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The Emergence of Non-State Actors in Space: Challenging the Traditional Notions of Sovereignty

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Abstract:

Since the inception of space exploration, governments have predominantly pioneered space exploration and established the frameworks of sovereignty in outer space. The United States and the former Soviet Union were in the lead during the Cold War. As sovereignty acquired significant attention within nations on Earth, this focus naturally expanded to their activities in space. However, the growing involvement of non-state actors in space endeavors challenges traditional perceptions of sovereignty. Private companies are currently engaged in the deployment of satellites and are also considering the development of future space habitats. The traditional borders of territorial rights and governance, formerly dominated by nation-states, are blurring as these non-state actors embark on ambitious projects. Furthermore, the expanding footprint of private entities in space activities necessitates reevaluating established space laws and treaties. Given the potential for resource extraction, economic returns, and even

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the establishment of space habitats, there is a pressing need to reconsider traditional sovereignty definitions and practices. By drawing on SpaceX's undertakings as a case study, this research aims to shed light on the complexities of sovereignty in an age where space activities are no longer solely the purview of nation-states.

Keywords: Space, Non-State Actors, Space Exploration, Sovereignty, Outer Space Treaty.

1. Introduction

Space exploration has predominantly been a dominion of states, spearheaded by superpowers like the U.S. and the Soviet Union. Their iconic space race epitomized the heights of state-led initiatives driven by Cold War rivalry and national pride. However, with technological innovations and the rise of private actors in space, non-state actors, primarily private corporations, have started to play a part in space exploration. Companies like SpaceX are not just contractors for state missions but pioneers of independent projects that reshape the space landscape, such as; Starlink Mega-Constellation and SpaceX Mars colonization.

1.1. Problem Statement

With the introduction of non-state actors in space exploration, there is an increased possibility for contradictions and challenges to the Outer Space Treaty (OST) principles. The OST governs space activities conducted by member states, their citizens, collaborative initiatives, and international organizations. The OST's traditional interpretation and implementation of sovereignty in space may no longer fully align with these private organizations' realities and objectives. Moreover, the Treaty did not explicitly cover the non-state actor's involvement in space. As space is a common heritage of mankind (Alshdaifat, 2019) this discrepancy increases potential conflicts and challenges the traditional notions of sovereignty.

1.2. Purpose of the Study

This research investigates the evolving concept of sovereignty and its implications for space activities. The growing roles of non-state actors like SpaceX. Further, the study will investigate its consequences for traditional ideas of sovereignty. With private companies becoming more prevalent

in outer space, their initiatives are being examined against the OST provisions. The objective is to identify areas where present understandings of sovereignty need to be more transparent and to provide recommendations for enhancing space situational awareness and sustainability.

1.3. Research Questions

The study will address several pivotal questions:

1. How are traditional concepts of space sovereignty, as defined by the OST, impacted by the actions of non-state actors?
2. What are the sovereignty implications of non-state actors in space, especially concerning territorial claims and resource utilization?

1.4. Study's Significance

It is crucial to comprehend how private entities will affect established standards, particularly those relating to sovereignty. This research examines the contemporary dynamics of space exploration and governance, emphasizing the significance of non-state actors in determining the course of the future. The study provides a roadmap for designing future space legislation by clarifying the implications and potential interpretations of the Outer Space Treaty.

1.5. Study Limitations.

While the research addresses prominent non-state actors like SpaceX, it might not encompass all private entities in space. In addition, some relevant data, especially proprietary information from private entities, may not be publicly available. This could limit a comprehensive understanding of all non-state actors' activities and intentions in space. Also, Space law can be open to interpretations, especially as delineated by the OST. The study will

rely on the interpretations of legal experts and scholars, which may not always be universally agreed upon.

1.6. Variable Definitions

1.6.1. Non-State Actors: Non-state actors refer to entities other than sovereign states that play a role in space exploration and activities. This primarily includes private corporations but can also encompass non-governmental organizations (NGOs) and intergovernmental organizations (IGOs).

1.6.2. Sovereignty: Traditionally, sovereignty is a political concept that denotes a state's supreme power within its territory. In the context of space, it is a complex term. International space treaties, like the Outer Space Treaty, proclaim space, including the Moon and other celestial bodies, as the "province of all mankind," implying it is not subject to national appropriation. (Ferreira-Snyman, 2021).

1.6.3 Territorial Claims: Refer to formal declarations by states asserting rights to an area or territory based on historical, geographical, legal, or political grounds.

In international law, territorial claims often involve disputes where two or more countries claim sovereignty over the same land or maritime region.

In space, it's a claim by a state or non-state actor to have rights over a specific area or celestial bodies, such as planets or asteroids.

1.7. Study Methodology

1.7.1. Study Approach

The research employs a qualitative approach, focusing on analyzing the Outer Space Treaty and SpaceX's activities and projects. This approach

aids in dissecting the implications of the OST in today's context, especially when private entities like SpaceX play pivotal roles in space exploration.

1.7.2. Data Collection

Primary data for this study are sourced from official documents and provisions of the Outer Space Treaty, which provides the foundational context for space activities and sovereignty. Additionally, reports, mission statements, and documented objectives from SpaceX are consulted to comprehend the company's position and trajectory in space endeavors.

