s, States have launched objects around or on the Moon. From the mid-1970s until the early 2000s, the missions to the Moon decreased compared to the earlier period. However, they have recently increased arriving at the highest frequency and multi-nationality ever registered. See a comprehensive list of all missions to the Moon at the following link: www.planetary.org/space-missions/every-moon-mission.

[722] For more information, see the Japan Aerospace Exploration Agency's press release on the Small Lander for Investigating Moon, available at the following link: https://global.jaxa.jp/press/slim/

[723] On 22 February 2024, the American company Intuitive Machines landed its spacecraft *Odysseus* on the Moon, although due to some malfunctions the mission could not reach all its expected targets. More recently, on 6 March 2025, a second Intuitive Machines spacecraft called *Athena* arrived on lunar soil. However, also this mission – like the first one in 2024 – experienced critical problems after landing, which compromised its full success. A list of private missions funded by the NASA's Commercial Lunar Payload Services initiative can be seen at the link: www.nasa.gov/commercial-lunar-payload-services/clps-providers/.

[724] As reported in S. McCarthy, *China's Chang'e-6 moon mission returns to Earth with historic far side samples*, 2024, available at the following link: https://edition.cnn.com/2024/06/25/china/china-change-6-moon-mission-return-scn-intl-hnk/index.html

that more than three-hundred manmade objects will reach the lunar environment by 2030[725].

All Moon missions are historically the result of ambitious public programs, where private companies participate under public procurement contracts[726].

However, a new trend is changing the situation.

The space industry has turned its attention to the Moon as a place where business opportunities can be grabbed and, as a result, new private projects are being created having the goal to commercialise lunar services[727].

For example, after the arrival in February 2024 of first private lunar lander[728], other undertakings are following: the American Firefly Aerospace has completed in March 2025 a fourteen days mission with its *Blue Ghost* lander, which reached Mare Crisium carrying several instruments[729]; in January 2025, the Japanese ispace has sent a lander called *Resilience* together with a rover called *Tenacious*[730]; Astrobotic Technology, also based in the USA, is set to attempt its own moon landing in late 2025[731].

As private actors embark in lunar space activities, the role of States changes.

One thing is to involve private companies under a public contract, another thing is to be the authority in charge of their authorisation and supervision with no contractual power on the activity they perform. Acting as "*appropriate States*" is much more difficult on the Moon than in the cis-terrestrial space.

As diffusely examined in Chapter III, the mechanism of national authorisation and supervision is functional to the obligation of assuring the conformity of non-governmental activities with the applicable legal framework. The question is: which international norms define the legal framework applicable to the Moon?

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[725] S. Nelson, *Moon Race 2.0: Why so many nations and private companies are aiming for lunar landings*, published on 16 February 2024 at the link: www.bbc.com/future/article/20240216-moon-race-20-why-so-many-nations-are-aiming-forlunar-landings.

[726] See the analysis on the US lunar programs offered in: J. Kluger, *NASA is working with private companies to go back to the Moon. That's riskier than it seems*, 2019, available at the following link: https://time.com/5639998/nasa-moon-commercial/.

[727] This – it must be said – does not take public actors out of the pictures yet, as they still remain the main funding source and the promised anchor customers for private lunar companies. See for example ESA's position on private lunar projects under the Moonlight initiative at the following link: www.esa.int/Applications/Connectivity_and_Secure_Communications/ESA_invites_space_firms_to_create_lunar_services

[728] See above at 723.

[729] R. Lea, *The age of the private moon mission has begun*, 2024, available at the following link: www.space.com/moon-age-of-private-missions-has-begun

[730] See the press release of 9 January 2025 by ipace at the link: https://ispace-inc.com/news-en/?p=6678.

[731] For more information, visit the link: www.astrobotic.com/lunar-delivery/manifest/

Unlike traditional space activities, lunar activities are still based on a quite scattered international regime.

Most general principles of the space treaties apply to the Moon as much as in the void of outer space, however many norms of technical nature, many guidelines, and many best practices were not drafted with lunar activities in mind.

The next sub-section describes more in details this situation, underlying the aspects where the lack of international norms is most troubling for the advent of private lunar missions, risking to undermine the possibility to hold the "*appropriate State*" responsible under Article VI of the OST.

While waiting for the international community to eventually fill the gaps of the current international regime applicable to space activities on the Moon, States need to consider with due care the requirements for their authorisation and the methods of their supervision.

The manner in which they implement the obligations of Article VI not only can set a precedent, and should therefore be done with the utmost attention, but it can also expose them to international controversies, if done without proper international transparency and coordination.

For this reason, the present discourse tackles also the elements of lunar authorisations in the last sub-section (*infra*, at 5.5.2), underlying the main problems and offering the possible solutions to the implementation of Article VI for private missions on the Moon.

5.5.1. The international legal framework applicable to private lunar activities

Most norms of the space treaties are expressly mentioning the Moon in their scope of application.

For example, the OST from its title, down to most of its provisions, establishes principles applicable to "*outer space, including the Moon*". Sometimes, that expression is changed in the broader "*on celestial bodies*"[732]. Sometimes the provision is meant to apply specifically to the Moon[733].

[732] OST, Article V, para. 2, and Article VIII.
[733] OST, Article IV, para. 2, and Article XII.

It is possible, therefore, to conclude that the OST finds full application on Earth's natural satellite.

As for the other space treaties, the Rescue and Return Agreement envisages its application on the Moon – when compatible with its provisions – using the expression "*place not under the jurisdiction of any State*"[734].

In the Liability Convention the drafters preferred a different wording: "*elsewhere than on the surface of the Earth*"[735], while in the Registration Convention the expression used is "*into Earth orbit or beyond*"[736], all equally broad to include the Moon.

From this, it follows that the norms of the main space treaties, as far as compatible, apply on the Moon and States are called to assure that authorised private lunar activities are in conformity with them.

In addition, there is also the Moon Agreement. The latter, as the name suggests, is an elaboration of the principles of the other space treaties for activities on the Moon. However, since only seventeen States have ratified it, its relevance from the perspective of individuating the legal framework to take into consideration for authorising States is limited.

For the ratifying States, however, among which there are Australia, Belgium, and the Netherlands, it is important to consider certain specific rights and obligations contained therein, such as the right to use minerals and other substances of the Moon for supporting scientific lunar missions in Article 6[737]; or the duty to prevent adverse changes to the lunar environment established in Article 7[738]; or – most importantly – the duty to establish an international regime, including appropriate procedures, to govern the exploitation of the natural resources of the Moon as such exploitation is about to become feasible in Article 11[739].

When those States are going to authorise private lunar activities, they will need to comply also with the obligations of the Moon Agreement, knowing that if they do not, they expose themselves to possible disputes with the other parties of the treaty.

[734] Rescue and Return Agreement, Articles 1, 3, 4 and 5.
[735] Liability Convention, Articles III and IV.
[736] Registration Convention, Articles II and V.
[737] Moon Agreement, Article 6, para. 2.
[738] *Ibid.*, Article 7, para. 1.
[739] *Ibid.*, Article 11, para. 5.

Leaving aside the Moon Agreement, the question is whether – despite their extensive scope application – the other international norms of space law are suitable to regulate the particular activities that occur on the Moon.

By 'activities that occur on the Moon' it is not only meant to refer to activities on the resources contained therein, but also the whole range of operations doable in the lunar environment, such as, for instance, the launching of satellite constellations around the Moon offering telecommunication services for lunar activities, or the construction/installation of habitation modules on its surface or below it[740].

There are, of course, certain basic principles that raise no problems also in front of lunar activities. That is the case, for example, of the registration of space objects, of the application of a fault-based liability regime, or of the sharing of information on lunar missions and on foreign objects found on the Moon.

However, there are other treaty provisions whose application is problematic.

In general, it is possible to distinguish between two categories of troublesome norms: 1) the ones whose content is unclear and insufficiently defined; 2) the ones that are not applicable.

5.5.1.1. Unclear and insufficient norms

All norms, sooner or later, require a certain level of clarification in order to adapt to the possible novelties of the context where they apply.

