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OUTER SPACE DEFENSE PROGRAMS AND SPACE LAW: COMPARATIVE REVIEW OF THE UNITED STATES AND THE PEOPLE'S REPUBLIC OF CHINA

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ABSTRACT

The emergence of outer space defense programs in the security agenda of the United States and the People's Republic of China relates to the technological and ideological competition that surfaced from the Cold War, the space race. Nevertheless, the initiation of the novel outer space defense programs defies the rule of law established by public international law with its young branch of space law. While the framework of space law originated from the consensus of the international community and the compromise between the US and the USSR, the original competitors of the space race, the conditions of the modern international system and the relationship between the US and the PRC are far from being ideal. Furthermore, the development of these outer space defense programs shines a light to the outdated and inconsistencies found in the regulations of space law, thus, a need for transformation and evolution is required in order to maintain the principles of peace and cooperation in the international community.

Keywords: Space law, Space Race, Outer Space Defense Programs, United States, People's Republic of China.

RESUMEN

El surgimiento de los programas de defensa del espacio exterior en la agenda de seguridad de los Estados Unidos y la República Popular China se relaciona con la competencia tecnológica e ideológica que surgió de la Guerra Fría, la carrera espacial. No obstante, el inicio de los novedosos programas de defensa del espacio ultraterrestre desafía el estado de ley y orden establecido por el derecho internacional público con su joven rama del derecho espacial. Si bien el marco del derecho espacial se originó a partir del consenso de la comunidad internacional y el compromiso entre los Estados Unidos y la Unión Soviética, los competidores originales de la carrera espacial, las condiciones del sistema internacional moderno y la relación entre los Estados Unidos y la República Popular China están lejos de ser ideales. Además, el desarrollo de estos programas de defensa del espacio ultraterrestre arroja una luz sobre la obsolescencia e inconsistencias encontradas en las normas del derecho espacial, por lo que se requiere una transformación y evolución necesarias para mantener los principios de paz y cooperación en la comunidad internacional.

Palabras Clave: Derecho Espacial, Carrera Espacial, Estados Unidos de América, República Popular China

Index of Acronyms and Abbreviations

Acronym	English	Spanish
US	United States	Estados Unidos
USSR	United Socialist Soviet Republic	Unión de Repúblicas Socialistas Soviéticas
PRC	People's Republic of China	República Popular China
UN	United Nations	Naciones Unidas
COPUOS	Committee on the Peaceful Uses of Outer Space	Comisión sobre la Utilización del Espacio Ultraterreste con Fines Pacíficos
UNOOSA	United Nations Office for Outer Space Affairs	Oficina de las Naciones Unidas para los Asuntos del Espacio Ultraterrestre
NASA	National Aeronautics and Space Administration	Administración Nacional de Aeronáutica y el Espacio
ISS	International Space Station	Estación Espacial International
JFK	John F. Kennedy	-
WWII	World War II	Segunda Guerra Mundial
FDG	Final Degree Project	Trabajo de Fin de Grado

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1. DESCRIPTION OF THE SUBJECT MATTER

The subject matter of this Final Degree Project has been selected in consideration of a contemporary and relevant trend in the international system: the emergence of *outer space defense programs* and its relationship with the evolution of the main regulatory framework of this substance, *space law*.

Has to be mentioned that the advancement of outer space programs is not a novel feature in the international community. Throughout the 20th century and onwards, there has been significant progress regarding the exploration and research of outer space. The *space race* represents the golden era of innovation and accomplishments in this topic (De Zwart & Stephens, 2019). Furthermore, the current integration of private actors in operations such as the development of satellite connection networks and space tourism has further increased the participants' density – and complexity – in outer space (Vernile, 2018). Thus, outer space programs can be determined as the different strategies and projects made by any actor, with special and dominant involvement of nation-States, to develop and deploy technological infrastructure in their territories and outer space for exploration, scientific development, and in recent times, defense purposes. The latter is the core component of this research.

The intrinsic conditions and risks in outer space create a complex and unpredictable environment. These are capable of disrupting the operations and interests of any actor involved in the outer space ecosystem (Marov, 2020). For this reason, International Space Law was formulated by the United Nations as the main body of law governing space-related activities to approach the need to control and address any disputes, difficulties, and uncertainty that may arise amongst the actors present in this environment. The main purpose of these regulations is to avoid harmful conflicts and support international cooperation and development in accordance with the main principles of public international law (UNOOSA, 2022).

The United States and the People's Republic of China are the subjects of this study since these two are the most influential and powerful actors in our international community. The objective is to review the components and incentives that preceded the subjects chosen in developing their outer space defense programs and the consequences of these initiatives have in the international system. A comprehensive analysis of space law and international relations will be completed to define the limitations present in this framework and its relationship to this phenomenon.

1.1. Research Question

The research question of the subject matter chosen for this FDP is divided into two sections: (1) the evolution of space law within the context of public international law and international relations, and (2) the surge of outer space defense programs and their implications for the international system and space law with a central focus on the two main actors in this regard, the US, and the PRC. Thus, in consideration of this organization, this study's main research question might ask what will be the impact of modern outer space defense initiatives by the United States and China in the evolution of space law and the international system?

The emergence of outer space defense programs, such as the *Space Force* initiative of the US, represents a decisive time for the current development of the international system and public international law. This is because many States have reached the capacity to develop and sustain the technology needed for more effective and creative application of infrastructure deployment in the outer space ecosystem (Hobe, 2010). Therefore, the recent technological advancements and the policymaking by States with outer space defense programs are set to begin a new space competition which is going to demand the formulation of a new defense agenda and regulations for this environment to ensure security and stability for all actors (National, 2016).

These represent the current issues for space law and the international system to produce the required regulations and agreements to maintain stability and security for the international community on Earth and outer space. Thus, to build a fair environment that allows the progress of outer space programs and the preservation of peace and international cooperation, there needs to be mutual conformity and consent between the actors involved to determine the utmost effective ideas and direction for this matter.

The role of the US and the PRC in the subject matter of outer space defense programs is going to be critical for the determination of the answers to the issue at stake. This is because these two States aspire to be international leaders in outer space affairs and have the resources to follow this objective (Bowe, 2019). Their actions are shaping the evolution and changes of the international community in regard to outer space defense programs and the rest of outer space activities. For this reason, these two subjects' strategies and policymaking will be evaluated to understand the evolution of the subject matter with their actions.

