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Shifting Dynamics in Space Security:
The Barriers and Prospects of Cooperation

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RESUMO

Esta tese explora o cenário em transformação da segurança e colaboração no espaço, focando na interação entre nações espaciais estabelecidas e novos atores, incluindo empresas privadas. Critica a teoria realista por suas inadequações em capturar as complexidades das atividades espaciais contemporâneas, destacando a necessidade de uma transição para abordagens mais cooperativas e inclusivas. O estudo sublinha a importância de desenvolver novos acordos e políticas internacionais que envolvam uma ampla gama de partes interessadas para garantir a exploração do espaço de maneira sustentável e segura. Através de uma análise das missões espaciais recentes, que são tanto competitivas quanto colaborativas, a tese explora como o futuro das empreitadas espaciais dependerá cada vez mais da capacidade das nações e das entidades privadas de colaborar na resolução de desafios mútuos e no avanço de objetivos comuns na exploração espacial.

Palavras-Chave: Segurança Espacial, Cooperação Internacional, Política Espacial, Empresas Privadas no Espaço

ABSTRACT

This thesis delves into the shifting landscape of space security and collaboration, focusing on the interplay between established spacefaring nations and new actors, including private enterprises. It critiques the realist theory for its inadequacies in capturing the complexities of contemporary space activities, highlighting the need for a transition towards more cooperative and inclusive approaches. The study underscores the importance of developing new international agreements and policies that engage a wide range of stakeholders to ensure the sustainable and secure exploration of space. Through an examination of recent competitive yet collaborative space missions, the thesis explores how the future of space endeavors will increasingly depend on the ability of nations and private entities to collaborate in addressing mutual challenges and advancing shared objectives in space exploration.

Keywords: Space Security, International Cooperation, Space Policy, Private Space Enterprises

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Glossary of Acronyms

ASAT: Anti-Satellite Weapons

ASTP: Apollo-Soyuz Test Project

BRI: Belt and Road Initiative

BRICS: Brazil, Russia, India, China, South Africa

CNSA: China National Space Administration

DIA: Defense Intelligence Agency

DPRK: Democratic People's Republic of Korea

EDA: European Defence Agency

ESA: European Space Agency

EU: European Union

GPS: Global Positioning System

ISRO: Indian Space Research Organisation

ISON: International Scientific Optical Network

KARI: Korea Aerospace Research Institute

NASA: National Aeronautics and Space Administration

NATO: North Atlantic Treaty Organization

NATA: North Korean National Aerospace Technology Administration

NGO: Non-Governmental Organization

NSIL: New Space India Ltd

OECD: Organisation for Economic Co-operation and Development

OST: Outer Space Treaty

PNT: Positioning, Navigation, and Timing

QUAD: Quadrilateral Security Dialogue

ROK: Republic of Korea

SSA: Space Situational Awareness

STM: Space Traffic Management

SpaceX: Space Exploration Technologies Corp.

UAE: United Arab Emirates

UNCOPUOS: United Nations Committee on the Peaceful Uses of Outer Space

UN: United Nations

U.S.: United States

USSR: Union of Soviet Socialist Republics

VSSC: Vikram Sarabhai Space Cen

INTRODUCTION

Humanity relies on outer space technologies for almost every aspect of modern living, including communication and navigation, financial transactions and weather forecasts. Scientific exploration to find habitable planets intrigues many, and what once used to be science fiction might soon become our reality. Efforts to colonize the Moon and missions to Mars do not seem so out of reach. However, as our reliance on space grows so does the importance of effective space security.

The global landscape of space exploration is characterized by a complex interplay of traditional and emerging state actors, along with significant contributions from private companies. The United States and Russia, with their longstanding space programs, continue to exert substantial influence, but face new challenges and evolving dynamics in the field of cooperation. Meanwhile, new players, such as China and India have rapidly ascended as major competitors, each with unique national strategies and international partnerships. The European Union (EU), with its focus on collaborative projects and technological advancements, aims to bolster its strategic autonomy in space, while countries like South Korea expand their capabilities and its strategic alliances, particularly with the United States, which strengthens the growing trend of the remilitarization of space activities.

The role of private companies, exemplified by SpaceX, Blue Origin, and others, is transforming the space industry, driving innovation, reducing costs, and fostering a new era of commercial space exploration. This shift necessitates new governance frameworks to address the unique challenges posed by the privatization of space activities.

Overall, space exploration is being shaped by a combination of state-led initiatives and private sector innovations. The need for international cooperation and effective regulatory frameworks is more critical than ever to ensure the peaceful and sustainable use of outer space. As nations and private entities continue to push the boundaries of what is possible, the balance of power and the dynamics of space politics will likely continue to evolve, presenting both opportunities and challenges for global space governance.

Traditionally, space activities were dominated by a handful of major spacefaring nations, which established the norms and regulations over this vast frontier. However, the emergence of new actors, including private companies and non-state entities, has introduced complexities that challenge the traditional ideas around space security. Scholars often relied on realist paradigms,

when it came to security questions, however these may overlook the cooperative dynamics necessary for addressing the multi-faceted challenges of modern space activities.

All strands of realism in international relations share a fundamental belief in the anarchic nature of the international system and the importance of power, even though they diverge in their emphasis and prescriptions for state behavior. Classical realism, neorealism (structural realism), and defensive realism prioritize states' security and survival with varying degrees of focus on power dynamics and defensive strategies and offensive realism asserts that states inherently seek power and dominance to maximize security, advocating for aggressive policies to achieve relative gains.

Despite the growing presence of new actors, there remains a significant research gap in understanding their specific impact on cooperative space security efforts. While many studies acknowledge the shift in space dynamics, few have systematically analyzed how the involvement of private companies and non-state actors affects the collaborative mechanisms established by traditional spacefaring nations. This lack of focused inquiry limits our understanding of the challenges and opportunities presented by these new participants in the space arena, particularly regarding their ability to engage in cooperative security measures and contribute to the overall stability of space operations.

The research question that drives this study seeks to find answers to: What are the potential barriers, challenges, and future prospects for cooperation in space security among traditional and new actors in space, and how does this cooperation transcend the limitations of a realist approach? I hypothesize that while space has traditionally been dominated by a few major spacefaring nations, the emergence of new actors in space has significantly altered the dynamics of space activities. As a result, cooperative measures have become essential for sustainable space utilization; however, this increased presence has also created additional layers of challenges in regulating space-related activities.

To explore these questions, the following chapters will examine the historical context of space activities, analyze regulatory and legal frameworks, and investigate the role of new actors in shaping cooperative efforts in space security. The first chapter of this study will explore the concept of space security. In Chapter II of this paper each of the strands of realism will be introduced, as well as their inefficiencies will be pointed out concerning space cooperation. At the end of Chapter II the proposed conceptual framework of space cooperation will be introduced to allow for a broader understanding of the way collaborative strategies address the complex nature of outer space

security, and it will provide a lens through which the following chapters will be viewed. Chapter III will introduce the background and the history of space activity and the current engagement of the United States and Russia in the field. In Chapter IV the existing space treaties and agreements will be discussed and how they fail to impose regulations in the current international system. The next and final chapter will introduce the new actors that have emerged in space over the last decades, both state and non-state entities, and how they make an impact on the space faring community.

