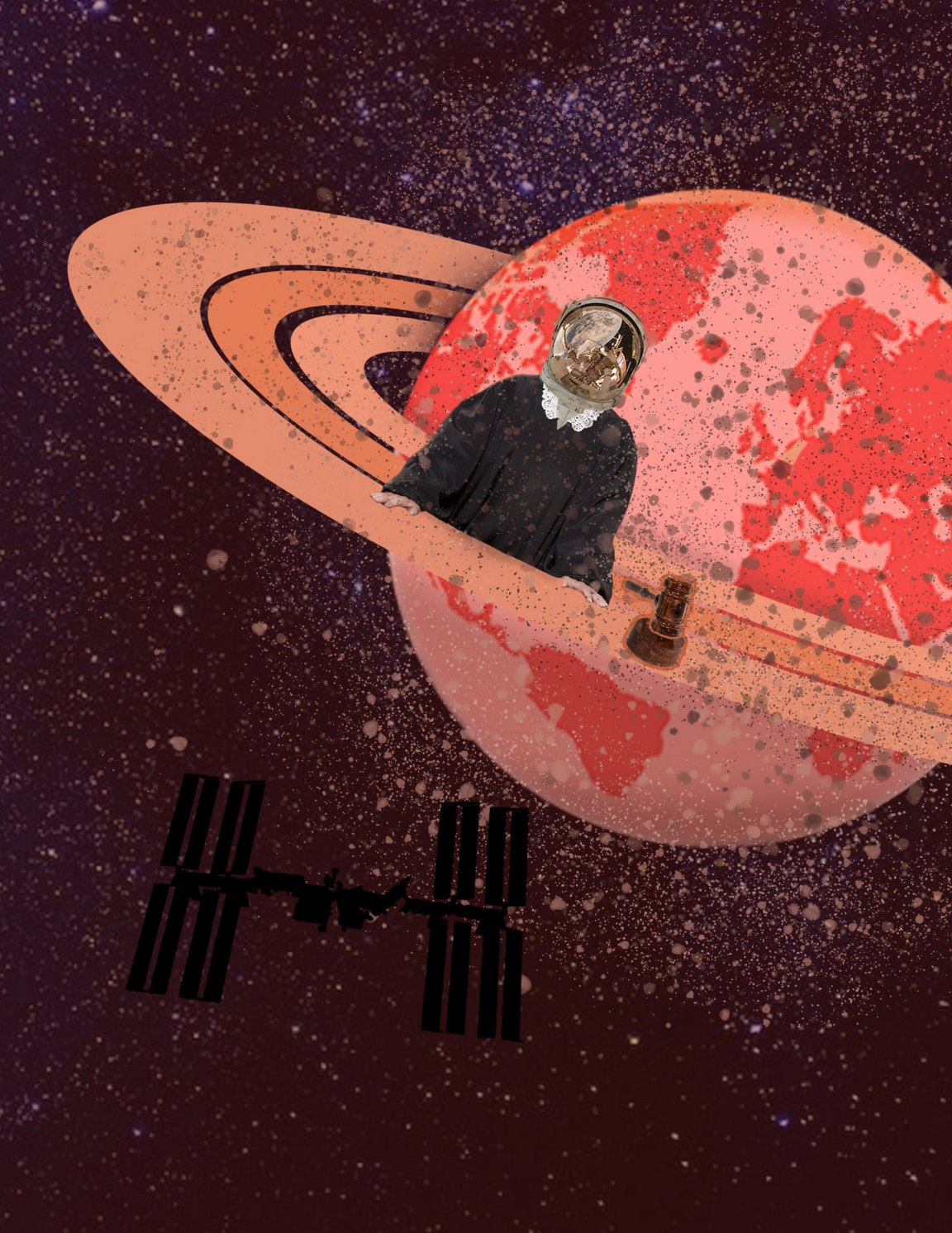

Do look up: Current Challenges and Needed Reform in International Space Governance

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AUTHOR'S NOTE

"The Earth is a cradle of the mind, but we cannot live forever in a cradle." - Konstantin E. Tsiolkovsky, Father of Russian Astronautics, 1896

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Abstract

This paper identifies the militarization of outer space and space debris as two primary challenges to the current system of global space governance and security and situates them within the existing international legal framework. Given the Cold War heritage of space law, I suggest it has become outdated and underdeveloped. However, a total abandonment of space law is unnecessary, as these issues can be addressed by modifying the current legal framework. Specifically, potential amendments to Article IV of the Outer Space Treaty and the reinforcement of the Registration Conventions and the Liability Conventions are discussed. I conclude that through targeted amendments and expansions, space law can be effectively updated to address emerging twenty-first century challenges.