1.7.3. Data Analysis

The study extracts themes and patterns from the qualitative data using content interpretation. This approach facilitates the examination of the provisions outlined in the OST about the rising problems and opportunities presented by non-state actors, with a specific focus on SpaceX. It also involves analyzing the broader implications for space sovereignty and collaboration.

1.8. Literature Review

Over the past decade, discussions surrounding space governance have shifted to encompass intricate debates on sovereignty. Traditionally, space governance was anchored in territorial rights and the jurisdictional claims of states. However, as the involvement of both state and non-state actors in space intensifies, the question of who holds and exercises sovereignty in this vast expanse becomes paramount.

Marino and Cheney (2023) delved into this dynamic, suggesting that as environmental concerns are increasingly integrated into space governance, a comprehensive reevaluation of traditional sovereignty paradigms in

space is essential. The growing commercialization of outer space further complicates the matter, potentially redefining sovereignty in ways that could neglect environmental and ethical considerations. As the frontier of space becomes ever more accessible and contested, there is a pressing need to harmoniously weave the principles of sovereignty.

A significant shift from when space was the only preserve of sovereign nations is taking place, resulting in intricate discussions about sovereignty and the place of non-state entities in space. (Reinalda, 2016) discusses the historical development of state-centric space programs in his paper. These endeavors were mainly motivated by Cold War rivalry and national pride. An infusion of non-state entities that are leading pioneers in space enterprises rather than merely participants is now posing a threat to this established order and several legal, ethical, and policy concerns.

In the realm of space law and policy, asteroid mining is a controversial issue, highlighted by Dr. Philip De Man, in a paper titled "The Exploitation of Asteroids and The Non□Appropriation Principle: Reflections on the Nature of Property Rights in light of the US Space Resource Act of 2015." This research probes the intricate relationship between asteroid exploitation and the non-appropriation principle established in the OST. The OST maintains that celestial bodies are beyond the reach of national sovereignty claims, reinforcing the notion that space and its resources are the "common heritage of mankind." The landscape is further complicated when considering the roles and ambitions of prominent non-state actors like SpaceX on broader sovereignty issues. (De Man, 2016).

Del Canto Viterale emphasizes that the rise of businesses like SpaceX marks a new stage in space exploration where commercial interests and

entrepreneurial innovation have a significant stake. While bringing about improvements and possibilities, this transformation also introduces new difficulties since it places sovereignty issues and legal frameworks in an area formerly strongly tied to state-led activities. Technology developments and a broader understanding of space's economic feasibility are the fundamental drivers of this transition, which calls for reevaluating current treaties and international space law. (Del Canto Viterale, 2023).

These changes raise important questions about territorial claims, resource use, and the discourse surrounding sovereignty in space activities, which international treaties had previously broadly defined from a state-centric perspective. This growing body of research suggests that considering the shifting dynamics and stakeholders, there is an urgent need for a comprehensive understanding and strategy to control space activities. To accommodate and direct the operations of non-state players in space and facilitate a harmonic development in the constantly changing story of space exploration, a concentrated effort in evaluating and rebuilding legal and regulatory frameworks is necessary. Thus, this body of literature creates a favorable environment for research into the complexity of this shift and its effects on the global space community.

2. The Rise of Non-State Actors

The emergence of non-state actors in space, led by companies like SpaceX, signifies a significant transition from traditional, government-led space exploration to a varied and dynamic landscape. These private entities are expanding their scope beyond conventional satellite launches, undertaking ambitious projects such as developing space habitats and resource extraction. (Caldwell, 2023). A prime example of this shift is

SpaceX's Starlink mega-constellation, which aims to provide global internet coverage through a vast network of satellites. Additionally, SpaceX's development of reusable rockets further exemplifies how these private ventures are challenging established norms in sovereignty and space law, introducing new paradigms in space technology and exploration. (Francis, 2023). Given the intricate nature of space systems and the cutting-edge technologies they employ, coupled with substantial initial investment costs—especially for space access—entry barriers for businesses in this sector have remained steep. (Vernile, 2018).

Hence, except for notable areas like satellite communication and launch services, space has traditionally been considered unsuitable for private commercial initiatives, with limited investments from non-governmental players. (Consonni, Rizzi, & Herrera, 2023). Pursuing space activities in regions like the U.S. and Europe has led to a competitive private industrial sector in specific market niches. The conception, deployment, and operation of space systems have still primarily relied on public financial support. (Vernile, 2018). Space exploration, once exclusively within the purview of national governments due to towering financial and technical challenges, has dramatically evolved. (Costa, 2023).

In recent decades, non-state actors, especially private enterprises, have recreated a substantial role in this domain. Factors such as notable achievements by these entities, external influences, and challenges faced have collectively catalyzed their ascent. (Zannoni, 2020). This rise presents both opportunities—like economic growth—and challenges concerning global governance, peace, and security as traditional norms of international interactions get redefined. (European Space Policy Institute, 2017). This research will focus on the leading private space exploration actor: Space

X. In recent years, private companies such as SpaceX, established by Elon Musk in 2002, have emerged as disruptors in the field. The innovative strategy of SpaceX has significantly altered the dynamics of space activity. (Seedhouse, 2013).