However, looking at the legal framework of lunar activities, it is possible to identify two provisions whose lack of clarity is felt as particularly troublesome in the current context: Article II and Article IX of the OST[741].

In Chapter II, Section 2.5, the text and *rationale* of Article II and of the non-appropriation principle established therein have been already discussed, arriving at the conclusion that the Moon is of no one, meaning that it is qualified by law as a non-appropriable domain beyond the jurisdiction of States.

[740] Practical examples of this kind of activities are respectively ESA's Moonlight Program, being developed by a consortium of companies led by Telespazio, and the Lunar Multipurpose Habitat, being developed by Thales Alenia Space.

[741] See the study conducted by Antonino Salmeri on the main regulatory concerns of multiple stakeholders in lunar activities. A. Salmeri, *Lunar Policy Priorities For safe and sustainable lunar development – A report of the Lunar Policy Platform*, 2023, p. 6, available at the following link: https://lunarpolicyplatform.org/policypriorities.

This reading of Article II together with Article I allowed to add also that the legal status of the Moon is that of a *res communis omnium*: freely usable, freely accessible and non-appropriable[742].

All *res communes omnium* entail two aspects: a container and a content, the first one individuating the domain at large with the characteristics recalled above, the second one corresponding to the resources contained therein whose legal nature is that of *res nullius*, freely appropriable by anyone[743].

Therefore, it is also recognised in law that the resources of the Moon can be the object of property rights[744].

Even if these two principles on the appropriation of the lunar domain and of its resources are clear, their implementation in practice raises several doubts on crucial legal aspects of lunar activities, leaving them dangerously ambiguous.

Starting with the non-appropriation principle, one may ask: how wide can the area of operation of a lunar mission be? And for how long can that area be used by a State or its authorised operator without violating the non-appropriation principle? Lacking any express indication in the space treaties, the possibility of a *de facto* occupation remains possible and its legality can only be assessed on a case by case scenario relying on evaluations based on reasonableness and good faith.

As for the appropriation of lunar resources, while the combined reading of Articles I and II of the OST allows to claim property rights on them, it is unsure under which rules the extracting activity can be performed: does the principle of first-

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[742] See above in Chapter II, Section 2.5.1.

[743] See A. Capurso, above at 145, p. 118.

[744] Other than based on a combined reading of Articles I and II of the OST, the principle of free appropriation of lunar resources is supported by consolidated and uncontested practice. In fact, the USA, Russia, Japan and China have all extracted materials from the Moon's soil and returned them back to Earth for their own studies, allowing eventually foreign entities to access them temporarily.
Moreover, the affirmation in practice of this principle has been reinforced by the fact that several States have taken international political commitments, such as the ones under the Artemis Accords, for the exploration of the Moon including the utilisation of its resources.
The recognition of the legality of their appropriation is supported also by the majority of scholars. See the International Institute of Space Law, *Does International Space Law Either Permit Or Prohibit The Taking Of Resources In Outer Space And On Celestial Bodies, And How Is This Relevant For National Actors? What Is The Context, And What Are The Contours And Limits Of This Permission Or Prohibition?*, 2016, p. 42. See also M. Byers and others, *Who owns the Moon?*, Cambridge University Press, 2023, p. 137; and F. Von der Dunk, *Property Rights over the Moon or On the Moon? The Legality of Space Resource Exploitation on Celestial Bodies*, in Journal of Law & Innovation, Vol. 6, No. 1, 2023, p. 125. Having said that, it must be stressed that arguments based on an inexistent benefit-sharing obligation or on a misconceived interpretation of the expression "*province of mankind*" as analogous to the common heritage of mankind principle should be discarded as legally unfounded (see Chapter II, Section 2.5.1).

come, first-served apply? Should there be a moratorium until an international regime is established? Is there any form of limitation to commercial for-profit extractions in favour of scientific missions?

In the absence of internationally agreed rules, the first States that put in place mining operations on the Moon are going to unilaterally set a precedent, not necessarily in line with the interests of the international community.

Next to Article II, the other provision that is urgently needing clarification is Article IX with regard to the duty of paying due regard to the interests of other lunar operators and to the duty of undertaking appropriate consultations with them in case of potentially harmful interferences between operations.

The uncertainties connected to the application of Article IX derive from the fact that there are no international specifications on how to assess other States' interests on the Moon or how to coordinate potential interferences between activities, including the frequencies used.

In fact, a State may claim to have established an interest in a certain area because its space object attempted to land there, even if it crashed. Or another State may submit to the UN its plan to conduct a lunar mission in a certain region and then postpone its actualisation for years, claiming nonetheless that other States must take into regard and not interfere with its interest therein.

It is doubtful to ascertain whether such claims of established interests are well founded pursuant to Article IX.

Similarly, dust and radio-waves are natural and necessary 'emissions' in any lunar activity, but at what point they become a potentially harmful interference is yet to be determined.

All this is evidently unsatisfactory in front of the growing public and private investments in lunar activities. And that is why without an answer to the questions mentioned above, the prospects of disputes and international claims are a spectre above any lunar mission.

However, while the norms commented so far can provide at least some guidance, although unclear and insufficient, there are other norms that apply in the cis-terrestrial space, but not to lunar activities, creating an even more uncertain regulatory framework for operators on the Moon.

5.5.1.2. Inapplicable norms

It was said at the beginning of the Section that most norms of the main space treaties find their application also in case of lunar activities.

There are however other sources of law that contain important norms on the conduct of space activities, whose scope of application is apparently limited to outer space.

The three most significant examples are the ITU frequency allocation, the UN Space Debris Mitigation Guidelines of 2007 and the Remote Sensing Principles Declaration of 1987.

Starting with the first one, it must be said as a premise that any mission to the Moon requires complex communications systems to transmit data between the spacecraft and Earth. Manned missions also involve voice transmission[745].

The ITU has traditionally regulated and facilitated the coordination of radio frequencies for space services, including those used by lunar missions.

However, the ITU has yet to define a system of frequency assignment that allows scientific and commercial users, both on the surface of the Moon and orbiting around it, not to interfere with each other[746].

ITU's recent World Radiocommunication Conference (WRC-23) placed lunar communications on the agenda of its next conference in 2027, laying the groundwork for future regulations relating to radio-spectrum use on and around the Moon[747].

The goal is to establish a spectrum-management framework for communication on the lunar surface and between lunar orbit and the lunar surface, ensuring efficient and interference-free operations as missions and exploration intensify[748].

Until then, the legal framework for lunar missions, especially of commercial nature, lacks an important part of the system of frequency assignment in place for cis-terrestrial activities.

[745] See the ITU's website at the following link: www.itu.int/hub/2024/07/lunar-exploration-poised-to-intensify/

[746] See A. Martin, *The Relevance of ITU Rules for Regulating the Use of Radio Frequency and Associated Orbits in the Context of Space Mining Activities*, in Journal of Space Law, vol. 43, no. 1, 2019, p. 99. See also F. Giannoni-Crystal, *Legal Issues for Lunar Orbiting Satellites and Suggested Solutions*, in Journal of Space Law, Vol. 47, No. 1, 2023, p. 67.

[747] See ITU Res. 680 of 27 March 2024.

[748] See ITU's website, above at 745.

Moving to the second example, the UN Space Debris Mitigation Guidelines are drafted using a definition of debris that makes them not applicable to the Moon. Space debris are in fact defined as a sub-category of space object localised "*in Earth orbit or re-entering the atmosphere*"[749].

This adds another problem to the definition contained therein, other than the ones already addressed above in Chapter V, Section 5.2.1.

Because the guidelines' scope of application does not include the Moon, States may consider them as not applicable to their lunar operations.

Nonetheless, through an extensive interpretation it can be argued that some of the guidelines could also be conceived as applying to the Moon[750], notably guidelines 5.1 (limit debris released during normal operations); 5.2.2 (minimize the potential for break-ups during operational phases); and 5.2.3 (avoid intentional destruction and other harmful activities).

The fact remains that all norms on space debris need to be adjusted – starting from the adoption of a legal definition of 'waste' – so as to ensure the full application of apposite mitigation and remediation measures in the lunar environment.

A similar situation concerns the third example: remote sensing.