Introduction

The launch of Sputnik 1 on October 4th 1957 heralded the beginning of a new era for humankind. This event not only had important political consequences in the context of the Cold War rivalry between the United States and the Soviet Union, but also spurred the development of a new field of international law to regulate the peaceful usage of outer space. Over the following decades, the field of space law grew to encompass a series of international treaties, principles, methods of best practice, and new international organisations (IOs). As the usage of space has intensified since the 1950s, issues have continued to multiply over time, yet space law has remained largely static. Some scholars have begun arguing that space law is no longer relevant in the management of outer space and is "destined to fail" (Quinn 2008, 488). This raises a serious question: how effective is space law at addressing current issues in global space governance and security?

This paper identifies two primary challenges to the current system of global space governance and security: the militarisation of outer space and space debris. This paper further situates them within the current international legal framework.. Based on this analysis, I argue that space law is becoming increasingly outdated and that it needs further development. However, a total abandonment of space law is unnecessary, as steps can be made to resolve these issues within the current legal framework through targeted modifications. This paper provides an overview of the current legal regime of outer space, as well as an outline of the issues of space militarisation and space debris, and their intersection with space law. The findings of space law's outdatedness and underdevelopment are discussed in relation to these two challenges. Finally, potential amendments to space law: the amendment of Article IV of the Outer Space Treaty and the reinforcement of the Registration Conventions and the Liability Conventions, are evaluated.

Overview of Existing Space Law Treaties and Principles

Space law is primarily composed of five international treaties and five sets of principles that govern the usage of outer space (United Nations Office for Outer Space Affairs *n.d.*a). These rules were developed through the United Nations, particularly via the Committee on the Peaceful Uses of Outer Space (COPUOS). The Outer Space Treaty is the cornerstone of international space law and "serves as a 'constitution' for international space activity and provides the framework for the present-day legal regime regulating outer space" (Ford 2017, 240). Some of its most important articles are Article II, which prevents states from claiming sovereignty over space, and Article III, which places the exploration of space under international law (United Nations Office for Outer Space Affairs 1966).

The Outer Space Treaty was further elaborated upon in subsequent international treaties. The 1968 "Rescue Agreement" specifies the steps required for the safe return of astronauts and spacecraft

should they land in another country. The 1972 Liability Convention establishes the procedures for the settlements of claims for damages made by space objects on Earth or to other space objects. The convention also defines the terms 'damage,' 'launching,' 'launching state,' and 'space object,' which are crucial for legal settlements (United Nations Office for Outer Space Affairs 1971). The 1976 Registration Convention "expanded the scope of the United Nations Register of Objects Launched into Outer Space" and clarified certain issues "relating to States Parties responsibilities concerning their space objects" (United Nations Office for Outer Space Affairs, *n.d.*b.). Finally, the Moon Agreement expands on several clauses of the Outer Space Treaty regarding natural resources in space.

In addition to the five United Nations treaties on outer space, there exist five declarations and legal principles that complement them: the "Declaration of Legal Principles", the "Broadcasting Principles", the "Remote Sensing Principles", the "Nuclear Power Sources Principles" and the "Benefits Declaration." These documents outline legal principles which are generally accepted, but are much closer to the legal status of a UN General Assembly resolution in terms of binding enforceability than that of an international treaty (United Nations Office for Outer Space Affairs *n.d.*a).

Current and Future Challenges to Space Governance and Security

Militarization of Outer Space

Currently, most military activities in space are to provide support for armed forces on the ground through "weather forecasting, communications, precision timing and navigation, reconnaissance (of various types), and early warning" (Motz 2014, 122). Access to such information is critical in modern warfare. The United States still enjoys the immense space capabilities it acquired during the Cold War and continues to dwarf all other countries' military space programs (122). While Russia also maintains significant space capabilities, it has suffered greatly by the dissolution of the Soviet Union and is currently "further behind the US military in space than it was during the Cold War" (122).