SpaceX's accomplishments mainly rely on developing reusable rockets, such as the Falcon 9 and Falcon Heavy, whose ability to land and reuse has significantly decreased launch costs. (Eriksson & Newlove-Eriksson, 2023). In addition, SpaceX's Crew Dragon spacecraft made history when it transported crew members to the International Space Station, marking the first time a private enterprise launched humans into orbit. SpaceX has also unveiled its ambitious Starship, designed for extended flights and potential interplanetary journeys, alluding to future endeavors such as Mars colonization. (Seedhouse, 2013).

Furthermore, the Starlink project, a network of satellites designed to provide global high-speed internet, showcases the commercial potential of SpaceX's endeavors. (Peeters, 2021). Considering these developments, it is evident that private entities like SpaceX are reshaping the landscape of space exploration and commercialization. Their groundbreaking innovations, from reusable rockets to expansive satellite networks, offer more cost-effective solutions and broaden the horizons of space possibilities. (Brian Dunbar, Ed., 2023). Hence, private enterprises continue to intersect with and even lead certain areas traditionally dominated by governments. (Bragg, 2018).

3. Legal Challenges Faced by Non-State Actors

The Antarctic Treaty of 1961, the Partial Nuclear Test Ban Treaty (PTBT) of 1963, the Outer Space Treaty (OST) of 1967, and the United

Nations Convention on the Law of the Sea (UNCLOS) of 1982 collectively form a crucial background that illuminates critical principles in international law, such as peaceful uses, scientific research, and the non-appropriation of global commons. The Antarctic Treaty established a framework for international cooperation and peaceful use in a region beyond national jurisdiction, setting a precedent that influenced the OST. (The Antarctic Treaty, 1961).

The PTBT's prohibition of nuclear testing in outer space laid foundational norms for the non-militarization of space, echoed in the OST. This treaty, in turn, extended these principles to outer space, emphasizing peaceful exploration and use, scientific investigation, and explicitly prohibiting national sovereignty claims over celestial bodies. (Partial Nuclear Test Ban Treaty, 1963). UNCLOS further elaborated on these concepts in the maritime context, particularly regarding the deep seabed as a common heritage of mankind, also not subject to national appropriation. (United Nations Convention on the Law of the Sea, 1982). Understanding these treaties is vital for navigating contemporary research on sovereignty challenges, especially with the increasing involvement of non-state actors in space.

These treaties provide a legal and philosophical context for addressing how private entities engage in activities traditionally reserved for sovereign nations, such as resource exploitation and exploration. (Costa, 2023).

3.1. Sovereignty Implications

The OST is a seminal piece of international legislation, acting as a compass for nations navigating space's vast and uncharted territories. Also, its guiding philosophy was shaped by an aspiration for collective exploration

and use of outer space. It enshrined the noble ideal that space, including the Moon and other celestial entities, belongs to the entirety of humanity and not to any individual nation. (Martinez et al., 2019). This spirit was further echoed in its stipulation that endeavors in space should pivot around the collective good, with the celestial bodies remaining sanctuaries of peace.

In the vastness of space, sovereignty, a cornerstone of international law and terrestrial geopolitics, faces complex reinterpretation challenges. (Berry, 2023). Historically, sovereignty was linked to nation-states' possession and control of territory. With more private entities engaging in space exploration, the traditional contours of this concept are being examined.

The OST prohibits any nation from appropriating outer space, including celestial bodies. As non-state actors, such as SpaceX, develop ambitious Mars colonization goals and entities contemplate asteroid extraction, the lines between what constitutes 'appropriation' and how sovereignty emerges in space become blurred. The vastness, accessibility, and shared nature of space exacerbate these challenges. It is no longer only necessary where a country's borders end but also how state and non-state entities engage in activities beyond our planet. This chapter will delve thoroughly into the concept of space sovereignty. (Martinez et al., 2019). Despite their successes, non-state actors encounter numerous challenges and regulatory impediments.

A complex web of international treaties and national regulations governs the frontier in space exploration and utilization, posing significant challenges for non-state actors such as commercial space companies. Key among these are the 1967 Outer Space Treaty, which lays the foundational

legal framework for space activities, and the 1972 Liability Convention, which establishes principles for liability for damage caused by space objects.

The 1975 Registration Convention also mandates the registration of space objects, linking state responsibility to private sector activities in space. (Storrs, 2022). Companies must also adhere to International Telecommunication Union (ITU) regulations, which are responsible for allocating radio frequencies and satellite orbits since their inception, crucial for avoiding interference in increasingly crowded space domains. Furthermore, space debris guidelines, developed by bodies like the Inter-Agency Space Debris Coordination Committee, emphasize the importance of minimizing and managing space debris, a growing concern with the surge in satellite deployments. (Rajapaksa & Wijerathna, 2017).

Key amongst these is the OST, which places the onus on states to oversee and be accountable for all space activities, including those spearheaded by private entities. (Kenwick & Lemke, 2023). This places an intricate regulatory burden on non-state actors, compelling them to engage in labyrinthine processes for licensing, securing communication frequencies, and ensuring compliance with space debris guidelines. (Sheer, Fatima, Farooqui, et al., 2023). Space debris is usually the materials or objects that are a part of the more significant object that does not have any utility, often referred to as space junk or space waste. (Alameeri, 2021).