CONTEXTUALIZATION OF THE RESEARCH TOPIC

The past decades have brought about a competition between the two current superpowers, the United States and China. A new race for the resources and the colonization of the Moon is unfolding. This celestial body closest to our planet holds strategic powers, which both nations have recognized and are eager to harness. The raw materials on the Moon and its position for future missions to the Mars are essential. To establish a strong lunar presence would be an advantage for either nation, as it would not only position them ahead in a geopolitical competition, but would mean significant economic and political wantage points. Getting to the areas of the Moon that contain water, at the South Pole of the Moon, would provide access to untouched resources, and, due to the lack of legal framework in place to keep nations accountable, they could easily lay claim to territories to important areas.

Both the U.S. and China have extensive cooperative projects with other nations, NASA collaborates with a number of western countries including the European Space Agency, Japan and Canada and China has been opening its doors for cooperation. The BRIC countries (Brazill, Russia, India, China, Iran, Egypt, Ethiopia, and the United Arab Emirates) and the Belt and Road Initiative (BRI) have both made cooperative agreements and China has used its extensive influence in the world to create smaller scale initiatives towards space cooperation. The members of the BRICS organization cooperate and share information through their remote sensing satellites and the information corridor that runs along the Belt and Road areas provide information services to participants. One partner in particular is increasingly important to China. Its ties with Russia have intensified even more since the beginning of the war in Ukraine.

The Russian invasion of Ukraine has heightened geopolitical tensions between Russia and Western countries, particularly the United States and European Union members. This escalation has extended into the domain of space security, as nations reassess their space strategies in response to the changing security landscape. The conflict has reinforced the perception that space is a critical theater for both military and strategic competition. In response to heightened threats, there has been a growing focus on the militarization of space. Countries are increasingly viewing space capabilities not just for strategic deterrence but as essential components of their national defense infrastructure. This has led to an accelerated development of space-based technologies, including advanced reconnaissance satellites and potential space-based weapons systems.

The war in Ukraine has highlighted the vulnerability of space infrastructure to cyberattacks and electronic warfare. Both Russia and Ukraine have experienced significant cyberattacks, with implications for space assets. Satellites communication and data systems that are essential for military operations can be disrupted and cause significant losses on either side. The increased use of electronic warfare capabilities in the conflict underscores the potential risks to space-based assets and communications systems.

Moreover, the war has strengthened alliances on both sides. Western countries have increased cooperation and NATO and EU members recognized the importance of space as a strategic asset that that requires collective defense measures and cooperative security frameworks. The conflict has prompted a reassessment of national space policies and strategic priorities. Countries are investing more in space defense capabilities, enhancing their satellite infrastructure to ensure resilience against potential attacks, and developing strategies to counter emerging threats. The need for robust space situational awareness and rapid response capabilities has become a priority for many nations.

Russia has also strengthened its cooperation with it main partner, China. After China was banned from the ISS in 2011 it worked meticulously on strengthening its presence in space. In 2022 the Chinese Tiangog space station became fully operational and the superpower set out to embark on a lunar mission. China is collaborating with Russia on a project called the International Lunar Research Station, project running parallel to the Artemis program, the lunar project initiated by the United States, launched by NASA, which has similar aims to build a space station on the Moon. This might be a second race in space, but this time there might be more on the line, than fight for global influence or political domination. In this race the first to establish a strong presence on the Moon will have significant advantages not only in the future of space expropriations, but in harnessing the natural resources of the Moon for supplying energy demands on Earth.

The Cold War and the decades after set the stage for the current barriers and challenges in space security. The competition drove technological advancement, while the cooperation efforts have proved, that working towards a common goal is beneficial for mankind as a whole. At the current time the international arena is in a similar situation it has been before. The U.S.-China race for the moon could end in a similar way as the race during the Cold War. After propelling each other forward in developing the technologies and securing the funding to make the necessary steps

towards a new chapter for humankind in space, the two superpowers and their allies could end up joining their forces on the Moon.

The ongoing wars and conflicts exacerbate tensions among member states of regional unions like the EU. These conflicts strain diplomatic relations and challenge the ability of unions to maintain cohesion and address shared security concerns, including those related to space. The question of whether these unions will endure or face fragmentation is tied to their ability to adapt to evolving geopolitical dynamics and internal divisions. The current context suggests that regional unions may face significant tests of their resilience and unity. These developments may either lead to a more complex evolution of international relations or prompt a re-evaluation of how regional and global institutions interact and cooperate on space security issues.

There are also newly emerging problems in governance on the national levels including the struggle to improve coordination between regulatory entities involving licensing, authorization, and supervision. Additionally, information sharing for space situational awareness (SSA), space traffic management (STM), and space weather is becoming more vastly available, more states are developing national SSA capabilities. Although more data sources and centralization of information is needed, the harmonization of these sources of date is indispensable for the reliability of operational decisions. SSA capabilities have traditionally been monopolized by the military, but private sector entities are emerging as providers and more open-source visualizations of the Earth's orbital environment are becoming available (Martinez, 2019, p. 66-67).

The outsourcing of space technologies to private companies has ushered in a new era of innovation and efficiency. Private entities like SpaceX, Boeing, Blue Origin, and others have revolutionized space access through cost-effective solutions and rapid technological advancements. This trend fosters greater interconnectedness by integrating diverse expertise and resources from the private sector, which can enhance collaborative efforts in space exploration and security. However, outsourcing raises concerns about the concentration of power in the hands of a few private individuals and corporations. The control over critical space technologies by a small number of actors can lead to vulnerabilities, such as monopolistic practices and the potential for unilateral decision-making that might not align with broader international interests. Balancing innovation with regulatory measures is crucial to ensure that private actors do not undermine collective security goals or prioritize profit over global interests.

The increasing amount of actors and debris in space, the lack of enforceable laws and regulations all leave most actors to navigate in a gray zone. The consequences of the slow reaction of the international community to the challenges that threaten us globally are a cause for concern.

The realist approach, which often opposes the establishment of a central authority to enforce rules upon states does not accommodate the current trends in space security anymore. Realists argue that states are primarily driven by self-interest and power dynamics, which can undermine efforts to establish effective global governance structures. However, history does notsupport this claim. The Cold War era space race led to cooperative efforts that solidified over time and the achievements of that period are the foundations for todays space mission. The challenges, the environment, the technologies have changed, but we are still humans and we are able to recognize the collectiveness of the issues and dangers we face today and maybe one day we will be able to put aside our differences for the benefit of all of humankind, as we were able to do just a few decades ago. Moreover, realism is state-centric, while at present we witness a fragmentation of the space actors, with more private players entering the stage of space competition.

METHODOLOGY

This chapter outlines the methodology employed in this thesis to examine the role of space cooperation and how it can enhance security in outer space. The research aims to critique the traditional realist approach to space security and explore how cooperative efforts among states and non-state actors can provide effective solutions to contemporary challenges. This section will detail the research design, the methods used for data collection and analysis and some of the limitations of the scope of this study.

This research employs a qualitative approach, which is suitable for exploring complex social issues and understanding the perspectives of various stakeholders involved in space cooperation. Qualitative research focuses on gathering non-numerical data to provide in-depth insights into specific topics about human experiences and behavior.

Space security is a complex topic with intricate dynamics; therefore a qualitative approach allows for a rich exploration of the motivations and relationships between states and non-state actors and the cooperative efforts among them. The research questions guiding this study aim to uncover insights about how these actors navigate challenges in cooperation, how they create or look for opportunities to strengthen their security measures in space and how these issues transcend the scope of the traditional realist approach to space security.