1.2. Research Objectives

The research objectives for this FDP are going to be the components that will determine the direction of the analysis required to answer the different issues and questions presented for this dissertation. Hence, the research objectives are:

1. *The development of the historical context and evolution of the subject matter (Background of Outer Space Programs and Space Law)*: focused on the breakdown and review of the history and causes developed in the 20th century in regard to outer space programs and the emergence of space law in the international system.
2. *The evaluation of the selected focus State actors of the subject matter, the United States, and the People's Republic of China (Assessment of the Actions from the US and the PRC in Outer Space Defense Programs and their Impact on Space Law)*: focused on the assessment of the current conditions, strategies, policymaking, and impact of these two actors in the development of outer space defense programs and their relationship with space law.
3. *The examination of the subject matter with respect to modern international relations and the international system (Outer Space Defense Programs and Relationship with International Relations)*: focused on the evaluation of the subject matter and its implications in international relations and the international system with respect to the focus States.
4. *The determination of general conclusions (Final Reflection of the Research and Closing Observations)*: focused on the culmination of the FDP dissertation with the development of conclusions, recommendations, and some closing thoughts on the subject matter.

1.3. Methodologies

In order to provide valuable answers to the questions proposed in this research, the analysis supported applies a methodology based on a descriptive and comparative approach. The resources implemented for the formulation of this research are mainly secondary resources. Most the information is supported by academic articles retrieved from scientific journals and other credible sources. Furthermore, complementary tools such as books, news articles, and transcription from speeches of prominent individuals in the subject matter are also used in the composition of this research.

As established in the description of the subject matter, this research focuses on the emergence of outer space defense programs and their relationship with space law. Though the research provides a holistic analysis of the subject matter in the context of the international system overall, the determination of specific instances of study were required to expand the analysis produced. For this reason, the US and the PRC were selected to develop a comparative approach required to organize all the information from each focus States and evaluate their differences, similarities, and implications of their outer space defense programs with space law and international relations. The establishment of this methodology enables the research to further detail the features and implications of the subject matter with space law and the international system through the individual examples and results of the two focus States selected.

Due the complex nature of the subject matter in question, the research requires a descriptive approach in most instances to gather and review all the information needed to understand each component and precedents of the domains studied, outer space programs and space law. For instance, this approach is applied in the initial overview that produces an examination of the events, causes, and impact of the formulation of space law and the nature of the early outer space programs developed in the international community. The reason for this descriptive approach of the past instances of the subject matter is done in order to validate the examination developed for the present and to support the ideas for the scenarios that may arise in the future whether these might be opportunities or challenges for the international system. For this research is important to review the actions and initiatives executed in the past as an example to formulate significant answers for the present and future with the adaptation required for the conditions and components that have changed over time.

The research has been divided into six sections in order to provide the reader with an organized structure that enables a comfortable experience and assimilation of the information. The current section corresponds to the introduction of the research that includes the description of the subject matter, the research question, objectives, as well as the methodology applied for its elaboration. Section two incorporates an outline of the core theoretical framework applied in the research. The next section includes a comprehensive overview of the emergence of the initial outer space programs and the formulation of space law as a new component of public international law. Section four comprises the review of the strategies, actions, and conditions of the

US and the PRC with respect to the development of outer space defense programs. Furthermore, this section focuses on the assessment of the differences and similarities of each subject in terms of the interpretation and aspirations of their outer space defense programs as well as how these initiative challenge the current framework of space law. Section five provides a continued examination of section four about outer space defense programs and the implications and issues that emerged in international relations and space law with respect to this issue. Finally, the concluding section provides a brief discussion of the findings of the research and assessment of the suggestions for the issue at stake.

2. THEORETICAL FRAMEWORK

The theoretical framework for this FDP includes components from international relations and public international law. This is because these two structures have a relevant role in the subject matter and the research objectives established. Moreover, these outlines are going to provide theoretical knowledge and practical applications in regard to the question under discussion.

2.1. Components from International Relations

The theoretical components of international relations for this FDP are based on the realms affected by the dynamics of space-age and security identified by scholar Walter McDougall, particularly (1) the relationship of the State to technological change, and (2) political culture and evolution in nations of high technology. This research integrates the notion of outer space and international relations as the study of the exploitation of outer space for social, political, economic, and military purposes.

The concept of the security dilemma, a situation in which actions taken by a State to increase its own security cause reactions from other States, which in turn lead to a decrease rather than an increase in the original State's security (Britannica, 2022). The term was coined by the American political scientist John Herz in 1950. Since then, the concept has been used by many to describe the competition of the US and the USSR throughout the Cold War. This concept reflects the tragic nature of international relations from a realist perspective when States strive for peace but fail to maintain stability and develop an environment of military conflict.

2.2. Components from Public International Law

The theoretical components of public international law that support this research are focused on the agreements and framework established by the main treaties that comprise the core principles of space law. The 1967 Outer Space Treaty is the core multilateral agreement that provides the basic framework for international space law. Drafted under the support of the UN, opened for signature on 27 January 1967, entering into force on 10 October 1967. Today, 111 countries are parties to the treaty and another 23 are signatories. The treaty includes following content (UNOOSA, 2022):

- The exploration and use of outer space shall be carried out for the benefit and in the interest of all countries and shall be the province of all mankind;
- Outer space shall be free for exploration and use by all States;
- Outer space is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means;
- States shall not place nuclear weapons or other weapons of mass destruction in orbit or on celestial bodies or station them in outer space in any other manner;
- The Moon and other celestial bodies shall be used exclusively for peaceful purposes;
- States shall be responsible for national space activities whether carried out by governmental or non-governmental entities;
- States shall be liable for damage caused by their space objects; and
- States shall avoid harmful contamination of space and celestial bodies.

Since the formulation of the Outer Space Treaty, the UN and the COPUOS produced four additional treaties to the foundation of space law (UNOOSA, 2022):

- The "Rescue Agreement": Entered into force in December 1968. Elaborates on elements of Articles 5 and 8 of the Outer Space Treaty and provides that "States shall take all possible steps to rescue and assist astronauts in distress and promptly return them to the launching State, and that States shall, upon request, provide assistance to launching States in recovering space objects that return to Earth outside the territory of the launching State".