Article I of the OST states that: "The exploration and use of outer space, including the moon and other celestial bodies, shall be carried out for the benefit of all mankind irrespective of the degree of their economic or scientific development, and shall be the province of all mankind." Article I

of the Treaty propounds the tenet that outer space exploration and utilization should cater to the collective benefit of all mankind.

This provision presents an intricate challenge for entities like SpaceX. With its groundbreaking initiatives and commercial ventures in space, SpaceX operates at the intersection of corporate ambitions and global obligations. While its endeavors, like the Starship Mars mission or Starlink satellite constellation, may primarily serve business objectives, the OST compels SpaceX to ensure these activities resonate with a broader, altruistic purpose.

Balancing proprietary interests with the Treaty's mandate might necessitate SpaceX continuously reflecting on and adjusting its mission strategies, ensuring they harmonize with the overarching principle of universal benefit. As a private company, SpaceX's endeavors, such as the Starlink project, whose objectives are to provide global internet coverage, must navigate this provision with caution. While SpaceX seeks commercial profitability, the OST imposes the duty to ensure that such endeavors serve global interest. This raises concerns regarding equitable access, particularly for historically underserved or disadvantaged regions. (Taneja et al., 2023).

In addition, the notion that outer space is open to all for exploration threatens SpaceX's long-term strategic goals, mainly if other entities, inspired by SpaceX's success, undertake similar projects, potentially overcrowding or overusing shared space resources. Beyond regulatory complexities, space exploration's financial landscape presents its challenges. While space endeavors promise monumental returns, they demand substantial upfront investments, often with uncertain profit timelines.

3.2. Territorial Claims by Non-State Actors

Territorial claims by non-state actors in outer space present a unique challenge to traditional international law, particularly in the context of the 2015 U.S. Commercial Space Launch Competitiveness Act (CSLCA). This Act represents a significant shift, as it allows U.S. private sector entities to own, transport, and sell resources they extract from celestial bodies, potentially conflicting with the non-appropriation principle of the Outer Space Treaty. (CSLCA, 2015). The involvement of the private sector in space activities, backed by national legislation like this, raises complex questions about sovereignty, property rights, and the use of space resources without a comprehensive international regulatory framework. (Kenwick & Lemke, 2023).

The interest of private operators in mining outer space natural resources has been increasing recently. This growing attention focuses on the potential to own and extract extraterrestrial resources. (Alnuaimi, 2022). The prospect of superpowers extending their rivalries to space loomed large during the OST drafting. As a protective measure, the OST explicitly states that space cannot be subject to national appropriation by any means. The purpose was clear: to ensure that space remains a sanctuary, free from the geopolitical tussles of Earth. (Article II, OST). Non-state actors must use caution while engaging in space activities to avoid unintentionally igniting new geopolitical conflicts or amplifying existing ones. (Kenwick & Lemke, 2023).

Plus, concerns regarding space traffic management are growing due to the proliferation of satellites, the potential for lunar habitats, and the appeal of asteroid mining. (Sheer, Fatima, Farooqui, et al., 2023). Although

economical, these endeavors are part of a much larger geopolitical picture. The dramatic rise of non-state actors in the twenty-first century, which are not subject to the same constraints as nation-states, was something the OST's designers could only partially anticipate. These corporations, driven by a mix of profit, innovation, and exploration, operate in a domain where the rules are still in flux. For instance, a multinational corporation establishes the first mining colony on an asteroid or creates a research habitat on Mars. (Caldwell, 2023) While these acts do not denote 'sovereignty' in the traditional sense, they undeniably establish a presence.

This presence, especially if accompanied by exclusive control or utilization of resources, naturally invokes questions akin to territorial claims. It is not merely about land but about influence, access, and potential economic monopolies. (Caldwell, 2023). Private actors enter ethically shadowy waters when they develop ambitious intentions, such as populating other planets. (Sassen, 2020). The very act of colonization raises a critical question: Who gets to claim foreign territory in space?

Article II of the OST states: *"*Outer space, including the Moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, using use or occupation, or by any other means." SpaceX has outlined ambitious plans, most notably its intention to colonize Mars. Article II of the OST becomes critical in this context. While the company may successfully transport humans to Mars and establish a base or even a colony, the Treaty ensures that neither SpaceX nor the United States (under whose jurisdiction SpaceX operates) can claim sovereignty over any part of Mars. Without the possibility of claiming territory, the legal framework surrounding ownership and rights to use local resources becomes ambiguous. (Sassen, 2020).

There is a looming question of how SpaceX, or any company, would negotiate resource rights, habitation areas, and operational zones, especially when multiple entities establish presences on the same celestial body. Furthermore, how would conflicts be resolved without clear territorial rights, especially those concerning resource extraction or land use? This Article, though concise, raises complex legal and ethical questions regarding SpaceX's interplanetary aspirations. Moreover, since SpaceX's activities, regardless of how autonomous they may be, are ultimately the responsibility of the United States, the boundaries between national and private enterprise endeavors in space become even more blurred. (Ganatra & Modi, 2015-2016).