The data is collected primarily from secondary literature such as academic articles, books, primary sources such as treaties and agreements from international organizations, as well as examples of specific events covered by the media. These sources are analyzed to provide a comprehensive understanding of space cooperation as the framework of this study. While the subjective nature of qualitative research may introduce certain biases, mitigations measures such the diversification of sources is used to enhance the validity and reliability of the findings.

This study is grounded in the framework of space cooperation, which emphasizes the collaborative efforts among various actors—such as states, international organizations, and private entities—to achieve shared objectives in outer space. Space cooperation suggests that the dynamics of security in outer space are fundamentally influenced by collaborative relationships, mutual interests, and shared norms among actors, rather than solely by competition and military power.

In contrast, the realist paradigm serves as an anti-paradigm in this research. Realism focuses on the anarchic nature of the international system, asserting that states act primarily out of self-

interest and prioritize military power and national security. This perspective often overlooks the significance of cooperation, dialogue, and the interdependence that can exist in space activities.

The space cooperation framework informs this research in several ways. It acknowledges that cooperation can enhance security and stability in outer space, contrary to the to the realist emphasis on competition. The space cooperation framework prioritizes understanding the way actors in space perceive collaborative efforts and how they assign meaning to cooperation. In contrast, realism views knowledge as objective and grounded in a predetermined state behavior, neglecting the subjective interpretations of actors involved in policy making and space activities.

Methodologically, a qualitative approach aligns with the framework of space cooperation, as it facilitates the identification of underlying norms and values that promote cooperation and enhance security in space. In contrast, realism typically relies on quantitative methods that reduce complex interactions to mere power struggles.

The evidences in this study relies predominantly on primary sources from various international organizations and secondary sources as conducting interviews with policy makers and actors at the forefront of the space industry are not easily accessible. In the following chapter the existing literature on space security and cooperation and related legal frameworks will be revies, relying on important academic works, such as the 2024 edition of "The Oxford Handbook of Space Security""The Routledge Handbook of Space Security". Additionally, some of the most important treaties, that are still in effect today are also referenced in this paper, such as the "Outer Space Treaty", the "Joint Communication on an EU Space Strategy for Security and Defense", and the "Artemis Accords" just to mention some. These treaties are the cornerstones of space cooperation and have served as the basis for the framework of space cooperation.

The data is organized into chapters for a more comprehensive understanding, first laying down the foundations of the definition of space security in Chapter I. The following chapter explores realism and its shortcoming to fully comprehend the topic of space security, as well as introduces the framework of space cooperation. Space cooperation is the lens through which the following chapters are analyzed, always comparing it to the realist approach and pointing out its shortcomings. The historical context of Chapter III, the regulatory and legal frameworks introduced in Chapter IV, and the new actors described in Chapter V all relate back and reinforce the research hypothesis, that new actors in the space industry have significantly altered the dynamics of space

activities and therefore cooperative measures became necessary to utilize space in a sustainable manner.

The method used for analyzing the qualitative data is through literature review. The aim was to analyze existing research and academic discourse on the topic of this paper, to identify key findings, gaps, and areas for further exploration. Throughout the chapters these finding and gaps are explored and analyzed one by one. The literature is organized around key themes summarizing the main arguments and findings of different authors, including discussions on the effectiveness of certain treaties, the role of various actors, and theoretical frameworks, such as realism and space cooperation.

Naturally, as with qualitative research subjectivity can become an issue, leading to potential biases in the research design and the collection methods of data. I was only able to draw from literature available in the languages more prominent in the West, leaving a large gap of non-Western literature, including Chinese and Russian sources, which could have provided interesting perspectives on the topic of space cooperation and security. Furthermore, state issued documents of these countries are often not widely accessible, and when so, their credibility might be in question. Therefore, the scope of the study was limited to a potentially Euro-centric view, which limits the generalizability of the findings.

To summarize, the outlined methodology serves to explore the role of space cooperation in enhancing security in outer space, critiquing the traditional realist approach. A qualitative approach was employed to gather and analyze literature, including academic articles, treaties, and agreements, allowing for a comprehensive examination of the complexities surrounding space cooperation and security dynamics. The analysis focuses on identifying key issues and norms, that illustrate how collaborative efforts among various actors can address contemporary challenges in space, contrasting this with the limitations of the realist perspective. The study acknowledges the potential biases inherent in qualitative research and the Euro-centric perspective due to language barriers, yet it aims to contribute insights into the evolving landscape of space security. The following chapters will build upon these ideas by reviewing existing literature and legal frameworks related to space cooperation, and further supporting the hypothesis that new actors in the space industry necessitate cooperative measures for sustainable utilization of outer space.

CHAPTER I: SPACE SECURITY

Security and safety are two concepts closely tied together: security is often understood as relating to threats caused voluntarily, or with hostile intentions, while safety is more often associated with non-voluntary threats (Mac Garry, 2020, p. 136). As of today, most space activity is navigated by voluntary human actions rather than events of natural occurrences or accidents, which are far and few in between.

The definition of security has also widened over the years. A majority of people on this planet are more familiar with the feeling of a lack of security caused by various military and non-military factors, such as migration, food shortages, economic crises, environmental disasters, political instabilities or power struggles, then with the feeling of security. (Peoples, 2010, p. 206).

The pursuit of security has become a fundamental objective of state behavior and states are becoming more aware of the importance of security in space as well. The protection of satellites and spacecrafts positioned in orbit, the safeguarding of access to space, and the significant role played by diverse satellite types in ensuring the security of individuals on Earth is encompassed in the concept of space security (Sheehan, 2015, p. 8).

In a traditional sense, the concept of space security was primarily associated with the military security of states, focused on the military and environmental aspects of accessing and utilizing space, and it was defined within the context of the strategic balance between the United States and the Soviet Union. However, in recent years, there has been a shift in the understanding of space security. While the military dimension remains essential, other significant aspects have been included in the concept. Space security now encompasses various facets as the basic operation of nations are built on space technologies (Sheehan 2015, p. 7), which are exposed to threats of natural origin (e.g., asteroids and space weather) as well and man-initiated ones (e.g., cyber-attacks such as jamming or spoofing, radio frequency interference and even anti-satellite weapons) (Mac Garry, 2020, p. 135).

To add to this increasing list of destabilizing forces, space systems have become the governors of our security. Our everyday lives depend on high-tech space infrastructure on a global scale (e.g., financial transactions, electronic payment systems, mobile telecommunications networks, elements of civilian air traffic control, military communication, satellite images). Numerous industries, such as defense, transportation, energy, utilities, emergency services, banking, environment, academia (Plotnek and Slay, 2022, p. 253) and communication systems for

rescue and disaster management, monitoring systems of extreme weather conditions, migration and agricultural production rely on space technologies (Haas, 2020, p. 1). This dependency on space technology adds to our exposure to catastrophic events (Sheehan, 2015, p. 10) and leaves us more vulnerable than ever before in history. (Plotnek and Slay, 2022, p. 254).

Modern societies heavily depend on space technologies for communication, navigation, weather forecasting, and financial transactions. This dependency creates vulnerabilities, as disruptions to satellite services can have widespread consequences. The number of space actors, including private companies and nations, has increased, leading to more launches and contributing to space congestion and debris. Moreover, satellites used for civilian purposes (e.g., GPS) also have military applications, complicating regulation and raising concerns about the militarization of space. This means, that threats to space technologies concern every actor and nation. The space debris, that can cause damage to these objects, is the result of defunct satellites, spent rocket boosters, and fragments from disintegration, collisions, or ASAT tests (antisatellite weapons can destroy or disable satellites and disrupt services). The more tests and collisions in space, the more debris is generated, increasing the likelihood of further collisions. Countries like the US, Russia, China, and India have developed and tested ASAT weapons, demonstrating the capability to disable satellites. One significant example of such a test was China's ASAT test in 2007, which created a significant amount of debris.