- The "Liability Convention": Entered into force in September 1972. Elaborates on Articles 7 of the Outer Space Treaty and provides that "a launching State shall be absolutely liable to pay compensation for damage caused by its space objects on the surface of the Earth or to aircraft, and liable for damage due to its faults in space". The Convention also delivers procedures for the settlement of claims for damages.
- The "Registration Convention": Entered into force in September 1976. Elaborates on the principles contained in the Outer Space Treaty and expands the scope of the United Nations Register of Object Launched into Outer Space.
- The "Moon Agreement": Entered into force in July 1984. Reaffirms and elaborates on many of the provisions of the Outer Space Treaty as applied to the Moon and other celestial bodies. Provides that "those bodies should be used exclusively for peaceful purposes, that their environments should not be disrupted, that the United Nations should be informed of the location and purpose of any station established on those bodies". Moreover, conveys that the Moon and its natural resources are the common heritage of mankind.

Furthermore, in addition to the five international treaties described, the COPUOS has concluded five sets of declarations and legal principles on space-related activities (UNOOSA, 2022):

- The "Declaration of Legal Principles" governing the activities of States in the exploration and uses of outer space.
- The "Broadcasting Principles" governing the use by States of artificial Earth satellites for international direct television broadcasting.
- The "Remote Sensing Principles" relating to remote sensing of the Earth from outer space
- The "Nuclear Power Sources Principles" relevant to the use of nuclear power sources in outer space.
- The "Benefits Declaration" on international cooperation in the exploration and use of outer space for the benefit and in the interests of all States, taking into particular account the needs of developing countries.

3. OVERVIEW AND EMERGENCE OF OUTER SPACE PROGRAMS AND SPACE LAW

The origins of outer space programs, and subsequently its main regulatory body, space law, stem from the age of growth and innovation that arrived after World War II. These new phenomena of the international system emerged as a result of the ideological competition between the US and the USSR in the 20th century, the *Cold War* (Dettmann, 2018). Throughout this time, both States competed for the obtainment of global influence and sabotaged each other's advances, often described as a security dilemma scenario. Therefore, due to the cumulative tension between them, and in order to prevent a direct conflict in the ecosystem of outer space, space law surfaced as a compromise between both States and the international community to engage and continue their developments with peaceful means and avoid the weaponization of the outer space environment (Kleiman, 2013). Thus, in consideration of the background of these components and their relevance in modern times, for the formulation of an answer to the research question, this section is focused on the examination of the record and focal points that occurred throughout this time to understand the nature and impact of the emergence of the original outer space programs by the US and the USSR as well as the foundation of space law as a novel component of international law.

The aftermath of WWII in 1945 changed the nature and regime of the international system. Europe, the most influential region of the world at the time, was overwhelmed by destruction and chaos as the main theatre of the war. As a consequence, all the great powers lost most of their global influence and power. Therefore, to prevent more conflicts and counter the threat of a power vacuum, political and economic integration initiatives began as an attempt to avert potential hostilities, and as a result, the UN was established as the answer to this issue. This represented the shift of the global order from an imperial regime to sovereign nation-States with democratic and liberal values championed by the UN and the international community (Manning, 2022). Since then, the UN became the main global governance organization to foster international cooperation, peace, and security under ethical and moral values. Moreover, the demise of the prior imperial regime triggered the decolonization process of the African and Asian regions that had been under control by the European powers (Gordon & Bragato, 2018).

Due to the devastation of Europe in the war, the US and the USSR emerged as rivals and only superpowers. This created the stage for the ideological competition between both States for the control and influence of the international system known as the Cold War. This was a period of intense geopolitical tension between the two superpowers and their respective allies, the Western Bloc with the US, and the Eastern Bloc with the USSR. Even though there was no direct conflict between the two superpowers, both States competed against each other in the international system in numerous realms; from ideological campaigns to undermine the success and narrative of the opposite rival to the support of major regional conflicts around the globe in proxy wars (van Alstein, 2009).

The military and technological sphere became one of the top priorities for both superpowers. The actions of the US to use nuclear weapons in Japan marked the beginning of the conclusion of WWII after the massive destruction caused by the two nuclear bombs used in Hiroshima and Nagasaki which overwhelmed the Japanese force to surrender and end their support of the war. The remarkable power shown by the US with its nuclear weapons to accelerate the end of the war compelled the second superpower, the USSR, to initiate its nuclear research and development of their own (Hoffman, 2009). Thus, the US and the USSR began to invest in their military and technological advancement to increase their nuclear arsenal. This competition formed the MAD principle (mutual assurance destruction) which was a deterrence for actors to have any kind of conflict between them in fear of complete annihilation.

The circumstances between the US and the USSR created a dynamic contest for technological advancement to sustain their nuclear programs. A relevant focus of this competition was the innovation of *ballistic missile design* and infrastructure (Hey, 2006). Both superpowers would engage and recruit the most creative and resourceful scientists to support their rocket programs and, unbeknownst to their citizens and the international community, this included thousands of German researchers who pioneered numerous scientific discoveries throughout the Nazi regime (Samuel, 2004). For instance, *Wernher von Braun*, the rocket scientist who was the mastermind behind the design and invention of the V-2 rocket used by the Nazi to relentlessly attack the United Kingdom would lead the US rocket development program and then the National Aeronautics and Space Administration. After WWII, some 1,600 German scientists, among them Von Braun, engineers, and technicians were secretly moved to the US as

part of *Operation Paperclip* (Neufeld, 2015). These individuals were assimilated into the US Army to support an intermediate-range ballistic missile program, the first of various ballistic programs developed by the US.

As the competition between the two superpowers intensified, the technological contest, which began as a nuclear arms race focused on the improvement of ballistic missile design, transformed into a multidimensional competition that transcended beyond technology and military aspirations (Bille & Lishock, 2004). On August 2, 1955, a short time after the US government announced the intent to launch artificial satellites to outer space for the International Geophysical Year, the USSR responded by making a declaration that they would also launch a satellite of their own as a challenge to the US. These implications marked the unofficial commencement of the space race that changed the aspect of technological advancement from a military priority into an achievement necessary for national security and, became part of the symbolism representing the dispute between capitalism and communism, the sociopolitical regimes of the time (Kallen, 2019).