This interdependence between SpaceX's goals and the principles outlined in the OST suggests a compelling need for national and international legal frameworks to address these evolving challenges. As space exploration and commercialization accelerate, it becomes imperative to reconcile OST's principles with contemporary realities. Article II of the Outer Space Treaty stipulates that outer space, which includes the Moon and other celestial bodies, cannot be appropriated by any nation. This Article specifically addresses the issue of space sovereignty. It poses substantial challenges for a commercial entity like SpaceX with ambitious plans for interplanetary colonization and resource utilization. (Ganatra & Modi, 2015-2016). Even though the company can operate and potentially establish bases on celestial bodies, it cannot assert sovereignty over any territory it occupies or uses. This non-appropriation principle implies that any infrastructure, such as bases or habitats, will not be regarded as U.S. territory even though SpaceX's actions are attributable to the U.S. government. (Alnuaimi, 2022). This lack of sovereignty can introduce legal and operational ambiguities,

mainly when multiple state and non-state actors are active in the same space, questions regarding jurisdiction, dispute resolution, and rights over-extracted raises. (Barral, 2016).

Moreover, Article II of the OST ensures that no nation or other entity, including private companies and individuals, can assert sovereignty over any area in space or its celestial bodies. As interest in space exploration increases, particularly as private entities consider activities such as asteroid extraction and colonization, the significance of this provision grows. (Putro, 2020). However, the current legal consensus holds that space is a public domain, open to exploration and use by all but owned by no one. (Munro, 2022).

3.3. Jurisdictional Challenges

The ambiguity and uncertainty characterizing the current outer space regime pose challenges and obstacles for sectors seeking to explore and exploit the region. (Al Shehhi & Haleelo, 2023).

In the domain of international law, "jurisdiction" refers to a state's authority and capacity to exercise sovereignty, typically guided by the principle of effectiveness. This authority can encompass various domains, including regulating individuals, assets, and events. However, the complexities of jurisdiction become particularly pronounced in the context of outer space, where non-state actors play an increasingly significant role. The challenge arises from the absence of well-defined territorial boundaries in space, rendering traditional jurisdictional principles rooted in geography inadequate. (Marchisio, 2010).

Instead, jurisdiction in space hinges on a multifaceted interplay of factors, including the registration of space objects, the nationality of the involved

entities, and the nature of the activities conducted. While international agreements like the OST provide a foundational framework for addressing jurisdictional issues, they primarily emphasize state responsibility. The direct involvement of non-state actors, such as private companies, is not explicitly addressed in the OST, potentially leaving gaps in the regulation of jurisdiction considering their expanding roles in space activities.

The most significant guiding principle in the OST is that space is for the benefit of all humanity and devoid of territorial claims. (Putro, 2020). It holds nations accountable for all domestic space activities. Thus, the laws of the country where the private company is based would govern any economic endeavor. Unlike territorial jurisdictions on Earth, space does not belong to any nation. However, when space activities developed and took on increasingly complicated shapes, the OST's clarity became insufficient and can be interpreted differently. Consider the scenario when a private company operates a satellite launched from another country's territory and interferes with operating a third country's satellite system. (Schoenefeld, 2021). The lines between international obligations and national laws can blur. While the OST requires that national laws apply to spacecraft, determining the distinctions of these laws for private entities can be complicated.

This demonstrates potential diplomatic challenges in addition to problems with jurisdiction. (Schoenefeld, 2021). Furthermore, a degree of complexity is added when more ambitious plans are considered, such as mining asteroids or establishing long-term outposts on celestial bodies like the Moon. When multiple organizations from many nations operate close to one another, the interplay of many jurisdictions becomes a complicated problem. (Jakhu & Pelton, 2016).

3.3.1. The Concept of "National Activities"

Dr. Frans G. von der Dunk's paper titled "Scoping National Space Law: The True Meaning of 'National Activities in Outer Space' of Article VI of the Outer Space Treaty" (2020) examines the complexities surrounding Article VI of the OST. This article emphasizes the accountability of nations for space activities, extending to both government and private sectors. The paper highlights the need for precise definitions in national space laws to align with the increasing involvement of private entities in space, stressing the importance of conforming to international legal standards in this evolving domain.

Concerning private activities in outer space, practical application has demonstrated that the nationality criterion is not always absolute. Given the absence of a rigid definition within the OST, states have, in their domestic space legislation, adopted a more expansive interpretation of the concept of "national activities." This broader interpretation can encompass activities conducted not only from a state's territory or jurisdiction but also activities conducted by foreign entities within their territory or jurisdiction. (Marchisio, 2010). Furthermore, states have extended the notion of "national activities" to include activities undertaken by their nationals from the territory of another state or from areas considered global commons, such as the high seas. Additionally, states have considered activities conducted by non-nationals within their territory or jurisdiction as falling within the purview of national activities. (Von der Dunk, 2020).

Linking it back to OST, Article VI of the OST can be divided into three key sections, each critical for regulating space activities in the context of private space companies. The first section, 'national activity,' holds states

responsible for all space activities conducted within their jurisdiction, including those by private entities. This ensures that private companies adhere to OST principles. (Gutzman, 2017). The second section focuses on 'authorization and continuous supervision,' requiring states to oversee the operations of these companies to maintain legal and ethical standards. The third section, 'appropriate state party,' mandates that a specific state is accountable for the actions of private companies in space, underscoring the essential role of national governments in upholding international space law. (Von der Dunk, 2011). As per OST Article VI, "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 outlined in the present Treaty."