The current mitigation strategies involve tracking debris, designing satellites with debris-avoidance technologies, and developing methods to remove debris, such as nets, harpoons, and robotic arms, however, this can only be done if space actors cooperate and share information about missions that potentially create more debris and rely work together to clean up the millions of pieces of debris orbiting the Earth. The United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUS) to minimize the creation of space debris, however the non-binding guideline does little to enforce these aims. The hostile environment that surrounds Earth due to the increasing amount of debris can be a discouraging factor for any new actor hoping to invest in space-based projects, which can undercut support from the financial sector.

Strategic action is necessary for the utilization of space for a range of security, commercial, civil and environmental purposes, while maintaining its capacity for future space activities (Sadeh, 2015, p. 24). Most satellites and space objects have a counterpart on Earth, which are also vulnerable against security threats (Mayence, 2010, p. 35), and all these issues create challenges

for the establishment of internationally accepted space regulatory laws. As much as states push for the peaceful use of outer space, they themselves continue to engage in, and develop military capabilities driven by the fear of losing advantage over potential opponents (Rajagopalan, 2021, p.155). Strategic alliances need to be credible in order to guarantee risk free access and utilization of space. Protection from threats to space systems needs to be at the forefront of international cooperative efforts (Sadeh, 2015, p. 24). It was not long ago that humans started to explore the possibilities of an arsenal of weapons that altered the future of space forever. Establishing and maintaining peace in outer space, should be taken as a prerequisite for long term sustainability of outer space activities.

A new challenge of outer space security is the appearance of newly emerging actors at both national and international levels of governance. As the presence of non-state space actors grows, international organizations are becoming more aware of the need to regulate space activities. The United Nations in 2013 called the attention of nations to regulate their commercial space activities (United Nations General Assembly, 2013, p. 1), however no such document regulates the market of non-governmental space actors.

Another challenge in space is the blurred lines between military and civilian uses of space objects as most current technologies are of dual nature. Therefore, security threats require both civilian and military solutions as well as states to pool their resources in order to lower the costs for security solutions (ESA, 2007, p. 24-25).

The number of countries that integrate space into their military capabilities is on the rise. Developing counterspace capabilities – such as ground and space-based weapons to deceive, disrupt or destroy adversary's space systems – has come into focus. This trend however, causes the attribution of the causes of satellite malfunctioning to be more difficult (Martinez, 2019, p. 68), meaning, that states can hide their identities while carrying out an attack, or act in the name of a third party, potentially create or intensify tensions. This type of irregular warfare will create more distrust and uncertainty between states, that can further hinder efforts towards cooperation.

In the domain of military space operations the focus lies not on self-reliance, but rather on the potential to cause disruption. In a traditional sense the influence of nations in space has been measured by their capabilities and hypothetical potential to diminish other states' technologies. On the contrary, most newly emerging actors, including nations, have a different approach to space. Instead of engaging in harmful activities in space these actors focus on the pursuit of practical

advantages and economic benefits that space infrastructures can provide. Their motivations are characterized by innovation, scientific exploration and space research. However, when major powers prioritize technological superiority in conflicts, it may encourage smaller nations to adopt similar approaches, believing that the international system enhances the military benefits of technological progress in their quest for influence and power on the global stage and they tend to imitate practices defined by dominating countries (Burzykowska, 2009, p. 187-188).

Although certain international treaties exist to limit space weaponization, most laws currently in place regarding space security are completely inefficient. They focus mostly on long-term sustainability of outer space activities and only impose limitations to weapon usage indirectly, not to their construction, development or storage. These laws are often not even adhered to or agreed by all spacefaring countries, as they do not have a common understanding of the need to limit the militarization of space (Yan, 2023, p. 4-5).

At the moment there is no universal definition in international law that defines space weapons. The most important treaties regulating space warfare are from the previous century and the debate around the use of terrestrially based weapons capable of hitting space assets is on going, without any major agreements reached in the last decades. Arms control, and the international law regulating it, is divided between the passive militarization and the active weaponization of space (Peoples, 2010, p. 205). The growing number of space weapons and their continued testing in space has already created a considerable amount of space debris and therefore a dangerous atmosphere for potential future space activities.

The thus created hostile environment on the lower orbits around the Earth is a discouraging factor for emerging commercial investors in space-based projects. The financial sector and the sustainability focused investments are struggling as an effect of this (Yan, 2023, p. 3-4).

Physical threats are not the only ways to disrupt peace in space. Jamming, spoofing, and cyberattacks on space infrastructure represent forms of irregular warfare that can severely impact space operations. Space infrastructure, including satellites and ground stations, is vulnerable to cyberattacks that can disrupt services, compromise data, and even take control of satellites. Such attacks can affect national security, economic stability, and emergency services. It is often hard to determine the origin of such attacks, making them effective ways of hybrid warfare, as attackers can hide their identities and create distrust between states to intensify conflicts.

Joint efforts could tackle common threats like space debris and cyberattacks, enhancing overall security and stability. Effective cybersecurity requires international coordination, unfortunately, the varying levels of capability and lack of trust among nations hinder the development of a robust, cooperative cybersecurity framework. The increasing number of space actors and satellites complicate space traffic management, requiring enhanced cooperation to prevent collisions and manage space debris. The mitigation of space debris and the prevention of the environmental degradation of space are crucial for maintaining the health of the space environment for future generations. The varying levels of willingness to cooperate and invest in debris removal technologies hinder these efforts significantly.

A further issue arises, that relates to the realist point of view, when the effort of one nation to enhance its space security is perceived as a threat by others, leading to a security dilemma where actions intended for self-defense provoke countermeasures. The increasing attitude towards the militarization of space also creates barriers to collaboration peaceful space activities.

CHAPTER II: THE CONCEPTUAL FRAMEWORK

Realism, the mainstream approach to space security

Realism was the prevailing theory of international relations especially during the Cold War, depicting international affairs as a struggle for power among self-interested states. A lack of cooperative mindset characterized this period, which emphasized competition and rivalry between the United States and the Soviet Union (Walt, 1998, p. 31).

Realism in International Relations posits the international system as inherently anarchic, lacking a central authority to enforce rules among states. It asserts that power and national interests are the primary drivers of state behavior. Realists view states as rational actors prioritizing their survival and security, navigating an anarchic environment where they must rely on self-help strategies. Emphasizing power politics, realism suggests states constantly seek to increase their power relative to others. They aim to maintain a balance of power to prevent hegemony and promote stability, as they remain skeptical about meaningful international cooperation, particularly regarding security and power dynamics (Walt 1998, p. 31). Realists believe that the state is the preeminent actor in world politics, and international relations should primarily be governed by states. Individuals, organizations, and NGOs are considered less important (Sørensen, 2012, p. 66). In traditional realism peace is seen as a balance of power between states (Elvevold, 2019, p. 6).