The establishment of the space race enabled the emergence of the initial outer space programs and, as a result, spawned numerous new industries throughout the 20th century that advanced the new technologies and scientific discoveries required for the success of these outer space programs (Erickson, 2018). Nevertheless, at the start of this competition, the international community did not synchronize its attention to this contest until a couple of years later. This changed drastically on October 4, 1957, when the USSR achieved the first-ever successful artificial satellite launch of Sputnik 1 that represented the original venture of humanity into the outer space ecosystem. This breakthrough by the USSR was the main cause for the international community, and especially the US, to acknowledge the progress of the USSR and reassess the delay by the US in this matter (Siddiqi, 2000). The success of Sputnik 1 was a global event that situated the US into a position of crisis due to its defeat under what was perceived at the time as the ‘backward’ authoritarian regime of the USSR that still was able to reach outer space before the US (Lule, 1991). As a consequence, this resulted in the US to prioritize and accelerate its outer space programs for the upcoming decades.

In the early stages of the space race, the USSR would defeat the US in most of the initial outer space milestones. A month after the Sputnik 1 mission, the USSR launched the first living being to outer space, a dog named Laika, in its Sputnik 2

mission. All these events impacted the prestige and confidence of the US not only in the international community but also within its borders (Corfield, 2007). The repeated success of the USSR raised concern in the US, where the media and its citizens would criticize if the actions of the US were effective and some even challenged the system established by capitalism over the communist structure which seemed to control the space race, creating public consternation in the country as this was happening in the context of the Cold War. This scenario pressured US President Eisenhower to order *Project Vanguard* that expedited the launch of the first US satellite much sooner than originally planned. Later, on December 6, 1957, the launch of Project Vanguard resulted in a great failure for the US, and it became an international banter and a national humiliation in the US (LePage, 1997).

Even though the US had a difficult start in the space race, it was able to catch up with the progress of the USSR's outer space program with time. Eventually, the US secured the launch of its first artificial satellite nearly four months after the launch of Sputnik 1. This achievement was possible because of the improvement obtained by von Braun's Redstone team and the production of the Juno I rocket in 1958, a design derived from the US Army's Redstone missile (Von Braun, 1963). This success allowed the US to recover the credibility and prestige that had lost with its previous failures in the space race. Moreover, on April 2, 1958, the Eisenhower administration proposed to the US Congress the establishment of a civilian agency to direct nonmilitary space activities as a reaction to the USSR's outer space organization. This proposal would prompt the foundation of NASA, the agency that became responsible for the major developments and accomplishments obtained in the space race by the United States (Page, 1979).

Regardless of the impressive dynamics of the space race in the late fifties, the sixties were the most intense and remarkable time for the space race and the international community. In this decade alone, the US and USSR surpassed all the technological challenges and limitations in order to achieve the most important breakthroughs not only in the space race but in science and humanity as a whole (McDougall, 1985). In short, the space race in this decade can be summed up in two significant events:

1. The first human spaceflight by Yuri Gagarin, credit of the USSR.
2. The Moon Landing by Apollo 11 that granted the ‘victory’ of the space race to the US.

In addition to the climax of the space race, the Cold War hostilities intensified in the sixties. The unprecedented success of Yuri Gagarin’s spaceflight created a similar dilemma as the Sputnik crisis in the US. This situation prompted US President John F. Kennedy to increase the commitment of the United States to the space race and on May 25, 1961, the president asked the US Congress to commit to the goal of "landing a man on the Moon and returning him safely to the Earth" before the end of the decade (Kennedy, 1961).

The promise introduced by the JFK administration to land a man on the Moon defined the direction of the sixties and the space race, whoever achieved this target before their rival was going to be declared the winner of the space race and the ‘superior’ power (Longsdon, 2010). Furthermore, the developments of the Cold War with the Vietnam War and the Cuban missile crisis had created a complicated environment not only for the US and the USSR but for the whole international community (Agar, 2008). Still, even though the stress levels were at an all-time high, the sixties had witnessed the most developments in regard to science and socioeconomic reforms that were required to complete the grand objective to land a man on the Moon. This incentive had driven exponentially the acceleration to design technologies crafted for space exploration. This, in turn, prompted a series of innovations in technology and science that had far-reaching impacts beyond space exploration (Spencer, 2021). Finally, all the advancements obtained in the sixties for the space race enabled the US to achieve the unparalleled milestone to land a man on the Moon in 1969 and claim the victory of the space race. This accorded the US all the international recognition and triumph over the failed attempts, actions, and outer space programs of the USSR.

The Moon landing by the US became the culmination of the space race (Williams, 2003). The USSR had attempted two crewed lunar programs, however, did not succeed before the US. Therefore, the USSR halted its lunar programs to focus on Salyut, the first space station program, the precedent of the Shuttle-Mir and the International Space Station (ISS), and the original satellite arrivals on Venus and Mars. In the meantime, the US executed five additional Apollo programs on the Moon and

expanded its space exploration aspirations to other extraterrestrial bodies with the use of robots and artificial satellites. Notwithstanding the progressive and novel developments completed in space exploration, the singular achievement of Apollo 11 attained most of the recognition of the international community in the outer space competition and overshadowed any combination of achievements by the USSR that have been made before and afterward (Frost, 2022). After all, the formal end of the space race was reached with the 1972 agreement and the execution of a cooperative Apollo-Soyuz Test Project. This resulted in the 1975 rendezvous on Earth's orbit of a US astronaut with a USSR cosmonaut in an international docking standard. This is considered the final chapter of the space race and the onset of a détente period where the competition between the US and the USSR was gradually replaced with cooperation initiatives (US Congress, 1985). In time, the collapse of the USSR allowed the US and the newly formed Russian Federation to officially end the Cold War and any space competition with the 1993 agreement on the Shuttle-Mir and the ISS.

3.1. The Emergence of Space Law

The space race between the US and the USSR did not only accelerate scientific and technological progress to support the outer space programs executed by them, but this trend also initiated the formulation of the legal framework in public international law that would regulate all outer space affairs and advances, space law. The emergence of space law began when US President Eisenhower introduced the concept to the UN in 1957, as feedback from disarmament negotiations with the USSR. The successful launches of the satellite Sputnik 1 in 1957 and Explorer 1 in 1958 encouraged the US and the USSR to develop and organize international space policy (Von der Dunk, 2015). In 1959 a permanent Committee on the Peaceful Uses of Outer Space (COPUOS) was created in order to advocate and maintain the UN Charter and public international law in outer space to ensure and enable the international community peaceful exploration of the outer space environment. Immediately after the establishment of the COPUOS, the committee formulated a resolution that defined that traditional laws of sovereignty would not apply in the outer space environment. This effectively closed the ability of any nation-State to claim territory in outer space or any extraterrestrial bodies (Simberg, 2012).