Taking into consideration the main international instrument on the matter, namely the Remote Sensing Principles Declaration, it can be argued that it does not apply to lunar satellites since Principle I(a) establishes that the "*term 'remote sensing' means the sensing of the Earth's surface from space*"[751].

It is clear that the principles on the rights of the sensed State and on the obligations of the sensing operator are essential also *vis-à-vis* lunar observations, which are generally a preliminary activity to the missions on the surface.

Without a clear set of norms applicable on this regard, a number of questions remain open: how, if at all, should such activity be regulated? For example, should a US lunar satellite be able to obtain images of a Chinese base on the Moon? If yes, must it share this data with China? Also, can it distribute the data to other States[752]?

[749] See IADC, above at 558, Guideline 3.1.
[750] T. Masson-Zwaan and others, *The Lunar Legal Landscape: Challenges and Opportunities*, in Air & Space Law, Vol. 46, No. 1, 2021, p. 36.
[751] UNGA Res. 41/65 of 3 December 1986, Annex, Principle I(a).
[752] F. Giannoni-Crystal, *Legal Issues for Lunar Orbiting Satellites and Suggested Solutions*, in Journal of Space Law, Vol. 47, No. 1, 2023, p. 89.

To provide an answer it is necessary to either apply in analogy the Remote Sensing Principles Declaration also to the Moon or to establish new specific norms agreed at the international level.

In conclusion, the uncertainties raised by certain norms together with the regulatory gaps created by the limited scope of application of others leave States and private operators to a troubling legal framework for activities on the Moon.

Other than the obvious disincentive for investments in lunar activities caused by this regulatory situation, the latter complicates also the application of the regime of State responsibility and liability on the Moon. In fact, States may be exempted from international responsibility and from fault-based liability due to the lack of norms against which to test their behaviour.

However, recognising the unsatisfactory nature of the current situation and considering the increased frequency of missions to the Moon, the international space law community has taken action.

5.5.2. Regulatory initiatives for a lunar legal framework

The need of establishing a proper regulatory framework for lunar activities has pushed various international entities to set up initiatives aimed at achieving legal clarity.

In 2016, a group of stakeholders of space resource activities representing industry, States, international organisations, academia and NGOs, was formed under the name of The Hague International Space Resources Governance Working Group[753]. After four years of work, it adopted in 2019 the Building Blocks for the Development of an International Framework for the Governance of Space Resource Activities (Building Blocks) [754] . These have been introduced to COPUOS in 2020[755] with the idea of serving as a basis for negotiations on an international framework[756].

[753] For more information on the initiative see its official webpage at the following link: www.universiteitleiden.nl/en/law/institute-of-public-law/institute-of-air-space-law/the-hague-space-resources-governance-working-group.
[754] The text of Building Blocks is available at the link in the previous footnote.
[755] UN Doc. A/AC.105/C.2/L.315 of 3 February 2020, titled 'Building blocks for the development of an international framework on space resource activities'.
[756] T. Masson-Zwaan and others, above at 549, p. 119.

As summarised by Tanja Masson-Zwaan, one of the founders of the working group: "*The Building Blocks include definitions of key terms, provisions regarding access to and rights over space resources, safety measures related to space resource activities, prevention and mitigation of their potentially harmful impact, sharing of benefits from space resource activities, and a number of general provisions. The Building Blocks also include provisions regarding the attribution of priority rights to operators to search and/or recover space resources in situ for a maximum period of time within a maximum area upon registration in an international registry as well as the establishment of safety zones to assure safety and to avoid any harmful interference with space resources activity*"[757].

Among the many matters touched by the Building Blocks, there are also technical issues, such as the assignment of frequencies for space resource activities, offering a possible solution on their registration[758].

Moreover, the Building Blocks have the virtue of having introduced new legal concepts in the legal debate on lunar activities, such as the idea of 'safety zones', inspired by maritime law[759] and adapted so as to tackle issues of interference and due regard between States on the Moon[760].

Despite their 'soft' legal value, the Building Blocks proved to be more than an interesting initiative for the development of norms on lunar activities, they also represented a strongly influential landmark for other, and more institutionalised, efforts[761].

In fact, after their presentation at COPUOS, the latter established the so-called Working Group on Legal Aspects of Space Resources Activities (UN Working Group)[762].

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[757] T. Masson-Zwaan and others, above at 549, p. 43.
[758] Building Blocks, Section 14.
[759] UNCLOS, Articles 60, 147, and 260.
[760] Building Blocks, Section 11.
[761] Following the road paved by the Building Blocks, other non-governmental initiatives produced similar results. For example, the Austrian NGO Moon Village Association (funded in 2017) drafted a document called 'Best Practices for Sustainable Lunar Activities' and published on 19 October 2020 on the following link: https://moonvillageassociation.org/download/best-practices-for-sustainable-lunar-activities-issue-1/. Another example is offered by the Canada-based Outer Space Institute, a group of global experts in space matters, which published the 'Vancouver Recommendations on Space Mining' on 20 April 2020, available at the link: https://outerspaceinstitute.ca/osisite/wp-content/uploads/Vancouver_Recommendations_on_Space_Mining.pdf.
[762] UN Doc. A/76/20 of 2021, Annex III, titled 'Mandate, terms of reference, and workplan and methods of work for the working group established under the Legal Subcommittee agenda item entitled "General exchange of views on potential legal models for activities in the exploration, exploitation and utilization of space resources"'.

Its constitution was aimed at developing a set of recommended principles on such activities, individuating also the next steps for adopting potential rules and/or norms on the exploration, exploitation and utilization of space resources[763].

As its work plan was set for five years, from 2022 to 2027, it is still too soon to know what the content of the recommendations will be, but it is telling that the Building Blocks are among the documentation indicated as relevant[764].

Through the UN Working Group, the international community is addressing some of the most impellent issues related to space resources: namely, the legal risk and uncertainty for private investments in commercial projects; the equitable access to space resources for all States without discrimination; the mechanisms to avoid conflicts between actors; the sustainability of space exploration missions (public and private); the development of an independent international framework to govern space resources activities[765].

The ambitious task assigned to the UN Working Group of finding solutions to those issues reflects the idea that any adaptation or elaboration of the current legal framework has to be produced at the international level, within COPUOS.

However, conscious of the lengthy advancements of legislative initiatives within the UN, the USA is pursuing a different method of international coordination on a regime for lunar activities.

The same year that the Building Blocks were introduced to COPUOS, in 2020, the USA launched the so-called Artemis Accords[766].

They are part of a bigger US vision for the return of humans on the Moon, the Artemis Program and they represent the basis for creating international partnerships on missions to the Moon[767].

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[763] *Ibid.*

[764] The latest document published by the Working Group is the 'Report on the International Conference on Space Resources, including the results of the expert meeting collecting preliminary inputs for consideration at the international conference in Vienna in 2024', in: UN Doc. A/AC.105/C.2/122 of 9 May 2024. For the reference to the Building Blocks see the working group's official webpage at the following link: www.unoosa.org/oosa/en/ourwork/copuos/lsc/space-resources/index.html.

[765] UN Doc. A/76/20 of 13 September 2021, titled 'Report of the Committee on the Peaceful Uses of Outer Space, 64th session, p. 25.

[766] The text of the Artemis Accords is available at the following link: www.nasa.gov/artemis-accords/. More information can be found at the following link: www.state.gov/artemis-accords/.

[767] For more information, see the following link: www.nasa.gov/specials/artemis/index.html

From a practical perspective, they are based on the signing of a multilateral political commitment[768], i.e. the Artemis Accords, which can be elaborated in individual bilateral agreements between the USA and each of the other States partners[769].

From a legal perspective, NASA officials have described the Artemis Accords as an "*ode to the Outer Space Treaty*" in how they reiterate its principles and incorporate them in a manner specific to lunar activity[770].

Looking at the content of the Artemis Accords, however, it appears that there is more than just an ode to the OST.