Article VI of the OST outlines a fundamental principle: States retain international responsibility for all activities in outer space, irrespective of whether government agencies or non-state actors conduct them. This principle ensures that countries can only partially avoid their obligations under the OST by shifting specific responsibilities to the private sector. In an era defined by the emergence of capable private space entities such as SpaceX, the significance of this clause has increased significantly. (Dasgupta, 2019). While autonomous in operation, these commercial space ventures remain attached to the legal and regulatory frameworks of their respective home nations, with states mandated to exercise oversight and ensure that these entities' actions in space comply with the Treaty's provisions. (Ganatra & Modi, 2015-2016).

In summary, the first section of Article VI functions as a precaution to prevent the disorderly conduct of space activities. It provides the

groundwork for an internationally accountable, structured space exploration and utilization approach. (Gutzman, 2017).

3.3.2. Regulating of Non-Governmental Activities

According to OST 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." The Article introduces a pivotal dimension to the regulation of space activities, emphasizing the crucial role of states in overseeing non-governmental activities beyond Earth's atmosphere. This provision acknowledges private entities' growing significance and influence in space exploration and utilization. (Foster, 2016). However, the Article situates jurisdiction with the states. By mandating that non-governmental entities operate under the purview of their respective states, Article VI establishes a clear jurisdictional framework: regardless of who conducts the activity in space, the responsibility and authority are always traced back to the state.

However, the phrasing of Article VI of the OST, which states that the appropriate State Party must "authorize and continue to supervise" non-government space activities, makes it difficult to determine how this supervision can be conducted. (Von der Dunk, 2011). The Treaty fails to elucidate the exact nature, mechanisms, or degree of the said "authorization and continuing supervision." This lack of specificity can lead to disparate implementation by states, with some adopting stringent oversight mechanisms. (Foster, 2016). In contrast, others may opt for a more lenient approach, fostering inconsistencies in space activity regulation. This variability becomes particularly concerning given the OST's absence of clear punitive measures or sanctions for states neglecting their supervisory

duties. Without a universally agreed-upon framework and associated consequences for its breach, there is an underlying risk of non-compliance, potentially jeopardizing outer space's harmonious and cooperative use.

This highlights the pressing need for refining the OST or introducing supplementary agreements to mitigate ambiguities and reinforce accountability. (Bragg, 2018). Frans G. von (2011) highlighted in his paper the underlying political disagreements in the 50s and 60s between the primary space superpowers, the U.S. and the Soviet Union, concerning the role of non-state entities in space. The U.S. was more open to private space activities, while the Soviet Union, aligned with its communist ideology, strongly opposed private involvement in strategically significant areas like space. Article VI introduced a distinctive perspective on the role of private enterprises in space. Unlike general international law, which delineates between a state's "direct responsibility" for its actions and a more nuanced "due care" or "due diligence" responsibility for private entities. (von der Dunk, 2011). Article VI does not differentiate, it uniformly holds states accountable for all space activities, irrespective of whether government agencies or private entities conduct them. (De Man, 2015-2016).

3.3.3. Shared Responsibility

In regards to shared responsibility Article VI of the OST states, "When activities are carried on in outer space, including the Moon and other celestial bodies, by an international organization, responsibility for compliance with this Treaty shall be borne both by the international organization and by the States Parties to the Treaty participating in such organization." Although the section of Article VI underlines the shared responsibility of international bodies and their member nations, the scope and mechanisms of this shared responsibility remain unclear. (Gutzman, 2017). The Treaty does not factor

in how accountability should be distributed in cases of violations or the specific repercussions for individual member states versus the international organization. This leaves room for interpretative challenges. For instance, if an international consortium violates the Treaty, would all member states face equal consequences, or would penalties be scaled based on the role or contribution of each member in the violating activity?

Furthermore, the Treaty must provide a precise mechanism for resolving disputes or disagreements between the international organization and its member states regarding accountability. In addition, this lack of clarity could lead to prolonged legal battles, delays in rectifying Treaty breaches, and challenges in ensuring the consistent application of the Treaty's provisions. (Gutzman, 2017). Fast forward to the present, and we are during a space revolution, steered not just by nations but significantly by private entities. While decreeing nations to exercise control and take responsibility for all space activities, including those of non-state actors. The OST needs to have granularity on the mechanisms and extent of this supervision. This creates a gap in oversight, especially when private interests only sometimes align with collective benefits.

On the other hand, the OST's scope conspicuously omits details on the extraction and utilization of space resources. Its intent to prevent sovereign claims over celestial territories inadvertently left room for ambiguity regarding resource exploitation. This becomes especially pertinent considering ambitious projects like asteroid mining. (LI Hoe et al., 2018). Herein lies a problem: While a company might have the technological competency to mine resources from space, the legal landscape needs to be more robust about the propriety of such actions. This raises complex debates about the rights to these resources, the legal framework governing their extraction, and the equitable distribution of the ensuing benefits.

4. Case Study

4.1 SpaceX's Mars Plan: Sovereignty Issues on Mars Colonization

Elon Musk, the entrepreneur who founded SpaceX, has clarified that one of its main goals is to colonize Mars. The goal is not merely to send human-crewed missions to the Red Planet but to establish a permanent human presence there. (Wall, 2017). However, one critical issue surrounding this ambition is sovereignty and the legal right to appropriate land on Mars. (Levchenko et al., 2021).