The original and core legislation written specifically for outer space exploration was created in 1967 with the Outer Space Treaty. This agreement represented an important milestone for the international community and public international law because its content reaffirmed all the previous guidelines for international space conduct (Qizhi, 1997). By creating of these standards and regulation, this agreement is regarded as the cornerstone of international space law conventions, also known as the Magna Carta of international space law. This progress would not have been possible if the US and the USSR had not conceded to the regulations proposed, however, both of them understood the need for a specific legal framework for the new environment of outer space activities to preserve stability and security (Zedalis & Wade, 1978).

The international impact produced by the initial outer space programs in the 20th century and the overall consensus of the international community enabled the creation of this legislative framework associated with the rules, principles, and standards of public international law in regard to these kinds of activities. All these treaties and principles were formulated in response to the needs and concerns of the international community to integrate the main body of law governing space-related activities, space law (UNOOSA, 2022). Nevertheless, an important fact to consider is that most of the content created for these regulations and procedures was developed in the context of the time when the main priority was to ensure the basic stability and security of the international community and the initial outer space programs. With the arrival of the détente period and the subsequent conclusion of the Cold War, the advancement of space exploration and space law slowed down since the political tensions halted and the international community shifted its attention to other issues, which in consequence, suspended the momentum of most outer space programs and activities (Von der Dunk, 2015).

Finally, in addition to these international agreements, many States have developed their national legislation governing space-related activities. For instance, national space law is relevant to adapt to the specific needs and practical matters of the scale of space activities executed and the measure of involvement of non-governmental entities (UNOOSA, 2022). At first, international space law did not consider much relevance to these entities since the barriers of entry to the outer space environment were high at the moment of its formulation, and respected nation-States

as the only actors performing space-related programs and activities. Today, a new revolution of space-related activities is on the rise. However, different from the context of the 20th century, there is high participation of non-governmental entities which have different priorities from the States back in the time and most are in expectation to obtain profit in this environment.

This is going to represent the new and most important challenges for space law to adapt and maintain the same pace of the advancements achieved by these private actors. Furthermore, the uniformity of space law will depend on the consistency and coherence of the whole international community and their production of regulations about space activities (Simberg, 2012). However, there are examples of national laws and regulations produced by different nation-States that fail to achieve the desired uniformity and compliance with the agreements produced by space law and the rest of the international community. This issue is set to become an important problem for the international system if any dispute arises between any member of the international community due to the lack of consistency between international space law and national space law. Therefore, in consideration of the issues present in the legal frameworks of space law, the next section will review and demonstrate instances of this problem with the analysis of the individual context of the focus subjects of this study, the US and the PCR.

4. OUTER SPACE DEFENSE PROGRAMS REVIEW OF THE UNITED STATES AND CHINA

Comparable to the progress and dynamics experienced in the international community throughout the original space race, the advancement of outer space activities in the 21st century is expected to become an intense period of scientific and technological development that may even surpass the frequency witnessed in previous times (Kakkar, 2010). The continuous integration of new actors into the outer space environment, from nation-States to non-governmental actors, impacts and increases the speed and efficiency of technological innovations which further validates the focus and attention to the emergence of novel prospects and elements in the outer space ecosystem which space law and the international system will have to take into consideration and manage. Nevertheless, whereas the environment and dynamics in outer space are getting more complex and diverse than ever before, the main

protagonists of this era will be the most powerful and capable subjects in regard to outer space development and the international community itself, and the US and the PRC match these conditions (Goswami, 2018).

For this reason, in order to establish a precise focus for the subsequent analysis, both States will be the main subjects and focal points of the study. The determination of this structure is going to facilitate the direction of the review with the information provided by these different sources. Furthermore, this resolution corresponds to the socio-economic and political developments of the international community where the two selected subjects are the main actors and most influential powers of the international system. This rationale supports the conviction that the US and PRC will continue with their economic growth aspirations and rivalry competition for the next decades (Allison, 2022).

The strategies and policymaking performed by these two subjects will influence the future of outer space activities, and hence, the dynamics of the international system and the evolution of space law. Therefore, in consideration of the pivotal roles of both the US and the PRC in the new era of outer space development, technological advancement, and the evolution of space law, this section will separate and review the strategies implemented by these two States and how these will influence the developments of space law (Gries & Jing, 2019).

Furthermore, this analysis is going to be structured around the novel phenomenon of outer space defense programs challenging the organization and composition of the regulations established by space law (Giri, 2018). To achieve this objective, it is important to understand the individual actions and planification of each State, this is based on the reality that each party might diverge from each other in regard to their particular priorities in the new era of outer space advancement. Since there is not an ultimate goal in this new competition like the moon landing in the original space race, both States will have to excel in many domains as possible which will pressure the need for technological innovation in an unprecedented manner. This review is going to help to understand and organize all the elements important for each subject, this will take into consideration the factors of technological advancement and capabilities, economic power, political drives, social adaptation, and legal resourcefulness.

4.1. The United States

The role of the US in the international system and outer space affairs is, at present, unmatched. The US has the most important economic and political impact in the international community; therefore, the US has relationships and influence with almost all entities of the international system and plays an important position as a global power. This financial structure and political power established by the US allowed it to prosper throughout time and develop the socioeconomic conditions needed to maintain a leadership position in the international system and outer space affairs to this day (Kahn, McConnell & Perez-Quiros, 2002). Taking into consideration the history of the US in the 20th century, the US holds the most experience and consolidation in outer space affairs. Furthermore, in recent years, the US has experienced an exponential emergence of non-governmental entities that are venturing into new industries such as space tourism and other private endeavors. Although most of these non-governmental actors seek to establish for-profit activities in the outer space ecosystem, these contribute to many socio-economic factors from employment, economic growth, technological innovation, and even culture (Collins & Autino, 2010). The stimulus generated by these private actors has the potential to reduce the cost of space travel considerably, and hence, achieve novel scientific innovations and creative application of this technology and much more. Still, while the emergence of these private actors is beneficial for the US, the leadership of the State will depend on the governmental strategies and policymaking that will determine the variables that will impact the structure evolution of space law and the international system.