The concept of space security has been studied with a realist approach and although it emphasizes the competitive nature of international politics, it cannot ignore the complex nature of the space activities, which obliges states and other space actors to cooperate. Challenges such as affordability, the necessity of scientific and technical advancement and shared risks all contribute to the creation of a more collaborative approach, then in other areas of national security (Sheehan, 2007, p. 7-9)

Classical realism

Realism encompasses several subcategories that offer nuanced perspectives on state behavior and the international system, such as classical realism, neorealism, offensive realism, and defensive realism. The roots of classical realism stem from thinkers such as Thucydides, Niccolò Machiavelli, and Thomas Hobbes, who explored the themes of power politics and human nature. Upon such early thinkers is the work of German-American jurist and political scientist, Hans Morgenthau built, who was one of the major s of international relations in the 20thcentury. His

book *Politics Among Nations* laid the groundwork for understanding the role of power and human nature in international relations. In this major work, he introduced the pillars of political realism, one of which objective laws rooted in human nature govern states, that politics and society, and, that the understanding of these laws is crucial for the improvement of society. He argued that realism has the necessary tools to differentiate between truth and opinion. He emphasized the importance of facts supported by empirical evidence and observed in their contexts, and argued that considering influencing factors are necessary for objective conclusions (Morgenthau, 2005, p. 4-5).

In Morgenthauian realism, the good intentions of any political leader do not assure the morality or the political success of their foreign policy. In his work, Morgenthau defines power as the key the concept of interest, and interest as the essence of politics. He refers to Thucydides' ideas of common interests and alliances among states in times of crisis or conflict. (Morgenthau, 2005, p. 6-7). In his book *The History of the Peloponnesian War* Thucydides describes how states and cities formed alliances based on perceived mutual interests. For instance, Athens and its allies formed an alliance to counter the Persian threat and to protect their maritime interests. He also portrays states as driven by pragmatic considerations of power and self-interest rather than idealistic principles. This pragmatic approach often leads to shifting alliances and actions based on immediate strategic advantage. According to him, the actions of states were dominated by a desire to maintain or enhance security and stability, which can lead to alliances or conflicts depending on perceived threats (Thucydides, 1972). In Morgenthau's read power is the established and maintained control of man over man and the means of gaining that power can reach from democratic to barbaric (Morgenthau, 2005, p. 11).

The space race between the United States and the Soviet Union can be seen as a bedrock example of classical realist behavior. Morgenthau's framework of power politics can be easily applied to understand how the U.S. and the USSR used space exploration as a means to demonstrate technological and military superiority. The competitive dynamics of the space race, driven by national interests, security concerns, and ideological rivalry, exemplify the principles of classical realism. However, the eventual shift towards cooperative space endeavors also suggests the potential for competitive interactions to pave the way for collaborative efforts, highlighting the complex interplay between competition and cooperation in international relations.

Neorealism

Neorealism, or Structural Realism, builds on Morgenthau's work. Kenneth Waltz, American political scientist, veteran of both World War II and the Korean War, proposed in his 1979 book *Theory of International Politics* the idea that the structure of the international system is the primary determinant of state behavior. His Systems Theory of International Relations shifted the focus of realist theory from state centered to a systemic viewpoint. His argument was that, an analytic method of studying international politics, which observed the elements of a whole and the relations between them, was not sufficient anymore when applied in the study of international relations (Waltz, 1979, p. 39). He argued that the main goal of states is survival and fear is their driving motive. To achieve any additional goal they might have, they have to prioritize their survival. (Waltz, 1979, p. 91). States will always take the course that serves their national interest. Since they do not know each other's intentions and there is no authority above states to keep them accountable or to assure peace, they always live under the threat of conflict by another member of the international system (Waltz, 1979, p. 113).

Waltz's neorealism provides a useful framework for understanding the Cold War's competitive dynamics and the constant possibility of conflict driven by the anarchic international system However, the defensive realist perspective, which emphasizes state behavior aimed at preserving security and maintaining a balance of power, may not fully capture the complex motivations behind state cooperation. The Cold War era demonstrates that states engage in cooperative efforts for various reasons, including economic, technological, and ideological goals. To better understand international relations, it is essential to consider these multifaceted motivations and recognize that state behavior is influenced by a broader array of factors beyond mere security concerns.

Defensive realism

Defensive Realism is an extension of Waltz's neorealist idea, that that primary concern of states is to ensure their own security and survival. He emphasized the defensive strategies of states, such as the balance through alliances, to mitigate threats (Waltz, 1979, p. 41). Defensive realists argue that states seek to maintain a balance of power and avoid aggression, prioritizing security over expansionist ambitions in an effort to preserve stability in the international system.

Robert Jervis built on this idea in his book *Perception and Misperception in International Politics*. Jervis' research focuses on understanding how cognitive biases and misperceptions influence political decision-making, and how decision-makers often misinterpret historical events, leading to security dilemmas. He argued, that cognitive biases and perceptual errors often lead to misunderstandings and miscalculations, making cooperation more difficult and conflict more likely. He called attention to the lack of consideration of international relations theorist for the way state leaders tend to misinterpret the world, leading to conflicts. In his view the way each individual perceives the world is unique and is a different reflection of reality, that is influenced by the individual circumstances and psychological factors (Jervis, 1976, p. 3). Jervis suggested, that the intentions of states, based on the observes predictions can vary from the intentions and possible course of action of the decision-maker, however the actual course of action of the statesman can even deter from his original expectation (Jervis, 1976, p. 54).

Jervis' spiral model demonstrated how the defensive measures taken by one state are perceived as threatening by other states it can lead to a security dilemma, whereby states enter into a cycle of arms build-up and tensions escalate, even if no party had the intention to start a conflict. (Jervis, 1976, p. 62). He also argued, that cooperation between states would be more beneficial for all parties involved, as they would only gain benefits, whereas, in the conflict all actors suffer losses. To work together states must develop a certain level of trust and institutions that serve their common interests and put risks to their security out of sight (Jervis 1976, p. 67).

It could be said, that defensive realists, in contrast to offensive realists, argue that states prioritize security and stability over aggressive expansion and dominance. From a defensive realist perspective, the space competition during the Cold War can be seen as a manifestation of the security dilemma, where both the United States and the Soviet Union engaged in space exploration primarily to enhance their security and deter potential threats. The pursuit of space capabilities, including satellite technology and missile systems, was driven by the need to achieve strategic parity and ensure mutual deterrence. Defensive realists would emphasize that the primary motivation behind the space race was to avoid being at a strategic disadvantage rather than seeking outright dominance. This view posits that both superpowers invested in space not just for prestige but to maintain a balance of power, prevent unilateral advantages, and reduce the likelihood of direct conflict through assured retaliation capabilities. The resulting space achievements were seen as essential for national defense and as a means to secure the state's position within the anarchic

international system, highlighting the defensive realist focus on maintaining stability and preventing aggression.

Offensive realism

Offensive Realism, while still being a subset of structural realism offers a different approach to state behavior. This theory was advocated by John Mearsheimer in his works such as *The Tragedy of Great Power Politics,* in which he argues that states are inherently power-maximizing and that great powers will inevitably pursue power and dominance to maximize their security. Mearsheimer believes that the lack of overarching authority above the international community forces states to rely only on themselves to ensure their survival. In contrast to defensive realism he argues, that states are inherently aggressive and seek to maximize their power (Mearsheimer, 2001, p. 1). He supports the idea, that states can ensure their survival best if they become a dominating force of the international arena, therefore their ultimate goal is to achieve hegemony (Mearsheimer, 2001, p. 29). According to Mearsheimer, states exist in a constant state of fear and mistrust because they can never be certain of other states' intentions. This opposes Jervis' claim, that the prediction of states about the intentions of other states are at times more insightful, than that of the state itself, who might not be able to foresee his own future actions. In the Mershheimerian view the uncertainty between state actors drives the competition among them for power, which leads to conflicts and power struggles (Mearsheimer, 2001, p. 32-34).