The principles contained therein can be classified in three main categories[771]:

1) Principles reflecting existing international norms, namely Sections 1 and 7: Benefit of humankind; Section 3: Exclusively peaceful purposes, accordance with international law; Sections 4 and 8: Transparency and sharing of scientific information; Section 6: Assistance/rescue in outer space; Section 7: Registration; Section 12: Preventing and mitigating space debris;

2) Principles elaborating existing rules, namely Section 5: Interoperability, Section 10: Space resources, Section 11: Safety zones – de-confliction of space activities;

3) Principles purporting novel elements, namely Section 9: Outer Space heritage[772].

From this, it follows that the signatories of the Artemis Accords are taking a stance on their view of the OST and of a future lunar regime.

As noted by Australia in its Statement to the COPUOS Legal Sub-Committee of 2024: "*The Signatories intend to use their experience under the Accords to*

[768] This emerges in clear terms from Section 1 of the Accords, and it is reiterated in Section 13, stating that they are "not eligible for registration under Article 102 of the Charter of the United Nations".

[769] See Section 2 of the Artemis Accords. See also ESPI, *Artemis Accords: What Implications for Europe?*, in ESPI Briefs No. 46, 2020, noting: "The U.S. administration presents them as a preamble to following bilateral agreements between the United States and signatory countries".
Notably, as reported by Frans Von der Dunk, also Luxembourg has concluded several bilateral agreement with various States to discuss mutually-beneficial cooperation on space mining, such as with Portugal, Belgium, China and prospectively Russia. See F. Von der Dunk, above at 744, p. 131.

[770] C. Johnson, *The Space Law Context of The Artemis Accords (Part 1)*, 2020, available at the link: spacewatch.global/2020/05/spacewatchgl-feature-the-space-law-context-of-the-artemis-accords-part-1

[771] For a thorough analysis of each principle see: M. De Zwart and others, *The Artemis Accords and Subsequent Developments*, in International Space Law in the New Space Era (ed. by B. Sandeepa Bhat), Oxford University Press, 2024, p. 231.

[772] See B. Bartóki-Gönczy and others, *The Artemis Accords*, in International Legal Materials, Vol. 62, No. 5, 2023, p. 888.

contribute to multilateral efforts to further develop international practices and rules applicable to the extraction and utilisation of space resources"[773].

There is therefore an element of State practice forming through the Artemis Accords. And even if they remain at the level of political commitments, they do represent the official position of a State on the matter of regulating activities on the Moon.

This means that when lunar missions are put in place by any of the signatories, if they reflect the principles of the Artemis Accords they corroborate the value of such instrument as evidence of State practice in the making; and if they do not act in line with such principles they may be accused by other signatories of violating a general principle of good faith in international relations, if not more – should there be a bilateral agreement in force with the USA[774].

Overall, the Artemis Accords – signed by fifty-three States as of January 2025[775] – represent an undeniable source of legal influence both on COPUOS and on the international community as a whole.

It is therefore difficult to imagine a future regime on lunar activities incompatible with them.

For the time being – as the end of the story on how to solve the uncertainties and the gaps of space law for the Moon is still far – States conducting or authorising lunar missions have to be particularly careful on their conduct.

In fact, even if clarity is still missing at the international level, their operations on the Moon require necessarily to take a position *de iure* or *de facto* on what they consider doable.

Thus, while the international initiatives described above are starting to offer a pale picture of what should be considered consistent with international law on the Moon, States are called to make attentive decisions on how to ensure that their

[773] Statement by Australia on Agenda item 9 - General exchange of views on potential legal models for activities in the exploration, exploitation and utilisation of space resources, 63rd COPUOS Legal Sub-Committee, 2024, available at the following link:
www.unoosa.org/documents/pdf/copuos/lsc/2024/Statements/9_Australia.pdf

[774] In similar terms, see F. Von der Dunk, above at 744, p. 129.

[775] The complete list of signatories – among which Finland is the latest one – is available at the link: www.state.gov/bureau-of-oceans-and-international-environmental-and-scientific-affairs/artemis-accords. See also the paper submitted by the USA and others at the COPUOS Scientific and Technical Subcommittee titled 'An update on the work of the Artemis Accords Signatories' in UN Doc. A/AC.105/C.1/2025/CRP.16/Rev.1 of 10 February 2025, titled 'An update on the work of the Artemis Accords Signatories'.

lunar activities – especially if non-governmental – do not result in their responsibility or liability at the international level.

5.5.3. The essential elements of a lunar authorisation

Every private company that aims at offering commercial services on the Moon has to be authorised and supervised by an "*appropriate State*".

Therefore, those private companies that want to offer lunar services have an interest in establishing their control centres in a State that regulates domestically activities on the Moon.

Most national space laws can be said to apply to the Moon either because the law expressly mentions the Moon or because the wording used is broad enough that a lunar activity can be considered as falling under its scope of application.

For example, in the French space law a space operation is defined as any activity consisting of launching or attempting to launch an object into outer space or of controlling a space object during its stay in outer space, including the Moon[776].

Therefore, all norms applicable to space operations apply also to operations on the Moon.

A broad wording is used, instead, by Belgium which applies its national space law to the activity of launching, operating and guiding a space object, defined as an object launched or intended to be launched in outer space[777].

Also here, the final result is the same. As a lunar object is sent in outer space to operate on the Moon, its private operator has to be authorised under the Belgian space law.

While these two approaches offer a general legal basis for the authorisation and supervision of private lunar activities, they lack of provisions that acknowledge the specificities of operations on the Moon. This means that non-governmental entities are left with an authorisation mechanism that does not answer all the legal questions analysed in the previous Sections.

[776] French Law on Space Operations No. 518/2008, Article 1, para. 3.

[777] Belgium's Law of 17 September 2005 on the Activities of Launching, Flight Operation or Guidance of Space Objects, combined reading of Article 2, para. 1, and Article 3, para. 2.

There are only four States in the world, as of March 2025, where that is partially not true: the USA, Luxembourg, the United Arab Emirates (UAE), and Japan[778].

5.5.3.1. National Laws on Space Resources

In each of the four States mentioned above, it is possible to find a legislative measure that concerns activities on the Moon.

The first law of this kind was enacted in 2015 by the USA[779]. It established that "*a US citizen engaged in commercial recovery of an asteroid resource or a space resource under this chapter shall be entitled to any asteroid resource or space resource obtained, including to possess, own, transport, use, and sell the asteroid resource or space resource obtained in accordance with the applicable law, including the international obligations of the United States*"[780].

With that, the USA has recognised that a so-called 'US commercial space resource utilization entity' can acquire property rights on space resources and that those rights will be protected by the US Government. However, the 2015 legislative measure has offered any further details on the authorisation and supervision necessary to put in place a resource-related activity. The only condition being that it is in accordance with the laws of the USA, including its international obligations.

At the end of 2023, a draft bill of the US Government put forth the idea of setting up a specific authorisation mechanism for so-called 'novel space activities', which are defined in general as those activities that are not directly regulated under the current US regulatory system for private sector space activities, including potentially lunar missions[781].

[778] There is a fifth State, Brazil, which has also adopted a domestic space law that mentions lunar space activities in article 3, n. VIII and IX, of Lei n. 14.946 of 31 July 2024 '*institui normas aplicáveis a atividades espaciais nacionais*'. However, because it only refers to activities on the Moon among the activities that fall under the scope of application of the law without any further specification or separate regulatory elaboration, the Brazilian legislative approach can be considered more similar to the French one than to the ones that are described in the following section.

[779] See the US Space Resource Exploration and Utilization Act of 2015, amending Subtitle V of Title 51 of the United States Code, by adding Chapter 513 titled 'Space resource exploration and utilization'.

[780] US Code of Federal Regulations, Title 51 – National and Commercial Space Programs, para. 51303.

[781] The text of the draft bill is available at the following link: www.whitehouse.gov/wp-content/uploads/2023/11/Authorization-and-Supervision-of-Novel-Private-Sector-Space-Activities_Legislative-Text_final.pdf. See also Congressional Research Service, *Space Resource Extraction: Overview and Issues for Congress*, in CRS Reports, No. R48144, 2024, p. 18.

However, the bill has not passed into law yet. Thus, it is possible to say that the current legal framework for the US lunar industry remains limited to a recognition and protection of property rights.