One of the most pressing concerns in the militarization of outer space is the development and testing of anti-satellite (ASAT) weaponry (Ford 2017, 239). Since satellites are essential in the conduct of modern military activities and espionage, they constitute a prime target for rival states. Such an attack could also have an important impact on civilian wellbeing as many satellite technologies are used for both civil and military purposes. The Global Positioning System (GPS), for example, guides American missiles, but is also used by civilians across the world for localisation purposes. Although several types of ASAT weapons exist, the most common form, and the easiest to develop, is the kinetic energy type, which destroys its target through the sheer kinetic force generated by colliding with it at high speeds (Kuplic 2014, 1138). Although the United States and Soviet Union both developed a variety of ASAT weapons during the Cold War, the success of a Chinese ASAT missile test in 2007 has spurred its neighbors to further develop their own militarised space programs. Japan was quick to modify its legislation and in 2008, authorised the military use of space. India also launched its own ASAT weapons program which resulted in a successful test as recently as 2019 (Tellis 2019). Just as during the Cold War, new military competition in the space race only exacerbates existing tensions between space powers and hampers international cooperation on addressing issues of space governance. The prospects of such an arms race are clear and concerning.

Militarization in Space Law

Article IV of the Outer Space Treaty specifically deals with the militarization of space. This article strictly forbids the placement of weapons of mass destruction (WMD) in space, whether in Earth orbit or on other celestial bodies (United Nations Office for Outer Space Affairs 1966). However, it is important

to note that other types of armaments are not mentioned. This leaves the possibility for the presence of non-WMD armaments and even orbital military bases (Kuplic 2014, 1144).

These other military activities are covered by the second, more complicated, part of article IV, which states that "[t]he Moon and other celestial bodies shall be used by all States Parties to the Treaty exclusively for peaceful purposes" (United Nations Office for Outer Space Affairs, 1966). As there is no definition in the treaty as to what constitutes "peaceful purposes," the interpretation of this term "is crucial to determining the legality of actions in outer space under the Outer Space Treaty" (Kuplic 2014, 1145). This ambiguity has led to different interpretations in different countries. For example, based on the precedent of the 1959 Antarctic Treaty, the Soviet Union traditionally argued that "peaceful purposes" meant "non military" while the United States, by contrast, interpreted the term "peaceful purposes" as "non aggressive" (1145-1146). This was because the United States already had military intelligence satellites in space at the time "and therefore hoped to secure the legality of those satellites while also protecting them by prohibiting military actions in space" (1145). Although today the interpretation of "non aggressive" is more widely accepted, this lack of clarity and consensus has resulted in confusion on the international stage.

Since ASAT weapons do not fall under the category of WMDs and because they can be launched from Earth, their development and use does not violate the Outer Space Treaty (Ford 2017, 244). This has resulted in a "glaring gap in the coverage" of the treaty as "it does not prevent the use of weapons in space that are not weapons of mass destruction and are not used on the moon or other celestial bodies" (244). At the time of the creation of the Outer Space Treaty in 1967, "the stationing of nuclear weapons in orbit was the only significant military threat that [the United States or the Soviet Union] could envision in space." (Englehart 2008, 144). The weapons of today were either in their very infancy or were pure science fiction, and were therefore not considered

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Space Debris

Space debris is defined by the National Aeronautics and Space Administration (NASA) as "all man-made objects in orbit about the Earth which no longer serve a useful purpose" (NASA Orbital Debris Program Office, *n.d.*). Over the years, human activity in space has produced waste from used rocket stages, defunct satellites, and even solid fuel emissions. While some debris burns up in the atmosphere, much of it remains in orbit for long periods of time. This has effectively turned Low Earth Orbit (LEO) into an "orbital space junk yard" with an approximate 6,000 tons of materials still in orbit (National Aeronautics and Space Administration, *n.d.*a). Even a very small piece of debris can cause significant damage to a spacecraft or a satellite because such objects move at speeds of up to 18,000 miles per hour in LEO (National Aeronautics and Space Administration, *n.d.*a; National Aeronautics and Space Administration *n.d.*b). Space debris is especially dangerous because of the Kessler Syndrome. This phenomenon occurs when two space objects collide at very high speed, creating a snowballing chain of collisions as the debris from the first crash destroys other satellites (Pelton 2015, 2). Such a cascade of debris would be devastating to the planet's satellite infrastructure and pose a long-term threat to the exploration and exploitation of space, as certain Earth orbits would become clogged by impassable debris (Shackelford 2014, 494).