The ambitious plans for Mars colonization, particularly those proposed by private entities like SpaceX, bring to light significant issues concerning sovereignty and the principle of non-appropriation as outlined in international space law. These issues are central to the ongoing debate among space law experts, governments, and other stakeholders in the international community. (Francis, 2023). As a result, many nations, including the U.S., have ratified the OST, which states that the moon and celestial bodies are "the province of all mankind." This would suggest that no country or company can claim sovereignty on Mars. However, the ambiguity lies in what constitutes "appropriation." While setting up a base might not be claiming sovereignty, the large-scale colonization envisaged by SpaceX could fall into this category. (Putro, 2020).

Antonino Salmeri a space lawyer specializing in the governance of space resources Voiced his concerns in an article titled "No, Mars is not a free planet, no matter what SpaceX says." Salmeri emphasized that while space exploration encourages innovation and scientific advancements, the requirement to adhere to established space law remains critical for the sustainability of space activities. (Salmeri, 2021). The idea that Mars is a

"free planet," as SpaceX promotes, opposes the long-standing international consensus that space is a domain of common human heritage. Caldwell also examined the discussion, comparing the legal frameworks surrounding colonization efforts in different contexts. He specifically focused on the claims made by SpaceX regarding Mars colonization. (Caldwell, 2023). Moreover, he underscored that while the ambition to colonize Mars is commendable, the claims raise significant concerns regarding international space law, potentially setting precedents that might lead to "planetary pandemonium." (Costa, 2023). The sovereignty debate, focusing on land and resource ownership, demands unique rules for development. These complexities in exploration and resource use emphasize the need for flexibility within international space law. (Zannoni, 2020).

5. Key Findings

Recent shifts in space exploration dynamics have prompted a reevaluation of traditionally held notions about the primary actors in outer space. Historically, space endeavors were primarily the purview of nation-states, a natural consequence considering the significant technical expertise and resource allocation required. However, prominent corporate entities such as SpaceX are becoming central figures in the contemporary landscape. (Seedhouse, 2013). This evolving dynamic necessitates closer scrutiny of foundational space treaties, notably the 1967 OST.

Question 1: How does the OST address non-state activities in space? In the OST, non-state activities in space are predominantly addressed through Article VI, which establishes that states bear "international responsibility" for both their governmental and non-governmental actions in space. This means that private entities, regardless of their independence, are tethered to

their respective nation-states, which are held accountable for ensuring these entities' activities comply with the Treaty's provisions. While the Treaty sets foundational guidelines emphasizing state responsibility and underscores the obligation for national oversight, it needs more detailed mechanisms for enforcement, especially in the context of the rapidly evolving private space sector. The burgeoning involvement of private actors necessitates more precise guidelines to ensure peaceful and responsible space activities.

Question 2: How are traditional concepts of space sovereignty, as defined by the OST, impacted by the actions and aspirations of non-state actors like SpaceX? With their sophisticated space missions and ambitious projects like Starlink and Mars colonization, entities like SpaceX present potential tensions with these concepts. In contrast, the OST requires states to be accountable for their national and non-state endeavors in space.

Private actors' unforeseen nature, scope, and potential commercial and territorial interests can cause traditional boundaries to overlap. The ambitions of these non-state actors, which press the boundaries of exploration and commercial use, challenge the OST's foundational principles, highlighting potential gaps in the Treaty and necessitating a reevaluation of how sovereignty in space is conceptualized and regulated.

Question 3: What are the sovereignty implications of non-state actor space operations, especially concerning territorial claims and resource utilization? The OST stipulates that space exists outside national jurisdiction and forbids nations from claiming celestial bodies. However, questions about extraterrestrial resource rights arise with non-state actors like commercial companies pursuing space mining and habitat establishment.

The OST does not clearly define the rights of these non-state entities in resource extraction, leading to potential disputes over property rights

and territorial jurisdiction. (Taneja et al., 2023). Such endeavors by these entities could imply de facto territorial claims, pushing the boundaries of international space law and prompting a rethinking of sovereignty in the context of private space activities. While the boundaries between state and private activities become increasingly porous, a critical discourse emerges on responsibility, the ambit of legal jurisdiction, and the contemporary interpretation of space sovereignty. (Bruhns & Haqq-Misra, 2016). Moreover, reassessment rules and governance systems considering these non-state actors' active participation. There is a rising belief that, although private entities' objectives may speed up innovation and provide more affordable solutions, they should not be at the expense of undermining global standards and the essence of cooperation.

6. Conclusion and Recommendations

7.1. Conclusion

In conclusion, the emergence of non-state actors and their increasing prominence in space exploration represent a significant paradigm shift, challenging traditional practices and underscoring the need to reevaluate established guidelines. This evolution in space activities resonates with the foundational principles laid out in key international agreements such as the Antarctic Treaty, PTBT, the OST, and the UNCLOS. Though governing different domains, these treaties converge on common principles that are increasingly relevant in space exploration. These include the peaceful use of global commons, the principle of non-appropriation, and the recognition of these areas as part of the common heritage of humanity.