That said, for the time being private activities on the Moon can follow the authorisation system applicable to other space activities with the necessary adjustments for the specific case at hand. This is what happened with Intuitive Machines in 2023: the FAA authorised the launch of its lunar lander and the FCC authorised aspects related to telecommunication[782].

While waiting for the announced creation of a proper authorisation mechanism for non-governmental activities on the Moon, it can be said that for now the US regime has taken only a small step in the development of an authorisation system for lunar activities.

A bolder approach was taken in 2017 by Luxembourg.

With law n. 674/2017 'on the exploration and use of space resources'[783], the Luxembourgish government has not only recognised private property rights on lunar mining materials, but has also regulated certain specific aspects of the authorisation process related to them.

Article 2 states that no person can explore or use space resources without holding a written mission authorisation. However, the same provision also expressly maintains that the law does not apply to aspects of telecommunications, frequencies and orbits[784]. It follows that under the Luxembourgish regime it is necessary to have different authorisations depending on the type of activity to be performed on the Moon.

Another interesting element of the law is the use of the term "*exploration*"[785] and the reference to "*preparatory works*"[786], which suggest a scope of application of the law larger than the mere exploration and use of space resources, including also

[782] The authorisation issued on 23 October 2023 by the FCC for Intuitive Machines' mission is available at the following link: https://docs.fcc.gov/public/attachments/DA-23-935A1.pdf

[783] Luxembourg's Law n. 674 of 2017 on the exploration and utilization of space resources. Luxembourg further strengthened its laws in favour of lunar mining in 2020. For an account of the preparatory works behind the law and its international implications see: P. De Man, *Luxembourg Law on Space Resources Rests on Contentious Relationship with International Framework*, in KU Leuven Working Paper, n. 189, 2017, p. 4. See also M. Hofman and others, *Space Legislation of Luxembourg: A Commentary*, Wolters Kluver, 2022.

[784] *Ibid.* Article 2, para. 4.

[785] *Ibid.* Article 3.

[786] *Ibid.* Article 16.

activities functional to mining operations such as prospecting, remote sensing and building facilities.

Looking at the subjective scope of application of the law, it is interesting to notice that the applicant has to have its central administration and its registered office, including the administrative and accounting structures, in Luxembourg[787]. This connection between the applicant and the authorising State is understandable from a fiscal perspective, however it is less convincing as an implementation of Article VI of the OST. As diffusely addressed, the international obligation to assure the conformity of a non-governmental entity with the applicable legal framework requires a territorial connection between the supervising authority and the mission control centre.

As for the technical content of the authorisation request, the Luxembourgish law requires the applicant to provide all such information as may be useful for the assessment of the mission together with a mission program[788].

Then, in greater detail, it lists a number of mandatory elements to be transmitted to the public authority: a) the activities to be carried on within the territory of the Grand Duchy; b) the limits that could be associated with the mission; c) the modalities for the supervision of the mission; d) the conditions for ensuring compliance by the authorised operator with its obligations[789]. Finally, it expressly mentions the requirement to provide a risk assessment of the mission, specifying the financial means to cover such risks[790].

The remaining articles define the causes of withdrawal of the authorisation, such as the lack of activity for thirty-six months after the authorisation was granted; the full responsibility of the operator for any damage caused at the occasion of the mission, including at the occasion of all preparatory works and duties; and finally the applicable sanctions for contraventions[791].

Overall, the law enacted in Luxembourg is an advanced elaboration of the requirements necessary for conducting private activities on the Moon. Its scope of application may even be extended beyond the mere use of space resources, thanks to the use of terms such as "*exploration*" and "*preparatory works*" which can

[787] *Ibid.* Article 7, para. 1.
[788] *Ibid.* Article 6.
[789] *Ibid.* Article 12.
[790] *Ibid.* Article 10.
[791] *Ibid.* respectively Articles 14; Article 16; and Article 18.

attract within the requirements of the law activities such as prospecting, remote sensing, and constructions functional to the use of resources[792].

With its detailed regime, the Luxembourgish authorisation mechanism can be seen as an important standard on how to authorise lunar activities, although some provisions appear to be questionable.

For example, the choice of detaching the qualification of "*appropriate State*" from the element of having the jurisdiction over the MCC risks to result in an empty power of control over lunar activities by Luxembourg: a private company may have the central administrative office in its territory, but the control over the space object on the Moon may be performed from a different State. This would hinder Luxembourg from exercising direct enforcement powers over the actual operation of object on Earth's natural satellite.

Another questionable choice is to leave the aspect of supervision unregulated.

The methods of supervising private lunar activities are particularly troublesome since the object of supervision is on another celestial body. Therefore, setting up clear rules on how the governmental authorities are going to oversee the compliance with the authorisation should have been taken in due consideration.

Overall, it appears that Luxembourg brought a lot of focus on societal and financial aspects of companies that intend to perform space resources activities. However, at the same time, it overlooked some substantive elements of an authorisation procedure related to lunar operations[793]. This weakness of the Luxembourgish law may be connected to its adoption in 2017, when the space mining sector was still at an embryonic stage. But, after almost ten years, it would be advisable for Luxembourg to review its regulation, amending the law where necessary.

As for Japan, a specific Act on space resources entered in force in 2021[794].

The latter resembles the structure of the Luxembourgish law, but it also contains innovative elements, such as the measures aimed at ensuring international transparency[795] and the details of the so-called '*business activity plan*', which

[792] See in similar terms T. Masson-Zwaan, above at 549, p. 41.
[793] Expressing similar concerns, see: A. Salmeri, *The Multi-level Governance of Space Mining*, Wolters Kluwer, 2023, p. 113.
[794] Japanese Act No. 83 of 2021 on the Promotion of Business Activities for the Exploration and Development of Space Resources.
[795] *Ibid.* Articles 4 and 7.

include purpose, period and place of the activity, as well as methods used and business activities related to the resources[796].

All this provides private operators with a clearer understanding of the requirements necessary to perform space resources activities. At the same time, it offers the authorising authority a more precise understanding of the exact operation to be performed and of the possible contrasting interests to be balanced.

Also in the Japanese case, there are nonetheless elements of the authorisation mechanism that appear problematic.

For example, the Act does not apply to activities conducted exclusively for scientific research[797]. This leaves a perplexing gap in the national authorisation system: certain companies may elude the application of the Act by conducting prospecting or other research activities functional to mining operations without having to comply with the conditions set forth therein[798].

Another example is the lack of provisions – correctly envisaged by the Luxembourgish law – on withdrawal and sanctions. Both aspects are indispensable for the completeness of a law on an authorising procedure and their lack risks to create confusion for operators.

Moving to the UAE, the domestic space law adopted in 2023[799] endorsed a broad definition of 'space activities' including – *inter alia* – the discovery, exploitation, extraction and use of space resources, whether for commercial, scientific or other purposes, as well as the construction or use of facilities in space or on the surface of celestial bodies, permanently or temporarily[800].

Compared to the US legislation, the Emirati law enlarged the scope of application of its authorisation system going beyond the mere use of space resources, mentioning for example also construction activities such as building a research facility or a hotel on the Moon. The fact that such constructions may be permanent leaves a certain degree of perplexity in terms of compliance with the non-

[796] *Ibid.* Article 3.
[797] *Ibid*. Article 2, lett. ii).
[798] *Ibid.* Article 2(ii).
[799] The first mention of activities related to space resources was envisaged in UAE's Federal Law No. 12 of 2019 on the Regulation of the Space Sector, which was however repealed in 2023 with the adoption of the UAE's Federal Decree by Law No. 46 of 2023 Concerning the Regulation of the Space Sector.
[800] *Ibid.*, Article 4, para. 1 (i) and (l)

appropriation principle of Article II, OST. But it is yet to see if and how that part of the law will be concretely implemented.

Under Article 8 of the law of 2023, the conditions and controls relating to the authorisation for space resources activities are to be determined in a separate normative act of the Cabinet[801].

Thus, the Ministry of Cabinet Affairs adopted in March 2023 the Resolution n. 19/2023 'regarding Space Resources'[802]. Several provisions contained therein are noteworthy as they represent a virtuous implementation of Article VI of the OST in front of operations on celestial bodies.