For instance, a crucial element presented by the US to the international system and space law is the foundation of *outer space defense* programs. In June 2018, US President Trump announced his intention to establish "American dominance in space" with the creation of a *Space Force*. This announcement related and was executed after the release of a security assessment of the US Intelligence Community, which warned of the increasing threat of PRC and Russia's capacity to "offset any perceived US military advantage" through their antisatellite weapons if should the US engage in military conflict with any of the two countries (American Journal of International Law, 2020). The introduction of these new outer space defense programs was consolidated with the creation of the space force, a new branch of the US military, which will be responsible for organizing, training, and equipping space forces to the US Space

Command for operational employment (Giri, 2018). The US Space Command has the ability to employ assigned forces and resources to achieve its mission "to deter aggression and conflict, defend the United States and allied freedom of action, deliver space combat power, and develop joint warfighter to advance the US and allied interest in, from, and through the space domain" (US Department of Defense, 2019).

This initiative denotes an unprecedented shift of the security implications and interpretations for all the actors involved in the outer space ecosystem. The strategy developed by the Trump administration to establish the space force has considerably failed to achieve uniformity with space law. While these actions do not connect with public international law, they do reflect the divergence between the US approach to outer space and the approach taken by the UN. The US is still a part of the Outer Space Treaty that forces States to develop their outer space activities and exploration in accordance with the regulation of international law and the Charter of the UN Nations with the objective to maintain international peace and security (American Journal of International Law, 2020). The emergence of the US Space Command does challenge the future of US affairs in outer space and the uniformity of these activities with the instruments of space law. For instance, the mission declaration of the US Space Command affirms that one of the focus areas of the space force is to improve the development of joint space operations forces and military capabilities to increase warfighting execution and lethality as well as the integration of outer space capabilities. All these developments contradict with resolutions adopted by the UN which address the issue of prevention of an outer space arms race (UN, 2019).

One of the principal motivations of the US in regard to the recent developments of their outer space defense strategy is the threat of missile proliferation. Due to the relationships of the US with different members of the international community, it has been able to establish a global military network with presence in multiple regions (Abraham & Mulvenon, 2010). For this reason, the US is responsible for safeguarding the security and stability of its military presence and allies abroad. However, the US is concerned about the recent emergence of intercontinental striking capabilities of the PRC and other rivals such as the Russian Federation. Furthermore, the technological and military build-up of comparable force by Iran and North Korea further increases the vulnerability of the US military forces (Narang, 2015). All these instances pressure the US military to develop creative strategies to counter the threat of more advanced

missile proliferation. For this reason, the US Space Command is able to gain some traction in the consideration of policymakers and military strategists that expect to invest and develop new defense mechanisms with the support of the space force research and development programs.

4.2. The People's Republic of China

The PRC has been able to achieve economic and military strength growth, along with the diversification of its aspirations for East Asia and the international system as a whole. The next decades will be a pivotal time for the competition between the PRC and the US. While the US seems to have entered a decline phase and it struggles to maintain its global power position while enduring a socio-economic decrease relative to the PRC. Furthermore, the PRC has the advantage of its population size which is expected to outperform the US population if the current trends continue. From a long-term perspective, the US will compete to maintain its influence and growth against the PRC in the international system (Bowman, 2021). Furthermore, the security landscape of the international community is being disrupted by the invasion of Ukraine by the Russian Federation which the PRC has determined to support even though this meant the disapproval of the international community and a hit to its reputation. Still, the PRC has been able to maintain its role as the supplier of the world and secured a comparative advantage in the automation of its industries and technological growth. All of these conditions increase the need for the PRC to secure its influence and power in the international system even if that means challenging the US directly. For this reason, the PRC has committed to increasing all their capabilities and resources in all domains including outer space affairs.

Although the US is the current leader in outer space activities, Gen. David Thompson from the space force believes that the PRC could be able to outpace the US at some point due to the rapid advancements achieved by the PRC in recent years (Rogin, 2021). For example, China has announced new information about the progress on its 'Tiangong' space station, an under-construction orbiter started as a result of the Beijing ban from participating in the ISS executed by the US. The completion of this project will produce an important reaction from the international community and the US because the PRC will be the only country to operate a space station of its own. These advancements validate the commitment of President Xi Jinping to increase the PRC's efforts to match the US as the predominant power in outer space. Furthermore, the

recent events of the invasion of Ukraine by Russia and the reaction of the international community have driven President Putin to collaborate with the PRC on a proposed lunar research station in opposition to the US-backed Artemis Accords (Einhorn & Wang, 2022). Thus, in recent years, there has been an increasing separation between the PRC and the rest of the international community which further diverges from the original values and ideals of space law and the Charter of the UN to foster international cooperation and peace. This has contributed to the US following the formulation of the US Space Command in reaction to the actions executed by the PRC and Russia.

As a response to the US domination of international policymaking in outer space affairs and its execution of their outer space defense programs with the space force, as the PRC has been slowly emerging as an outer space power, it incorporated a strategy to interfere with the strategic goals of the US. One of these initiatives by the PRC is the push for recognition of vertical sovereignty, claiming control of outer space territories beyond the norms established by space law and the UN (White, 2021). The PRC joined Russia in an effort to adopt a draft Treaty on Prevention of the Placement of Weapons in Outer Space (PPWT) proposed in 2008 and 2014. This proposal by the PRC and Russia is used as a tool of legal retaliation against the US technological advantage in outer space. The PPWT has been constructed to be biased toward the PRC and Russia's interests to the sabotage of the US advancements and its allies. Even though the US repeatedly blocks the adoption of the treaty and criticizes its contents, the PRC restarts the process of the proposals for the treaty to be presented to the international community. If the treaty were to be adopted, this would undermine the military ambitions of the US and its space force which will help the PRC to compensate for the current capabilities' differences between them. The ultimate objective of the PPWT as a 'lawfare' tool is to destabilize the narrative of the US pursuit of national security in outer space affairs and punish those initiatives in support of the legal academia (Critical Will, 2021).