In addition to the traditional creation of 'space junk' from the human exploration and exploitation of space, the militarization of outer space also has an impact on the creation of space debris. Indeed, kinetic ASAT weapon tests performed on defunct satellites produce large amounts of debris when the satellite is destroyed. For example, the 2019 Indian ASAT test created some 400 new pieces of orbital debris, some of which intersected the orbit of the International Space Station and increased the risk of collision by 44 percent over the course of the next ten days (Safi

and Devlin 2019). ASAT tests can be particularly dangerous because unlike old satellites or rocket parts, which are large and easy to track, debris from the destruction of a satellite is often smaller than 10 cm and thus impossible to track (Safi and Devlin 2019). If safe access to orbits in LEO is to be maintained for satellites and crewed spacecraft, the generation of space debris must be carefully mitigated.

Space Debris in Space Law

Considering the rising importance of orbital debris in the governance of outer space, space law is woefully ill-equipped to effectively address the problem. In fact, the words "space debris" are "wholly absent from international space law", meaning there is no definitive definition of what constitutes orbital space debris (Von der Dunk 2001, 2). While the Liability Convention and the Registration Convention do define the term "space object," there is no such comparable definition for the term "space debris" (Pelton 2015, 2). The Outer Space Treaty does allude to this subject in Article IX where it states that State Parties "shall conduct all their activities in outer space […] with due regard to the corresponding interests of all other State Parties to the Treaty" (United Nations Office for Outer Space Affairs 1966). Since space debris can be destructive and consequently harm the interests of other space-faring nations, this could be interpreted as requiring States Parties to limit the amount of space debris they produce. Article IX also affirms that States Parties to the Treaty should "conduct exploration of them [outer space, the moon, and other celestial objects] so as to avoid their harmful contamination […] and, where necessary, shall adopt appropriate measures for this purpose" (United Nations Office for Outer Space Affairs 1966). However, the Outer Space Treaty remains vague and does not define what constitutes either "harmful contamination" or "appropriate measures."

The international community has taken steps to reduce space debris. Indeed, the Inter-Agency Space Debris Coordination Committee (IADC), "an international forum of government bodies for the coordination of activities related to the issues of man-made and natural debris in space," was created to address this issue (Inter-Agency Space Debris Coordination Committee 2002). This forum produced the Space Debris Mitigation guidelines in 2002, which were later refined in 2007, and focused on limiting orbital breakups during and after missions (Pelton 2015, 5). The UN COPUOS worked closely with the IADC to come up with these guidelines and succeeded in turning the framework into a UN General Assembly resolution later that year (5). These guidelines have successfully inspired some changes to state behaviour, notably those of France and China, which now place a greater emphasis on debris mitigation in their national space policies (Jakhu and Pelton 2017, 288). However, despite these new UN guidelines, the creation of space debris continues to worsen. Contrary to the five binding United Nations treaties on outer space, the guidelines of the IADC and the UN COPUOS are recommendatory in nature. They are therefore not only non-binding but have "no enforcement mechanisms nor any penalties for non-compliance" (288). Thus, though a space free of dangerous orbital congestion is in the interest of all states, few have felt pressured to take decisive action (289). In this regard, the soft law nature of these regulations hinders their effectiveness in addressing space debris because there are no consequences in the current international regime for not respecting them.

Findings

Space Law is Fast Becoming Outdated

Based on the analysis of two of the most pressing challenges facing global space governance and security, I find that space law has not been able to adapt to the important technological and environmental changes that have occurred in the fifty years since its creation. Space law was created in the context of bipolar superpower rivalry in which nuclear security was of primary concern (Blount 2011, 516). The importance of the ban on the deployment of space-based nuclear

weapons in Article IV is a prime example of this focus. However, such language has not been able to keep up with the technological advances space weaponry has made since 1967 (Englehart 2008, 144). The driver of space militarization is not space-based nuclear weapons anymore, but ASAT missiles, which are free to be deployed and proliferated because of their non-WMD character.

The environment of outer space has also changed significantly since the signing of the Outer Space Treaty. Space is much busier now than it was in 1967 and the problem of space debris has become much more pressing. The exploitation of outer space has considerably intensified since the 1960s. Although the IADC and the United Nations Office of Outer Space Affairs (UNOOSA) have provided guidelines on how to reduce the creation of space debris, these do not have the same force as international treaties. Though the Registration Convention and the Liability Convention were sufficient in the 1960s, they are now too simplistic to deal with the expected increase in space collisions and the compensation problems that ensue. Indeed, proper attribution of space debris, key to determining liability and compensation, remains a problem: "identifying the nationality of a screw traveling nearly 18,000 mph is no easy matter" (Shackleford 2014, 497).