Firstly, Article 5 provides a list of aspects upon which the assessment of the authorisation request by the public authority will be based (e.g. "*Any potential adverse impacts on the Earth's environment or harmful contamination in the Identified Area, including celestial bodies, bearing in mind any international guidelines, policies or other instruments relating to planetary protection*").

With this, the requestor of an authorisation is put in the condition to know which aspects are taken into consideration by the public authority. As a consequence, in case of a denial of authorisation, it can rely on a set of parameters established in the law that can avoid the discretionary use of public powers. It is easily imaginable how this creates a favourable framework for non-governmental entities in terms of certainty and transparency.

Secondly, Article 4, para. 1, lett. c) requires the holder of an authorisation to submit to the public authority before it initiates its operations the evidence proving that it has taken all necessary measures to prevent or mitigate risks, damages, harmful consequences and debris connected to its activity.

The placement of such duty upon the authorised private actor is particularly important as it protects the authorising State from international claims linked to that private activity. In fact, the submissions mentioned in the provision at hand can be used by the authorising State to demonstrate its diligence in reviewing the private activity before it took place. This is an essential element from an evidentiary perspective in international judicial proceedings.

[801] *Ibid.* Article 8.
[802] UAE Ministry of Cabinet Affairs, Resolution No. (19) of 2023 Regarding Space Resources.

In connection with this *rationale*, the Emirati legislator established in Article 4, para. 2 , that the authorised operator shall also keep the public authority up-to-date on a regular basis about the progress of the activity and comply with all instructions issued by it in the event of emergencies or the likelihood of material risks arising out of the activity[803].

With this, the UAE provided an effective mechanism to address the complicated issue of supervision over lunar operations. In lack of the possibility to directly overview them, it becomes crucial to put in place a mandatory and well-defined system of exchange of information between the State and the authorised entity. Only an informed State can put in place the necessary measures to protect the international security and safety of the lunar domain and to intervene with its powers when private activities raise public concerns.

Thirdly, Article 8 reiterates the importance of reporting obligations imposing a list of instances that trigger the duty to immediately notify the public authority. But the most interesting aspect of the provision is its third paragraph which requires the operator to submit "*a statement on the condition of the area where the Space Resources Activities were carried out, including the presence of any Space Objects or parts thereof*"[804].

It is evident from this clause the importance given by the Emirati legislator on the sustainability of space activities. It is clear that the principles of non-appropriation, of sustainable behaviour, of due regard to the rights of others can be fully respected only if at the end of a lunar activity the operator restores – as far as possible – the environment to its *status quo ante*[805]. Only then, the operator coming next will be in the position to benefit from the use of that same area.

Article 8, para. 3, goes in that direction as it seems to imply that the authorising State, based on that statement, will be able to develop a restoration plan at the end of the authorised activity.

[803] *Ibid.* Article 4, para. 2.

[804] *Ibid.* Article 8, para. 3.

[805] On the duty of restoration in international environmental law, see: A. Telesetsky and others, *Ecological Restoration in International Environmental Law*, Routledge, 2017, p. 17. On the definitional issue of 'restoration' see: A. Mendes and others, *Towards a legal definition of ecological restoration: Reviewinginternational, European and Member States' case law*, in Review of European, Comparative & International Environmental Law, Vol. 32, No. 1, 2023, p. 3.

Other than the numerous virtuous provisions adopted by the UAE with regard to space resources activities, there are also some legislative choices that remain more dubious.

Article 2, for example, connects the application of the Cabinet's resolution to the presence in the UAE of the headquarters of those companies that request an authorisation. At the same time, it imposes its authorising system on foreign companies whose subsidiary is based in the UAE. This subjective scope of application may look contradictory and it risks to create an empty shell in the hands of the authorising State if – as discussed in Chapter III, Section 3.1 – the actual control of the space operation occurs in another jurisdiction.

Next to Article 2, some doubts are raised also by Article 5 in as far as it refers in a very general manner to UAE's international obligations, guidelines, policies and other instruments. While it is commendable to define some legal standards upon which the public decision over the authorisation is taken, their vague reference may not allow a private operator to clearly understand with which precise norms its mission needs to comply. This is particularly troublesome for those smaller companies for whom a compliance assessment prior to submitting a request for authorisation may be costly.

Finally, the UAE's approach has been very meticulous on aspects such as information sharing, but it has not adopted the same level of completeness with regard to the measures that define how the controls will be conducted after the information is received. The same is true for the sanctions that will be applied if the norms of the authorisation are breached. Article 3 refers to the general rules on space authorisation, but – considering the specificities of activities related to space resources – a set of apposite norms on those aspects would have been a more appropriate choice.

From this brief analysis of the national laws regulating lunar activities, it can be said that the USA, Luxembourg, Japan, and the UAE, offer the first standards on how to authorise and supervise lunar activities, even if they mostly regard space resources operations.

Despite their limited number and the paucity of their actual application, in the lack of other suggestions at the international level, they can represent a standard against which to assess other States' conduct with regard to private space activities on the Moon. In other terms, the legislative stance taken by the States mentioned above

has significance under international law because the unilateral vision of some States, especially if they are the most advanced in a certain field, may become predominant, setting precedents and influencing the future legal framework for lunar activities on a global scale.

Having said that, there are still many ambits of private lunar activities that are not touched in those laws, but that should be taken into consideration by States when implementing their obligations of authorisation and supervision with regard to activities on the Moon.

5.5.3.2. Environmental considerations and supervising mechanisms

Among the various elements of private lunar activities that should be included in a national authorisation system, two in particular are considerably important.

The first one concerns the environmental aspects of lunar missions.

According to the Committee on Space Research (COSPAR) of the International Council of Scientific Unions, the Moon is a body of "*significant interest relative to the process of chemical evolution and/or the origin of life, but where scientific opinion provides a remote chance of contamination by organic or biological materials which could compromise future investigations of the process of chemical evolution and/or the origin of life*"[806].

Despite the low chances of contamination of the Moon by organic or biological materials, the possibilities of disrupting the areas where lunar activities are conducted, especially if consisting in large scale operations like the construction of a lunar station, are much higher.

Just like any other environment, also on the Moon – through Article III of the OST – the general principles of international environmental law find application, as far as compatible.

For example, at the international level, the ICJ recognised that environmental impact assessments (EIA) are nowadays a requirement under general international law where there is a risk that a proposed industrial activity may have a significant adverse impact in a transboundary context, in particular, on a shared resource[807].

[806] COSPAR Policy on Planetary Protection, approved on 20 March 2024, p. 20.

[807] See Pulp Mills case, para. 204. And Certain Activities case, para. 161. See also A. Savaresi, *Environmental Impact Assessment after the International Court of Justice decision in Costa Rica-*

The expression 'shared resource' should not be seen as only referring to traditional shared resources such as a river that traverses different States, but also to a resource that is 'shared' because all share its utilisation, without claims of sovereignty, such as in front of a *res communis omnium*. Under this light, also the Moon can be considered as a 'shared resource' and, therefore, an EIA can be regarded as a necessary requirement in national authorisations.

At the same time, the question of how to dispose waste created on the Moon needs to be addressed in national mechanisms, until proper rules are adopted at the international level. The mitigation and remediation measures envisaged at the international level cannot apply in equal terms to objects orbiting around Earth and to objects orbiting around the atmosphere-less Moon and, even less so, to objects used on the lunar surface.

Finally, if a private lunar activity has an impact on the morphology of a certain area of the Moon – for example due to excavation processes – once the activity is over, the private operator should be under a duty to rehabilitate the area, putting in place the measures necessary to bring it back to the *status quo ante*, if possible. All these environmental considerations are of the utmost important for "*appropriate States*".

In fact, a national authorisation that has not imposed any requirement on EIA, on waste mitigation and remediation, and on environmental rehabilitation, may be regarded as a negligent implementation of Article VI of the OST. On this regard, the UAE legislation examined above can be seen as going in the right direction.

However, it is not sufficient to include environment oriented requirements in the authorisation mechanism. The important aspect is whether they are effectively put in place. For this reason, it is crucial to have an effective and clear supervision mechanism. And that is precisely the second ambit of private lunar activities that has not received sufficient attention by States so far.