Similar to the position of the US, the threat of missile proliferation impacts the PRC security agenda too. In the context of the PRC, much of the proliferation has developed much closer to the PRC's borders due to its close proximity to the countries with these military aspirations (Shen, 2000). First, the volatile competition of its neighbours that hold nuclear weaponry of their own, India and Pakistan, and the nuclear testing programs developed by North Korea. Second, the US national missile

defense and space force developments that undermines the effectiveness of the PRC's response to any attack. Furthermore, the joint missile defense research and development programs and deployment of the US in the Middle East and Europe increases the vulnerability of the PRC against its competitors in case of a military conflict.

5. RELATIONS AND IMPLICATIONS OF OUTER SPACE DEFENSE PROGRAMS IN MODERN INTERNATIONAL RELATIONS AND SPACE LAW

The progress and evolution of the 20th century have shown the close and interconnected relationship between outer space programs and the international community. The technological innovations obtained to continue the progression of the space race have later adapted to the needs and use of the rest of the international community. Moreover, the space race enabled the emergence of whole new industries that have been able to take advantage of the tools and techniques that materialized from this competition (Gibney, 2020). A relevant characteristic of today's outer space developments is the diverse participation of numerous actors in the outer space ecosystem. This feature is unprecedented compared to the original space race where the technological innovation and information for outer space developments were managed by only two actors, the US, and the USSR. Nevertheless, now there are dozens of entities that engage in outer space activities with different objectives. The diversity of today's outer space development enables the exponential growth of technological innovation which is multiplied and shared by all the actors that participate in outer space activities (Kojima, 2018). The competition for influence between the US and the PRC in the international system and space law is also going to play a role in the developments of the current time. The economic growth and political assertiveness of the PRC enable them to be more efficient than the US in the political domain, and this is no different from the technological realm. Therefore, with a comparable purpose to the original space race, the contemporary outer space developments would serve a purpose of national pride and merge with the ideology of each power. This is heightened with the participation of private actors who are focused on singular objectives and, with each breakthrough achieved, can share the new information and innovations obtained by them with their State.

Nevertheless, there is an important difference between the outer space developments from today to the ones from the past. There is the emergence of a security dilemma in the US-China military space relationship that threatens to disrupt the stability established by the international community and the foundation of space law. One of the first elements that caused the security dilemma between both subjects is the perceived US quest for space dominance. The US has been the only State that has exposed an organized national strategy for space dominance. Former Air Force Secretary, Michel W. Wynne, has stated that "America's domination of the space domain provides an unrivaled advantage for our nation and remains critical to creating the strategic and tactical conditions for victory", thus, reasserting the US as the leader in the militarization of outer space (Zhang, 2011). These affirmations were then validated with the formulation of the US Space Command and the space force. This strategy of space dominance generates the classic security dilemma between the US and its rivals. The PRC military strategists perceive this US objective as a threat to the PRC's national security because in this context whoever controls the outer space security and resources will certainly have an advantage in case of a conflict between the two countries. In any instance, the PRC security experts considers that the US seeks absolute security and control of the outer space ecosystem. This demonstrates that the PRC acknowledges the military motivations of the US for space dominance and missile defense. However, considering the unpredictable nature of the international system, a country's strategy to maximize its security could have an impact on the security of others and change the balance of power. This is the security dilemma issue that is forming between the PRC and the US (Waltz, 1979).

The second factor contributing to the security dilemma in the US-China outer space developments includes the US efforts to modify the established rule of nuclear deterrence, mutually assured destruction, which was a prevailing factor throughout the Cold War era. The US has been developing a new deterrence strategy that combines both offensive and defensive capabilities (Glasner & Fetter, 2001). In consideration of this situation, PRC's strategists claim that the US outer space developments are driven by missile defense. Major General Xu Hezhen from the People's Liberation Army of China states that the US plans to develop space-based laser weapons to neutralize any missile advantage that could be used against the US. Thus, the PRC argues that the US is executing an organized plan to neutralize other countries' strategic

deterrence through the deployment of advanced space-based missile defense. As a matter of fact, in October 2008, the US Congress approved a budget of $5 million for a study of possible space-based missile defense strategy. This action confirmed the suspicion of the PRC army, which believed that the deployment of these resources could become a reality shortly (Zhang, 2011). Ultimately, any development of this magnitude by the US represents a direct threat to the PRC nuclear deterrent since the creation of these technologies could eliminate the mutually assured destruction rule.

The US-PRC strategic and military competition degrades their security relationship to an unstable position. The overwhelming distrust in their strategic relations has now extended to the outer space ecosystem, and many other domains such as the maritime space, and cyberspace (John, 2010). This is an unfavourable scenario for the international community since it is required the cooperation of both the US and the PRC to continue the development of space law and maintain the stability of the international system. The current experiments and developments of their outer space defense programs are indication of the onset of space militarization, an idea that has been rejected by all the treaties and principles of space law since the beginning of its formulation. Nevertheless, the intensification of a security dilemma scenario between the US and the PRC increases every time due to the lack of cooperation and their own security agenda (Glasner & Fetter, 2001). Furthermore, the disagreements between the two States only increases due to the ambiguity and legal voids present in the current regulations of space law that fail to consider the ever-changing conditions of the international system and the aspirations of certain actors such as the US and the PRC.

Therefore, in consideration of the context of the modern international system, the strategic competition between the US and the PRC is going to represent one of the principal issues for the development of a fair and sustainable space law (Asia Monitor, 2019). While the conditions of a security dilemma surging from both States in a polarized international community are similar to the context of the Cold War, however, the international system cannot expect a comparable outcome to the conclusion of the original space race. Although the advancement of the latter provided a lot of positive benefits to the international community with major advances in technology and science, the increasing complexity of the modern outer space competition and the emergence of outer space defense programs, while these might produce similar progress in the

domains of science and technology, the current strategies of the US and the PRC aim to achieve the deployment of dangerous weaponry in the outer space ecosystem that will only increase the risks of accidents and armed conflicts in the international system.

Furthermore, while the US holds the advantage in the modern outer space environment, the international community should not underestimate the growth and determination of the PRC. The main difference from the US and the PRC is that the political regime of the PRC is controlled under an authoritarian regime that enables the PRC leadership to react to any situation without the struggles and diligence often experienced in democratic systems (John, 2010). Furthermore, the current state of the international community seems to be weakened with the ongoing socioeconomic challenges, the struggles with racism and discrimination, the polarization of the international system, and many other issues that divides and interrupts the purpose and objectives of the UN to preserve peace and stability with international cooperation and sustainable strategies. This disadvantageous position of the international community might be exploited by authoritarian regimes such as the PRC and Russia among others where these actors might choose to follow their selfish objectives over the stability of the international system.