Mearsheimer states that status quo is hard to maintain in a world dominated by a constant competition for opportunities to gain power. The more military power a state has, the more aggressive approach it might take, but offensive actions of powerful nations are usually preceded by careful consideration for the existing balance of power and how other states would react. For any move to be made the benefit has to outweigh the risk. For this a state has to be aware of its limitations, however, they can still run into miscalculated situations, since it is impossible to possess all the information necessary to make completely accurate predictions (Mearsheimer, 2001, p. 37-38).

John Mearsheimer's theory of offensive realism posits that states are inherently driven to seek power and dominance to ensure their survival in an anarchic international system. This framework aptly describes the Cold War era, where the U.S. and the Soviet Union engaged in a space race that exemplified how both superpowers sought to maximize their global influence through technological and symbolic achievements. By striving to outdo each other in space

exploration both nations aimed to demonstrate their technological prowess, project their ideological systems, and assert their dominance on the global stage. This pursuit of space achievements was not just about scientific progress but also about gaining strategic advantages and reinforcing their positions in the global power hierarchy, aligning with Mearsheimer's concept of power-seeking behavior in offensive realism.

The insufficiencies of the realist theories and the research hypothesis

The main hypothesis of this paper is, that space has traditionally been dominated by a few major spacefaring nations, but the emergence of new actors in space, including private, non-state companies, has significantly altered the dynamics of space activities. Cooperative measures became necessary for sustainable space utilization, however the increase in space presence created additional layers to the already existing challenges in regulating space related activities.

Security challenges in space, including the militarization and weaponization of space, significantly complicate efforts to foster international cooperation. The trust deficit, differing national interests, dual-use technologies, and cybersecurity threats create barriers to effective collaboration. The proliferation of ASAT weapons and space debris further exacerbates these challenges. The potential conflicts arising from these issues, such as strategic competition, disruption of civilian activities, legal ambiguities, and asymmetrical warfare, highlight the urgent need for more comprehensive and cooperative frameworks. The realist theory's state-centric focus limits its ability to fully understand and address the collaborative potential among diverse space actors. The complexities and challenges posed by modern space activities, including the role of private companies, the dual use of space technologies, and the need for sustainable practices, require more nuanced and cooperative frameworks. By promoting inclusivity, mutual benefits, adaptive regulations, sustainability, and transparency, the international community can develop effective strategies for the responsible and equitable utilization of space, ensuring long-term stability and security. Moving beyond the limitations of realist theory, adopting inclusive, transparent, and adaptive approaches is essential for ensuring sustainable and peaceful space utilization.

The realist theory fails to adequately explain and promote the necessity of cooperative frameworks for managing shared resources and mitigating common threats like space debris or cyber security. Classical realism centers on human nature and power politics, offering limited insight into the technological and operational challenges in space that require technical and

cooperative solutions, whereas defensive realism focuses only on maintaining security and avoiding conflict through defensive measures, which also supports the tendency towards an arms race in space rather than cooperation. The offensive strand of the realist theory emphasizes achieving dominance and strategic advantage, encouraging competition and weaponization of space, which undermines collective security efforts. What all these approaches fail to explain, is the inevitability of cooperation in issues that transcend national borders, problems that require develop comprehensive and collaborative security solutions.

One of the things in common between these strands of realism is the lack of focus on the cooperative gains in space made over the decades during and after the Cold War era. It was during the height of the war, in 1972, that the first space cooperation effort took place between the two rivals, when the Apollo-Soyuz Test Project in 1972 allowed an American and a soviet spacecraft to join together in orbit. The project was an opportunity to deescalate a military confrontation at the time and to bring about a new era of cooperation. It is hard to comprehend such a turn in state behavior, and yet this moment might have saved humanity from further disasters, and have paved the way for a more cooperative approach in space. During this historic even information was shared, technology was exchanged and knowledge was traded, that benefited the space programs of both parties. The historical lessons from past space cooperations such as this, offer valuable insights for future endeavors. If Neil Armstrong's first step on the moon was a giant leap for mankind, the docking of the spacecrafts of two adversaries in space was an enormous leap for humanity as a whole. Long-lasting diplomatic engagement can build trust and reduce tensions among current space actors, eliminating uncertainty and the constant threat states live under fearing other states.

The realist approach is useful to analyze the competition between these two superpowers, however, the complex nature of the international arena and the past examples for unexpected state behavior leaning towards cooperations call for a critical view of the realist theory. Another example of cooperation that challenges a purely realist point of view, is long-lasting effectiveness of the International Space Station. At a time when Russia has launched an invasion against Ukraine and positioned itself once again as an enemy of the United States and its western allies, it decided to continue its cooperation on the ISS, with three Russian cosmonauts in space, working together with their American counterparts in 2024.

The European Space Agency (ESA) is yet another example of what is possible to achieve, when states put aside their differences and pool their resources. Through a cooperation between ESA and the European Union member states were able to set up Galileo, an independent satellite navigation system, to provide alternatives to the U.S. Global Positioning System (GPS). The project was funded by the EU, while ESA designed, developed and deployed the satellites and operates the ground infrastructure. Furthermore, the European Defence Agency (EDA) was also established as an agency of the EU in 2004, with the aim of supporting member states in improving their defense capabilities, fostering cooperation in defense research and technology, and enhancing European defense industry competitiveness. The EDA also helped member states develop a European Space Policy and it works to improve the Space Situational Awareness (SSA) of the EU. The EDA provides recommendations and advice to EU institutions and member states on matters related to space security, helping to shape the strategic direction of European defense in the context of space.

With these examples in mind it is clear, that realist theory struggles to explain these cooperative ventures, which transcend nationalistic competition. In these examples nations have put aside their power-oriented ways for a greater purpose. The scientific research conducted on the ISS benefits all humankind and results thereof can help us learn about countless aspects of human life, indispensable for our survival. This can serve as an opportunity to recognize our collectiveness and rise beyond our nationalistic perspective.

The proposed conceptual framework: Space cooperation

In an era marked by the rapid advancement of space technology and the diversification of actors involved in space activities**,** space cooperation has emerged as a conceptual framework for understanding security in outer space. Space cooperation refers to the collaborative efforts among states, international organizations, and private entities to achieve shared objectives and address common challenges in outer space. This collaboration is displayed in joint missions, data sharing initiatives, and the development of international treaties that promote the peaceful use of space.

The relevance of space cooperation to the discourse on space security is essential. As nations increasingly rely on outer space for communication, navigation, and surveillance, the potential for conflict and competition rises. However, the complex nature of these challenges necessitates a cooperative approach, as unilateral actions can lead to instability and conflict. While the realist perspective emphasizes national interests and military capabilities, and its scope does

not include the collaborative potential of existing and emerging space actors. Space cooperation on the other hand underscores the importance of dialogue, trust-building, and shared norms to foster security, without the dismissal of the existing geopolitical structures.

The literature on space cooperation highlights key contributions from scholars such as John Logsdon's examination of space cooperation, particularly during the Kennedy administration in *John F. Kennedy and the Race to the Moon* (2010), reveals the early complexities of international collaboration in space. Initially, President Kennedy saw space exploration as a critical arena of competition with the Soviet Union, a key aspect of Cold War rivalry. Logsdon highlights that Kennedy also recognized the potential for space to be a platform for peaceful cooperation, famously proposing to Soviet Premier Nikita Khrushchev the idea of a joint lunar mission. While this proposal never materialized, it marked an important early effort to bridge ideological divides through space collaboration, demonstrating that even amidst intense competition, the groundwork for future cooperation was being laid.