In general, the fact that an authorised private activity is performed in a place not directly controllable by the authorising State creates a risk of contraventions.

To contain it, the key is to ensure a constant interaction with the private operator through reporting obligations and transparency measures, potentially involving

Nicaragua and Nicaragua-Costa Rica: Looking backward, looking forward, in Questions of International Law – Zoom in, No. 42, 2017, p. 1.

periodical inspections and the participation of governmental officials in the overview of the operations.

The importance of all this can be seen in front of the duty to conduct an EIA.

Once the assessment is done and it has passed the governmental review, it needs to be translated in pro-active measures throughout the course of the authorised activity. In fact, the obligation to carry out an environmental impact assessment is a continuous one and, thus, monitoring of the project's effects on the environment shall be undertaken, where necessary, throughout the life of the project[808].

Therefore, both the aspects of environmental protection and of effective supervision are pivotal regulatory elements in front of the specific complexities of lunar operations.

The lack of attention to them is not only dangerous because of the potential exposure to international responsibilities, but also because they are essential safeguards of the accountable and sustainable use of the lunar domain.

5.6. CONCLUDING REMARKS

Everything that has been discussed in the present Chapter is based on one idea: private 'new space' activities are pushing the boundaries of space law beyond what was imagined by the drafters of the treaties.

Orbital waste, suborbital vehicles, private paying passengers, in-orbit services and lunar activities are composing a new picture of human endeavours beyond the atmosphere. With them, a reality not foreseen in now unfolding, and old legal concepts struggle to remain relevant.

Thus, for as resilient to change as it can be, the international legal framework of space law is concretely faced for the first time with the limits of its adaptability.

New definitions are needed and new regimes must be drafted.

As described throughout the Chapter, in recent years there have been efforts by the international community to draft new norms (e.g. the UN Space Debris

[808] Y. Tanaka, *Obligation to Conduct an Environmental Impact Assessment (EIA) in International Adjudication: Interaction between Law and Time*, in Nordic Journal of International Law, Vol. 90, 2021, p. 114.

Mitigation Guidelines or The Hague Building Blocks). However, either because of their incompleteness or because of their legal nature, they have not produced decisive results.

The most effective solution would be the long-awaited adoption of new binding instruments through COPUOS. It was said in the previous pages that this would be the most logical means to tackle the international issues raised by space tourism, suborbital flights and lunar activities. Aspects such as the international liability of the operator of a commercial human spaceflight or the coordination of mining activities on the Moon can only be effectively regulated at the level of treaty law.

On this regard, the COPUOS Working Group on Legal Aspects of Space Resource Activities is the most promising initiative in place at the moment.

At the same time, other issues – connected for example to the sustainability of space operations (e.g. the definition of space waste) or to the conduct of international in-orbit services (e.g. the exchange of consent and waivers of claims) – can obtain a desirable level of international regulation simply recurring to soft law measures, such as guidelines and recommendations.

All these solutions, binding or not binding, remain for the time being on the horizon of international space law.

But as the international community slowly tries to create new norms, States Parties to the OST have to comply with their obligations to authorise and supervise private 'new space' activities pursuant to Article VI of the OST.

This discrepancy between the factual needs of the 'new space' industry, the international obligation of Article VI and the lack of a proper international regime offering guidance on what norms apply has only one result: the creation of a patchwork of national solutions.

States comply with Article VI according to their own unilateral vision on what means to be in conformity with space law.

All the national laws commented throughout the Chapter represent a necessary, but dangerous trend.

It is true that for non-governmental entities it is better to operate under a unilaterally chosen regime than under no rules at all. If the latter scenario was prevailing, the resulting situation would be worse than the existing one[809].

However, although useful for example for the purpose of setting the current international standard of diligence applicable to States with regard to private 'new space' activities, the national laws discussed in the Chapter remain the product of uncoordinated and non-harmonized approaches to international problems, potentially leading to inconsistent regulatory approaches and legal uncertainties.

For this reason, each Section for each of the matters analysed therein has proposed some corrective measures: a new definition of space waste centred on the State with jurisdiction over the relevant space object; a conventional line to understand which objects are 'space' objects; an adaptation of certain aspects of air law and maritime law to the regulation of suborbital vehicles and commercial human spaceflight under space law; a system of exchange of consent and waivers of claims for in-orbit services; an expansion of the norms applicable to the cis-terrestrial space to the Moon and a formulation of the essential elements of lunar authorisations with a particular focus on transparency, environmental aspects and supervising methods.

The failure to address these corrective measures at the international level – or if necessary at the national one – could weaken some core aspects of space law, such as jurisdiction, responsibility and liability for private 'new space' activities, undermining the accountability of States.

This would create in the end a fertile ground for international disputes and conflicts, to the detriment of the industry and of space endeavours in general.

Thus, it is in the interest of all stakeholders in space activities to see States embrace the corrective measures suggested above, as they will not only protect the position of States *vis-à-vis* the conduct of non-governmental entities, but they will also contribute to the broader goal of ensuring clarity, transparency and coherence of the regime of space law in its evolutive status.

[809] T. Masson-Zwaan and others, *Regulation of space resource rights: Meeting the needs of States and private parties*, in Questions of International Law – Zoom in, No. 35, 2017, p. 17.

CHAPTER VI

CONCLUSION

SUMMARY: 6.1. Main findings and proposals – 6.2. Final reflections and the way forward.

6.1. MAIN FINDINGS AND PROPOSALS

The work outlined in the previous Chapters has moved from a research question which, although already expounded in the Introduction, is useful to repeat here:

How do contemporary private space activities affect the interpretation and the application of the international legal framework of space law?

As the present Thesis reaches its conclusion, it is possible to say that private space activities are bringing a revolution so strong to the manner in which outer space is used and explored that many certainties of space law are falling apart.
Starting with the basic principles analysed in Chapter II, it was found that they assume meanings of a different character when they are applied to the activities of non-governmental entities, instead of States.
More specifically, the benefit-aiming obligation should be seen as a standard against which to assess whether private actors intend to use outer space in inconsiderate manners, putting in place activities that serve no beneficial purpose and that may raise international tensions, like placing human remains on the Moon.
Furthermore, the expectations of dialogue, transparency, support and coordination play a role also when national activities are put in place by non-governmental entities. It is for States to incentivise business behaviours that enhance cooperation, *lato sensu* including also understanding and assistance. But most importantly it is for States to take into account those expectations when regulating

the exchanges of services and the mutual connections created by international investments, which are in the realm of private companies the most concrete bridge of cooperation.

Finally, the principle of due regard established in Article IX should be translated in concrete domestic requirements of information-sharing between authorised private actors and "*appropriate States*", so as to ensure that the latter are able to perform the context-dependent balancing of public interests entailed in its meaning.

Moving to the provisions that address private actors, the space treaties are thrifty of them and the few ones that mention non-governmental entities are surrounded by a fog of confusion and uncertainty.

But this regulatory condition, which allowed States to cope with private space activities as long as they were small in number and mostly under public contracts, can no longer be acceptable in the contemporary context of space activities.

For this reason, certain traditional and consolidated convictions on the interpretation of those provisions must be left behind.

The most vivid example is the interpretation of Article VI in combined reading with Article VII and Article VIII of the OST.

The expression "*appropriate State*" is not connected to the State of nationality or to the launching State. A thorough interpretation of its wording, its context and its relation with other relevant provisions in the system of space law, indicates that only the State with legislative and enforcement jurisdictions over the mission control centre of the non-governmental entity that qualifies to be the "*appropriate State*". This is corroborated by the practice of States such as Belgium, the Netherlands, Japan, Luxembourg (Chapter III, Section 3.7).

From this, it follows that the "*appropriate State*" is the only State that can retain jurisdiction and control over a private space object pursuant to Article VIII.

Moreover, the "*appropriate State*" is detached from the qualification of launching State: it may overlap with the latter if it also falls under one of the criteria of Article VII, but nowadays – in the 'new space' era – there are ever-increasing circumstances when it does not.