The insights gathered underscore the inadequacy of current treaties like the OST in addressing the multifaceted role of private entities. Moreover,

the study stresses the crucial responsibility of states in the authorization and supervision of these entities, ensuring that space remains a harmonious frontier. From the insights drawn, it becomes abundantly clear that collaboration and joint efforts are the cornerstones of a prosperous and conflict-free future in space exploration. Without structured platforms for dialogue, shared knowledge, and cooperative planning, there lies a potential risk of disputes. Specialized mechanisms, specifically tailored to address and resolve space-related disagreements, ensure that space activities continue smoothly and beneficially for the benefit of all mankind. Moreover, while the current research has provided a comprehensive understanding of the present scenario, the rapid advancements in technology and geopolitics demand consistent revalidation and updating of these findings. Future directions should focus on anticipating upcoming challenges, especially as space endeavors become more complex and varied. Ongoing examination of the evolving roles of non-state actors, assessment of their impacts, and refinement of collaborative and legislative approaches will be vital.

7.2. Recommendation

The entry of non-state actors into space exploration and their growing influence have accentuated the need for evolved regulatory and collaborative frameworks. While the OST was a landmark in space law, its articulations primarily catered to an era dominated by state actors. The current trend, characterized by private entities like SpaceX, calls for a review of such provisions. The OST needs revisions beyond generic stipulations, providing specific guidelines for non-state actors. For example; building a mechanism in addressing the legal obligations, rights, liabilities, and particularly the extraction and sharing of private space activities.

At the national level, states are responsible for monitoring and managing the activities of private entities originating within their jurisdictions.

Comprehensive regulations in terms of authorization and supervision harmonious with global norms must be established and reflect the nation's specific contexts and capacities. Moreover, Private entities operating in space must be prepared and even mandated to cover potential damages caused by their activities. Beyond the regulatory aspect, states should act as catalysts for innovation, investing in research and development to ensure safer and more sustainable space endeavors.

Collaboration remains the cornerstone of future space exploration, particularly in this new era. This would enhance the atmosphere of partnership and streamline global endeavors. With the potential for disputes over space resources, creating a specialized dispute resolution mechanism is equally essential. Such a system should address the unique difficulties of space and provide equitable and universally accepted solutions. Encouraging collaborative ventures and shared missions could further entwine interests, ensuring that space remains a frontier of human cooperation instead of conflict. Given the technological advancements in space and the increasing interest of private entities in space exploration, there is a need for more explicit laws and regulations.

Enhancing Space Situational Awareness is essential for a safe and secure space environment and is crucial for government and private sector activities. This enhancement entails advanced tracking and monitoring of space objects to prevent collisions, effective space traffic management, and hazard identification, thus enabling informed decision-making and risk mitigation in an increasingly congested space environment. Concurrently, promoting space sustainability is vital, demanding the development and enforcement of guidelines to minimize space debris and ensure responsible mission conduct. These measures aim to prevent space's harmful

exploitation and environmental degradation, balancing private actors' interests and activities with the overarching principles of state sovereignty and international space law.

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ظهور الجهات الفاعلة غير الحكومية في الفضاء: تحدي المفاهيم التقليدية للسيادة

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ملخص البحث:

منذ المراحل الأولى من عصر الفضاء، كانت الحكومات رائدة في استكشاف الفضاء، ووضعت نطاق السيادة في الفضاء الخارجي. وكانت الولايات المتحدة والاتحاد السوفييتي في المقدمة في هذا المجال خلال الحرب الباردة. ومع اكتساب السيادة اهتمامًا كبيرًا بين الدول، امتد هذا التركيز بشكل طبيعي ليشمل أنشطتها في الفضاء. ولكن، في العصر الحالي، نجد أن بعض هذه الشركات تمتلك قدرات تكنولوجية وموارد مالية تمكنها من إطلاق مهمات فضائية بشكل مستقل. ومع ذلك، فإن المشاركة المتزايدة للجهات الفاعلة غير الحكومية في المساعي الفضائية تتحدى التصورات التقليدية للسيادة. تعمل الشركات الخاصة حاليًا على نشر الأقمار الصناعية وتدرس أيضًا تطوير المستعمرات الفضائية المستقبلية. إن الحدود التقليدية للحقوق الإقليمية والحكم، أصبحت غير واضحة مع شروع هذه الشركات غير التابعة للدولة في مشروعات طموحة. وقد أدى هذا إلى طمس الحقوق الإقليمية والحدود الحكومية المحددة سابقًا في الفضاء الخارجي. إضافةً إلى ذلك، فإن البصمة المتزايدة للكيانات الخاصة في الأنشطة الفضائية تتطلب إعادة تقييم قوانين ومعاهدات الفضاء المعمول بها. ونظراً لإمكانية استخراج الموارد، والعوائد الاقتصادية، بل حتى إنشاء مستعمرات خاصة، هناك حاجة ملحة إلى إعادة النظر في تعريفات وممارسات السيادة التقليدية. بالرجوع إلى برامج شركة SpaceX في الفضاء، يهدف هذا البحث إلى تسليط الضوء على تعقيدات السيادة في عصر لم تعد فيه الأنشطة الفضائية من اختصاص الدول فقط

الكلمات الدالة: الفضاء الخارجي، اتفاقية الفضاء الدولية، السيادة، الجهات غير الحكومية، استكشاف الفضاء

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