Another important contribution to the literature about the concept of space security was James Clay Moltz and his book *Crowded Orbits: Conflict and Cooperation in Spac*e (2014), in which he takes the discussion further by analyzing the complexities of space cooperation in today's multipolar world. Moltz argues that as the number of space-faring nations and private entities has increased, so too has the necessity—and difficulty—of international cooperation. He explores the challenges posed by the militarization of space and space debris, while also acknowledging the crucial role of international treaties, like the Outer Space Treaty of 1967, in establishing norms for cooperation. Yet, these frameworks are increasingly under strain as new technologies and geopolitical tensions emerge. Moltz's work underscores the delicate balance required to manage national interests and global responsibilities in an increasingly crowded space environment.

Joan Johnson-Freese's *Space as a Strategic Asset* published in 2007 provides a broader strategic perspective, arguing that space cooperation is not just beneficial but essential for global security and international relations. She emphasizes that space has become a vital domain for national security, with the potential to either exacerbate conflicts or foster alliances. Johnson-Freese discusses how space cooperation serves as a form of soft power, allowing countries to build diplomatic ties and address global challenges like climate change through collaborative efforts. Her analysis highlights that while space is undeniably a strategic asset, leveraging it effectively necessitates a cooperative approach that balances individual national interests with the broader

global good. In this context, space cooperation emerges as both a diplomatic tool and a critical element of global strategy.

These works demonstrate that successful cooperation paves the way for sustainable use of outer space and are essential to enhance the security of states. The key components of the conceptual framework of space cooperation are: the actors involved in space cooperation, the mechanisms that facilitate collaboration, and the positive outcomes that result from such efforts. By examining these elements in the coming chapters, this thesis will illustrate the essential role of space cooperation in addressing contemporary challenges in space security. The conceptual framework will guide the analysis of historical contexts, regulatory and legal frameworks, and the influence of new space actors. Adopting space cooperation as a conceptual framework allows for a more comprehensive understanding of how collaborative strategies address the complexities of security in outer space.

CHAPTER III: A HISTORICAL CONTEXT

The historical background

The objective of this section is to examine how historical events and milestones have shaped the dynamics of space security through the constant dilemma of competition and cooperation. How this pattern created the current atmosphere and resulted in current state attitudes. It is also important to consider if the realist approach of international relations has been sufficient to explain space related issues that led to the existing attitudes towards space security today.

The struggle for dominance between powerful nations characterized much of our history in space. The Cold War divided the world, which was governed by two major ideologies, communism and capitalism. Each perceived the other as a threat to its national security, each superpower sought to demonstrate the superiority of its political and economic system. Military strength was a way to show power, and both nations perceived dominance in space technology as critical to their national security.

To understand the evolution of international cooperation in outer space, one must trace its roots back to the hostile and competitive origins of space activity during the Cold War. In the era of the space race the two superpowers of the 20th century, the United States and the Soviet Union, fought for dominance in outer space, which has led to scientific breakthroughs that opened a new door for humanity as a collective and has brought outer space and celestial bodies a step closer to human exploration. This race in space began with the launching of the first Soviet satellite to space named Sputnik 1, in 1957. What followed, was the beginning of the era of humans in outer space. The first person to have ventured to space was the Soviet cosmonaut Yuri Gagarin in 1961, who was followed by Alan Shepard, an American astronaut in the same year, and by 1969 the first men, Neil Armstrong and Buzz Aldrin, walked on the moon as part of the Apollo 11 mission, launched by the United States *(*Elvevold 2019, p. 4, 21*).*

As scientific research advanced the possibilities of utilizing space for military and strategic purposes became evident. Control over outer space and the monitoring of space assets thus became a national interest. Space became a strategic asset for intelligence, communications and defense activities. Military technologies such as reconnaissance satellites soon appeared and the race in space continued at an accelerated pace. To prevent future disasters treaties and agreements were put in place. One cooperation that paved the way for the future of space activities and space security

was the Apollo-Soyuz Test Project (ASTP). In 1972, as the Cold War was still dividing the world, the two opposing sides the United States and the Soviet Union, putting aside their rivalry, agreed to conduct a mission in space together in which an American Apollo spacecraft and a Soviet Soyuz spacecraft docked in orbit. The two astronauts from the two spacecrafts shook hands in space, as a symbol of the cooperation of the two states in a joint space mission. Such cooperation at the height of the war between two superpowers showcased to the world the possibilities of a future characterized by collaboration and cooperation instead of competition and destruction (Loff, 2017). The Apollo-Soyuz Test Project was only the beginning of cooperative efforts in space.

The scene has evolved since then with more countries and non-state actors entering the field of space activity, a renewed effort to conquer celestial bodies and utilize space infrastructure has emerged on the agendas of powerful nations as well as of eager businessmen, which propels space once again to the center of attention in the 21st century.

As not to repeat the history of the space race or the role the United States and Russia played in it, this and the next sections will primarily focus on current space programs, capabilities and the challenges that these countries face in this sector. The old dynamic of space cooperation has shifted distinctly in the last years. To lay down some foundations before exploring these changes it is useful to look into the actors that established the culture of space activity and later on in the next chapter the newly emerging state and non-state actors, that are contributing to the shifting of balance in and around space infrastructure.

United States of America

The United States' space agency NASA has played a pivotal role in shaping humanity's exploration of the cosmos since its establishment in 1958. It was responsible for the Apollo moon landings in the 1960s and 1970s, the Space Shuttle program that facilitated groundbreaking research and construction of the International Space Station (ISS), and recent endeavors such as the Mars rover missions. NASA's space strategy has evolved over the years, emphasizing scientific discovery, space exploration, and technological innovation. The United States is one of the actors in space, that have fostered strategic partnerships with international space agencies, including collaborative efforts on the ISS with Russia, Europe, Japan, and Canada, as well as commercial partnerships with companies like SpaceX and Boeing for crewed spaceflight and resupply missions (NASA, n.d.-a).

NASA has been a dominant force in space exploration since its beginnings, its annual budget for space programs also demonstrates this dominance. The USA allocated 73.2 billion dollars to this field in 2023, more than five times the expenditure of China (14.5 billion dollars) in the same year, the second state with the largest space economy in the world. Russia comes in fifth on the list with 3.4 billion dollars spent on space programs. The European Union is sixth on the list with 2.8 billion dollars in annual expenditure and India, another relative newcomer to the field invested around 1.7 billion dollars in 2023, which made the country the third most important Asian player in the space landscape after China and Japan (Statista Research Department, 2024).

As part of the Artemis campaign, to send the first woman and person of color to the moon NASA introduced a set of principles and guidelines for international cooperation in lunar exploration established in 2020 called the Artemis Accords, signed by 21 countries. NASA's program has four missions, each of them one step towards the exploration of the Moon, which could be a potential stepping stone for Mars missions. The currently active mission is Artemis III, which aims to land the first humans on the South Pole region of the Moon, the side of the Moon not visible from Earth (NASA, n.d.-b)

These peaceful explorative efforts however are not the only priorities of the United States' space policies, the worldwide military operations of the USA to this day heavily rely on space systems, and the immense network of satellites provides the necessary support for the world's most advanced military. However, although most US space technologies are highly advanced, they can become easy targets. To prevent attacks on these assets the United States cooperates with its allies to create a more secure atmosphere in space (Toyoma, 2022, p. 2-4).