Privately procured launches of space objects and transfers of control to a non-launching State show in practice how any forced correlation between Article VI and Article VII must be discarded: the "*appropriate State*" is a movable concept

that is determined by an evaluation in point of fact and in point of law connected to the place of the MCC and to territorial jurisdiction; while the category of launching State is a static and perpetual condition, linked exclusively to the connection – as per the criteria of Article VII – between one or more States and a space object at the moment of its launch.

It is found therefore that any use of personal jurisdiction in national space laws for the qualification of "*appropriate State*" is the fruit of an incorrect reading of the provision and leads States to claim an authorising and supervising power which in reality is an empty shell: Article VI cannot be implemented if the national person operating the space object is using an MCC in a foreign jurisdiction.

Moreover, it is also found that the international registration of private space objects must reconsider the relevance of the status of "*State of registry*" under the Registration Convention. In today's world it becomes important to emphasise the real connection between States and private actors under the concept of jurisdiction. There are means of registration that can and should be exploited to keep the system up to the dynamism of the space industry: the possibility to use duplicate registrations at the international and at the national level, depending on whether a State is a "*State of registry*" or just the "*appropriate State*", are consented under the law and should be exploited as some States have started doing, even if they are not reflecting the original construction of the system.

Remaining on the impact of non-governmental entities on the interpretation of Article VI, the surge of the space industry in recent years, with the new frequency and the consolidated dominance of private operations – including illegal ones – has put into question the traditional theory of direct State responsibility for the conduct of non-governmental entities.

Its application appears legally unfounded and contradictory with the understanding of State responsibility in public international law. Space law has nothing special on this regard. Therefore, Article VI is simply another treaty provision that establishes an obligation of due diligence over the conduct of non-governmental entities in outer space.

As for liability, holding only the launching States liable on the basis of an unwritten rule according to which they have the exclusive prerogative of compensating damages caused by the objects that they launched is a theory that must be discarded.

Next to the launching States, also the "*appropriate State*" can be liable according to the principles of public international law for the activities that occur from a place under its jurisdiction, including operating a space object.

It is found moreover that the rules that apply to launching States pursuant to the Liability Convention can be applied also to the "*appropriate State*" – as long as practicable – on the basis of an analogical reasoning.

The final result is that when victims of damages caused by space objects are looking for compensation, the primary choice should be to file suit against the "*appropriate State*" which can be both responsible and liable for what occurred.

This avoids complicated claims against a State – the launching State – that may have no jurisdiction over the private space object and that in front of a claim may not have the practical means to defend itself due to the lack of information on the space operator and on the dynamics of the harmful event.

All these findings are based on new readings, analysis and interpretations of the provisions that are part of the international legal framework of space law. They are proof of the adaptability and resilience of the space treaties.

However, not all the changes caused by the privatisation, commercialisation and democratisation of outer space can be brought under the sphere of such treaties.

Some changes pose questions that cannot find an answer in the current framework of space law.

Chapter V addressed the emerging legal issues raised by the so-called 'new space'.

A first part focused on the legal definitions of "*space object*" and "*astronaut*", looking at their application in front of concepts such as space waste, suborbital vehicles and paying private passengers. It was found that the difficulties in adapting those traditional definitions to such new concepts do not need a new outer space treaty to be solved. The legal clarity requested by the space industry can be achieved with corrective measures at the international and at the national levels.

More specifically, new definitions such as 'space waste' as a subcategory of space object can be included in a soft law document and be implemented accordingly at the national level, as it has been done with the ill-phrased notion of space debris.

Other solutions such as defining where outer space begins for the purpose of regulating suborbital flights are more plausible to be adopted at the national level, as it is already the case with some States.

Some other measures require a specific international binding instrument to be added to the five space treaties, and that is the case with the carrier's liability for spaceflights carrying persons on board. This should not be contemplated as a means to touch the five space treaties, but rather as a novel instrument required by new needs and placed next to the current hard law instruments on outer space.

A second part of Chapter V has examined the legal issues raised by new private space activities like in-orbit services and lunar missions.

Looking at in-orbit services it was found that the necessary corrective measures – such as a system of exchange of State consent and waivers of claims relating to the orbital servicing operation – can take the form of a soft law instrument, which is perfectly sufficient for the purpose of offering a guideline to States on how to deal with such services.

As for lunar missions, their complexities require more than just soft law.

There is a need for a comprehensive international regime especially for determining rules on priority rights and on the avoidance of interference. The international community – through various initiatives – is already going that way.

At the same time, at the domestic level it was found that the practice of some States, like Japan, Luxembourg and the UAE, is pointing towards the right direction: creating a specific authorisation mechanism. However, an increased attention should be given to important aspects such as environmental measures and means of supervision for activities that are happening on another celestial body.

Overall, while contemporary private space activities put into question many core theories of space law, they also open the opportunity to build new legal constructions.

That can be done with the interpretative tools familiar to lawyers, such as the rules of the VCLT and analogical reasoning, which have always been used to adapt provisions to new developments through time without recurring to the demolition of the legal framework already in place.

In parallel, where interpretative tools are not sufficient, new legal constructions can be built taking out of the toolbox a more complicated instrument to use: the adoption of new provisions. With the industry pressing and with new forms of multilateralism on the horizon, using that instrument may prove to be easier than thought.

6.2. FINAL REFLECTIONS AND THE WAY FORWARD

Space law is at its first real point of transformation since it was formed in the 1960s and 1970s.

The main reason has to be found in the new dimension of private space activities, which went beyond what was imaginable at the time when the space treaties were drafted and which sparked new life into the reality of human endeavours beyond the atmosphere, spreading excitement and interest in the general public and in the international community as a whole.

With that, however, many certainties of space law have been shaken.

Things that were given for granted do not fit anymore the current status of space activities: the context in which space law is applied today is not the one that the drafters of the space treaties saw, and foresaw.

The new reality that is taking shape in the 2020s is just the beginning: 'new space' operations such as suborbital flights, in-orbit services or lunar missions are now starting to enter the operational phase and are promised to become mature sectors and ordinary fields of activities in the near future.

It follows that the role of States in space law has to be reimagined.

It is unsustainable and illogical to look today at the relationship between States and private actors with the same eyes with which space activities were seen when they were a prerogative of a few governmental agencies using the industry principally under public procurements.

States cannot be responsible for everything that private entities do in outer space. Launching States cannot be the only and the main liable States with respect to private space objects with which they have no actual connection or control.

It is necessary to rethink the space treaties to make them suitable for the context in which they need to be applied and, in that context, non-governmental entities carry out space activities dynamically, changing States, moving from one jurisdiction to another, selling assets in outer space, choosing their flag of convenience, and – as in any field of operation – contravening the law for their own purposes.

How can States cope with this without reviewing the traditional interpretations of their rights and obligations under the system of space law?

The necessity to embrace a new reading of the main provisions on States and private actors is only one side of the coin. The other side is concerned with the evolution of space law.

As the UN has underlined in the Pact for the Future of September 2024: "*We are living through an age of increased access to and activities in outer space. The growth in the number of objects in outer space, the return of humans to deep space, and our expanding reliance on outer space systems demand urgent action. […] The opportunities for people and planet are enormous, but there are also risks that must be managed*"[810].

In light of that, the Pact for the Future reaffirmed the importance of adherence to the OST and of discussing the establishment of new frameworks[811].

Thus, it is clear that the way forward of space law is to embrace a new wave of multilateralism.

Domestic national laws can be used for adopting certain corrective measures that tackle the most pressing issues raised by private space activities. However, their capacity to delineate an encouraging and clear framework for activities in the cosmic domain depends on their coordination at the international level.

Only though multilateral efforts space law can effectively advance.

In front of the transformation of space activities, States are called to embark on a new legislative effort, more difficult than the one of the founders of space law, because the international space community is more complex than ever before.

Nonetheless, the times are mature for a new step in the advancement of space law that suits the contemporary realities of outer space activities, finding the right and delicate balance between maintaining the foundational principles of the space treaties and adapting them to the technological, commercial, and geopolitical realities of the 21st century.

[810] UNGA Res. A/79/1 of 22 September 2024, p. 39.
[811] *Ibid.*

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