The Outer Space Treaty is therefore largely held hostage by its Cold War heritage. Both the military technology and the intensity of outer space usage have evolved beyond what the drafters of space law originally envisioned. The provisions of space law addressing the most pressing issues of the Cold War are no longer the primary concern of today's states. Despite these changes, no major updates have been successfully made to prepare space law for the future by the Legal Subcommittee of the UN COPUOS because it takes extensive time and energy to achieve consensus between all members (Jakhu and Pelton 2017, 32). The static character of space law has resulted in the Outer Space Treaty addressing the issues of space governance from the 1960s and not those of today. As the time between the treaty's first signing and the current context increases, the Outer Space Treaty runs the risk of being reduced to purely abstract values and aspirations, as its more concrete provisions will no longer be adapted to the situation in space. As Jakhu and Pelton point out, such "nebulous principles" run the risk of confusing state activities in outer space, rather than benefiting them because determining specific international obligations becomes more difficult (2017, 130). Space law will therefore need to be "renovated" if it wishes to remain relevant in the twenty-first century (Blount 2011).

Space Law Remains Underdeveloped

Another recurring finding that arises based on the analysis of the issues of space militarization and space debris is that the lack of clear definitions and details undermines the effectiveness of space law in addressing current issues in global space governance and security. Key terms in addressing these challenges, such as "peaceful use of outer space" and "space debris" are either left to the interpretation of state parties or are wholly absent from space law. While such vague language eased over diverging superpower interests in the past, it now critically hinders the efficiency of space law to regulate the militarized usage of outer space and the sustainable management of space debris. Failure to address the issues of space militarization and space debris could have devastating consequences on humanity's ability to access space in the long term. Left unchecked by a strengthened space debris mitigation and removal regime, the IADC has predicted that LEO may be entirely unusable for satellites within 100 years due to the high risk of collision with debris (Jakhu and Pelton 2017, 289). The proliferation of ASAT weaponry is also an inherently destabilizing development for space security. At a time when countries are turning to expensive and sophisticated satellite technologies for civilian and military purposes, the weapons to destroy these prized assets are becoming more accessible. Despite the unsustainability of the current legal framework, states

have largely been unwilling to change. Attempts to expand space law have failed, as can be seen by the overly ambitious 1979 Moon Treaty, which only has 18 State Parties, none of which are independently spacefaring nations (United Nations Treaty Collection, *n.d.*).

The relative lack of detail and development in space law is further evident when compared to other areas of international law, such as international maritime law. While the Outer Space Treaty is a mere ten pages long, the UN Convention on the Law of the Sea (UNCLOS) III Treaty is over 200 pages long. (Englehart 2008, 148). Though humans have a much deeper and varied relationship with the sea than they do with outer space, the comparison is still apt because "both treaties are designed to harmonize the interactions of diverse parties in vast open areas that are owned by no one" (148). Ironically, the intense inter-state negotiations surrounding UNCLOS III drew most international energy away from further expansion of space law through the Moon Agreement, as both treaties were being drafted at the same time (Jakhu and Pelton 2017, 28). Despite the similarities between space law and maritime law, the former remains woefully underdeveloped in comparison to its counterpart despite the urgent issues it now faces. Space law will need to be further expanded if it is to address these challenges.

Discussion of Solutions

Amending Article IV of the Outer Space Treaty

One of the simplest changes that could greatly enhance space law's ability to regulate the militarization of outer space would be an amendment to Article IV of the Outer Space Treaty to expand its ban on space-based WMDs to ASAT weapons. This would bring the Outer Space Treaty up to date with the latest military and technological developments.

However, the most important obstacle to such an amendment is the United States (Kuplic 2014, 1160). Since the end of the Cold War, the US has enjoyed its position as the sole superpower of a unipolar international system. It has therefore traditionally sought to maximize its power in outer space, unrestricted from international regulations, limitations, and the "deterioration of US sovereignty" (1160). This was most visible under the Bush administration under its 2006 National Space Policy. It claimed that the United States would "resist any effort to restrict its 'freedom of action' in space" and ultimately adopted tenets of Dolman's *Astropolitik* theory, which called for the US to monopolize control of LEO through space weapons (Motz 2014, 154; Havercroft and Duvall 2009, 45).