5.1. Space Ownership and New Components of Space Law

The issue of space ownership is one of the most important debates in the evolution of space law. The developments of the international system and human civilization is one of the main drivers in expanding the limitations of science, technology and, in this instance, international law. Nevertheless, as mentioned earlier, the regulations and principles formulated for the framework of space law were created in the context of the mid-20th century and are now outdated to the current conditions and advancements of the international system (Kostenko, 2020). Moreover, the emergence of the novel outer space defense programs represent a new concept that was not even considered at the time where most international agreements and principles of space law were created. This is an scenario that might repeat again in the future with the emergence of a new disruptive component in the outer space environment.

As presented in this research, the development of these outer space defense programs challenge the whole regime established by space law, and one of the most important factors in this debate is the issue of space ownership and the administration of territorial settlements in outer space. When the COPOUS formed the resolution that

dismissed laws of sovereignty in the outer space ecosystem, it did not consider the future of space exploration since, at the time, the barriers of entry to this environment were high and not many entities could develop outer space programs. However, the capabilities and technology of the international system have drastically improved and trying to venture to outer space seems to be an easier feat every year (Frankowski, 2017). Moreover, the resolution executed by the COPOUS, in accordance with article 2 of the Outer Space Treaty, ownership of celestial bodies cannot be invoked. However, this not only creates limitations in the subject regarding ownership of space but also the ability to maintain freedom, openness, and development. Furthermore, any company or individual, whose home countries are not part of the Outer Space Treaty, use the deficiency of its content to claim their belief that the concept of *res nullius* remains valid for private entities. However, the use of this interpretation would cause major political conflicts and repercussion in the international system (Brittingham, 2010).

The emergence of commercial space tourism has created a whole new element for space law to address the legal regulation of this framework over the new private entities venturing outer space. At present, the law on the rescue of space flight participants is insufficient since the original rules have been formulated only for astronauts in space exploration missions from the State. Still, general humanitarian responsibilities would prevail in a scenario of crisis with a private space exploration mission. Regardless of this, the international community would benefit from an adaptation and clarification the status of 'space-flight participants' and the general applicability of the Rescue Agreement (Forganni, 2017). Nevertheless, the difficulty of this issue is only expected to expand as the commercialization of outer space and the ongoing struggle with space debris that is causing the risks to venture into outer space to rise exponentially. Over time, additional elements and issues will arise in the outer space ecosystem that will increase the complexity and difficulty for the reform and adaptation of space law. Research have addressed the problems related to space waste and controls on the export of space resources (Ivanishchuk, 2020). Nowadays, there are no regulations established for countries to be obliged to dispose of waste and control their impact in Earth orbit. In the future, the issue with space waste and the stability of the outer space ecosystem will have to be addressed in order to prevent any more damage of the Earth orbit.

6. CONCLUSION

The development of outer space defense programs, in consideration of the examples analysed of the US and the PRC with their respective strategies, represents a direct contest to the main agreements and principles established by space law. In this regard, the international community founds itself in a difficult position since the cooperation of the US and the PRC is required to maintain the objectives of peace and stability in the international system, on Earth and outer space. Furthermore, while the main purpose of the regulation founded by space law is still valid and useful for the current conditions of the international system, there are various inconsistencies and too much ambiguity when it comes to consider all the new elements and components that have appeared in the outer space ecosystem. This includes the formulation of the novel outer space defense programs and the definition of their objectives.

Since most of the regulations and principles of space law were formulated in the context of the mid-20th century, there are several factors and the emergence of new actors, both States and private entities, that are left without a specific framework to provide the answers and permission required for their own advancements. Thus, a revision of the current framework of space law is needed in order to provide the international system the necessary tools to venture into a new age of space exploration where peace and cooperation is achieved. As the number of actors and activity in outer space increases, the law governing human activity in this ecosystem becomes more and more relevant.

Within the dimensions of space law, further conclusions and suggestions about the subject matter may follow:

1. Reform and adaptation of the outdated content of space law is needed to eliminate the inconsistencies and ambiguity issues in the international community with regard to outer space development. Furthermore, this evolution of space law must consider the validity of the novel outer space defense programs if it want to preserve the purposes of international peace and cooperation. This might not necessarily mean the absolute prohibition of these strategies; however, space law might require developing certain limitations regarding the weaponization and the types of operations intended by the outer space defense programs.

2. Space ownership is a need for space and development. Recognition by governments and property of space could generate an important *financial incentive* to open the outer space environment to more entities. In accordance with this understanding, competition in a free market can help to decrease the high costs of space-related activities. A proposal to introduce a new ownership regime would be required to achieve this objective. The establishment of a new regime based on freedom, openness, and a free market could help to reduce political struggles in outer space affairs and would create new industries that will benefit the international community.

3. The main challenge to acquiring a fundamental evolution of space law would be to reach an international consensus and the compromise of the most relevant actors in the matter, in this case, the US and the PRC. As demonstrated by the advances of the mid-20th century between the US and the USSR with the rest of the international community this is not an impossible accomplishment. For this matter, the whole international community, under the leadership of a European initiative, seems to have the most potential when it comes to influencing and negotiating with the US and the PRC.

4. Following up on the previous point, a win-win scenario can be achieved between the US and the PRC if both States understand the potential consequences of an ever-increasing military strategy that produces an intense scenario of a security dilemma among them. In addition, the potential opportunities for growth and technological development are not exclusive if both States, and the international community, cooperate in a sustainable and safe outer space environment.

It is essential to understand that the emergence of complex legal issues and challenges for space law and the international community is inevitable. Today, the appearance of the new outer space defense programs has demonstrated to be disruptive in the domains of public international law and international relations, however, newer issues might arise with the advancement of space commercialization and resource exploitation.

For this reason, the international community must acknowledge the changing nature of the international system and understand that at any given time, a new problem may arise and disrupt the stability of the international system. Nevertheless, if the international community can keep consistent with the principles and values established by the UN of international peace and cooperation, the opportunity for progress as a cooperative human civilization is endless.

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