The further development and proliferation of ASAT weapons will continue to change the distribution of power in space and alter the calculations of American policymakers. While the United States still enjoys a dominant position in space, ASATs mean that "space superiority does not necessarily equal invulnerability to an attack that could cripple military operations or even the daily life of civilian society" (Kuplic 2014, 1161). Kinetic ASAT weapons are becoming increasingly simple and affordable for states. The proliferation of ASAT technologies is also occurring at a time when the United States is becoming increasingly reliant on its space support systems to improve the efficiency of its military forces. This means that "it has a significant interest in developing a global legal framework for the development, installment and use of technologies that make those systems vulnerable" (1138).

A weakness of this proposed change is that, while it would update the Outer Space Treaty to address current and near-future issues in space security, it does not account for the creation of future weapon systems outside of these categories. A blanket ban on "all types of weapons" which was proposed in the 2008 Sino-Russian Treaty on the Prevention of the Placement of Weapons in Outer Space would effectively solve this issue, but it "is a complete non-starter to the United States because it has already invested significantly in various military support satellites that would technically fall within that language" (Englehart

2008, 155). The agreement of the great space powers is essential for such an amendment to succeed. Changes to the language of Article IV must therefore be targeted to exclude existing American military support satellites while simultaneously garnering the most possible support from other countries. Such an amendment could set a beneficial precedent to modify the Outer Space Treaty whenever new destabilizing technological developments occur. An additional advantage of this amendment is that it would circumvent the Conference on Disarmament which has been blocked by great power rivalries (Moltz 2014, 163). It would also spare the US from adopting a treaty sponsored by China and Russia (Englehart 2008, 155).

Reinforcing the Registration Convention and Liability Convention

The lack of a clear definition of what constitutes space debris is a clear issue that needs to be remediated as soon as possible. This can be done by updating the Liability Convention and by expanding the term 'space object' to include space debris. Expanding the definition would also help in incorporating space debris into the current compensation system for damage occurring in outer space. A complimentary way of addressing the issue could be through the already existing Registration Convention. Under Article IV of the Registration Convention, launching states only need to register the most basic identifiers and orbital parameters in the UN registry (United Nations Office for Outer Space Affairs, *n.d.*a). While the convention does require notifying when an object is no longer in space, "there is no requirement to report anything about the object during the time between its placement in space and its removal" (Vedda 2017, 6). Since some objects remain in orbit for long periods of time after they stop functioning, expanding the registry to include more information, such as operational status, would be useful to track the current status of space objects. This could also open the door for a future international salvage regime, where states could transfer jurisdiction and liability of defunct satellites to a state willing to salvage it (6).

Conclusion

This paper has identified space militarization and space debris as key challenges in the current regime of global space governance and security. Though both issues are partially addressed in space law, the current language of the Outer Space Treaty is too outdated and underdeveloped to properly regulate modern space activity. Many of the provisions of space law reflect the concerns of states of the 1960s and have not been updated to reflect the changing global and technological context. The militarization of outer space through ASAT weapons or the generation of large quantities of space debris were simply not important issues at the time. Key terms of the Outer Space Treaty also remain ambiguous or lack definitions, creating confusion and easily exploitable legal loopholes. Due to these weaknesses, space law is currently not very effective at addressing the current issues in global space governance and security. The increasing reliance on space-based technologies has accentuated the dangers posed by these issues, but also presents an opportunity to motivate states to sustainably exploit outer space.

Through targeted legal revisions, amendments, and expansions, space law can be updated to address the issues of the twenty-first century while keeping the noble spirit of the time of its first signing. These processes would occur simultaneously in the UN COPUOS and through bilateral treaties between space powers. In particular, the amendment to Article IV of the Outer Space Treaty to include ASAT weapons and the reinforcement of the Registration Convention and the Liability Convention are two promising solutions to modernize space law. Though the United States has traditionally resisted attempts to impede its freedom in outer space, its increased vulnerability in space may prompt a change in policy. Similarly, all current and potential space faring nations share an increasing interest in guaranteeing the sustainable exploitation of LEO without debris.

Further comparative analysis between space law and maritime law offers an interesting path for future research, as space law has much to learn from its more mature counterpart. Should targeted amendments prove unsustainable, following the path of the UNCLOS treaties, the international community should not exclude the possibility of an "Outer Space Treaty II" to properly future-proof space law.

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