Russia

Next to the USA the country with the longest standing history of space activity is Russia, whose focus has also shifted quite significantly in the past decades. Russia's space policy since the Soviet Union's dissolution has largely been built on existing Soviet space achievements. The Soviet space program, heavily shaped by military interests and secrecy, became a national identity symbol. Post-Soviet reforms aimed to emulate Western space models, focusing on industry survival and market-based international collaborations, rather than national identity. However, its progress in this era is mostly confined to maintaining old Soviet technologies and infrastructure, as new initiatives often fail due to abandonment, obsolescence, or lack of funding. The Russian space program after the end of the Cold War faced challenges like economic turmoil, corruption, and

bureaucratic issues. In 2015, Roscosmos was established in Russia as a comprehensive space agency managing the whole industry. This governing body also underwent multiple structural and leadership changes as it faced challenges in balancing its roles as a state representative and an industry customer, aiming for both profitability and cost efficiency. This internal conflict hindered long-term management effectiveness and risked the collapse of the space industry's ecosystem. Dominated by government influence, particularly under president Putin's leadership, Russia's space commercialization remained state-centric. Despite controlling most commercial space flights, Roscosmos struggles with sector modernization, failing to make Russia's space industry globally competitive (Vidal and Privalov, 2023, p. 2).

The invasion of Ukraine in 2022 has brought further challenges to Russia’s stance on its space policy. The effects of the war on the Russian space strategy are visible both domestically and in the limitations of their international cooperative measures. As Russia's relationship with the USA deteriorated the international cooperation efforts took a blow. Russia has repeatedly made threats to discontinue the cooperation on the International Space Station (ISS), however as of 2024 there are still three Russian cosmonauts in the space station and Russia delayed its exit until 2028 (Porter & Friel, 2024).

Furthermore, Russia leads the nongovernmental organization of International Scientific Optical Network (ISON), which is the largest foreign network of ground based optical space surveillance sensors. ISON was established in 2001, and participants include international academic and scientific organizations and government entities such as Roscosmos. Russia’s Keldysh Institute of Applied Mathematics coordinates sensor tasking and combines information from nearly 100 ground-based optical sensors of varying sizes at 40 observatories across 16 countries—Australia, Bolivia, China, Georgia, Germany, Italy, Kyrgyzstan, Mexico, Moldova, Mongolia, Russia (seven locations) Spain, Switzerland, Ukraine (4 locations), the United States, and Uzbekistan (DIA, 2022, p. 27).

Russia has also deepened its ties with another superpower and major space actor – China – with whom it has announced plans to partner up for the creation of an International Lunar Research Station, similarly to the Artemis mission, however, they have also announced plans of a lunar nuclear power plant (Mishra, 2024)

CHAPTER IV: REGULATORY AND LEGAL FRAMEWORKS

Throughout the decades of the second half of the 20th century the international community made efforts to strengthen multilateral cooperation between nations. Several key treaties and agreements have been drafted to provide guidance for the international community in space. One such initiative was the space Shuttle Program by NASA that ran between 1981-2011 and facilitated cooperation with various countries through joint missions, satellite deployments, and collaborative research projects (Mutschler, 2015, p. 44).

Other examples of multilateral cooperative efforts include the United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS), which was founded in 1959 and continues to promote international cooperation and the peaceful use of space till today. The committee was established to govern exploration and the use of space for the benefit of all humanity, by providing a forum for the development of international space law.

Possibly the most important treaty for peaceful space cooperation was the Outer Space Treaty (OST) of 1967, which was signed by more than 100 countries and set the foundation for space law by emphasizing the peaceful use of outer space and prohibiting the placement of nuclear weapons in space and mandated that space activities should benefit all countries (Mutschler, 2015, p. 42-43).

Other examples are the less widely adopted, but just as important Moon Agreement (1984), which regulates the use of the Moon and other celestial bodies and encourage international cooperation in lunar activities (Sadeh, 2015, p. 32), the Space Debris Mitigation Guidelines, which were developed by various space agencies and organizations to reduce the creation of space debris and promote responsible space practices (Sadeh, 2015, p. 27) and the most recently adopted Artemis Accords (2020) proposed by NASA, which aim to establish guidelines for international cooperation on the Moon and beyond, focusing on peaceful exploration, transparency, and the use of space resources (NASA, 2024).

The United Nations Charter and the 1970 Declaration on Principles of International Law concerning Friendly Relations and Cooperation among States were documents that laid out a legal basis for international relations, including activities in space. International cooperation is one of the main aims of the United Nations itself and is reflected in the Charter, as it is one of the main goals of the international community to solve international problems together peacefully (Jiang and Zhao, 2021, p. 2).

Another successful example of multilateral collaboration is the International Space Station (ISS) which was established in 1998. This multinational project involved the United States, Russia, European Space Agency (ESA), Japan, and Canada. It still serves as a laboratory for scientific research and exemplifies long-term international cooperation in space (Chaben, 2020, p. 83).

At the beginning of 2023, despite the tensions between the United States and Russia due to the ongoing war in Ukraine, two American astronauts, a Russian cosmonaut, and a UAE astronaut safely landed abord the ISS. The Russian cosmonaut was the second Russian to ride with an American spacecraft under the ride-sharing deal, which was renewed in July 2022 by NASA and Roscosmos. (Gorman, 2023).

The Russian Soyuz spacecraft has had monopoly on all crew transportation to the ISS since 2011, due to NASA cancelling its program. Thanks to SpaceX from 2020 America's ability to transport astronauts to the ISS was restored, after a gap of 9 years (SpaceX, 2023). SpaceX's example of meeting American and European needs demonstrates how governments will need to continue to rely on public contracts. Although, states no longer have a technological control as previously, they continue to dominate the security and defense industries for the foreseeable future (Haas, 2020, p. 3).

Multilateralism has further increased space cooperation among the countries of the Belt and Road Initiative (BRI) and the members of the BRICS organization. In 2016, a spatial information corridor was included under the BRI umbrella, while remote sensing satellites were incorporated into the BRICS framework in 2017 (Wu, 2022, p. 1-3).

While these treaties and agreements aim to foster international cooperation and sustainable use of space, their effectiveness is limited and balancing national priorities with global norms remains a critical challenge in the evolving landscape of space law and policy.

Although, private companies have become major actors in space activities, states still remain the entities that hold the international community accountable for security threatening activities and are responsible to regulate the issues of space security on the international platforms. To establish a more stable future for space cooperation more effort on both sides, the state and the private sector, is needed. To level the playing field and to build capacity in the lawmaking processes newcomers, both state and non-state actors will have to be considered, and their active participation is necessary (Masson-Zwaan, 2019, p. 102). The United Nations seemed be a good platform for international discussions, however it seems to be struggling in enforcing regulations over its

member states. New laws and ways of enforcement is needed, which is hard to imagine without a central authority over all states.

The realist theory claims, that states will always prioritize national interests over collective agreements, hindering real consensus and effective regulation. States will interpret provisions to suit their strategic interests, undermining the intentions of the treaties and the ack of enforcement mechanisms weaken their effectiveness, as states will be able to violate terms without significant repercussions. The lack of participation in such treaties is viewed as a preference to retain flexibility and control over space activities, fearing constraints on strategic interests, even if the benefits for the greater good would outweigh the possible negative effects. The non-binding nature of these guidelines also reflects this realist thinking.

New actors emerged on the horizon of space activity and many of the existing guidelines were unable to accommodate their role due to the rigid state-centric approach they represent. This realist view of the international arena sidelines the growing role of the private sector and other non-state actors, hindering development in creating comprehensive regulations that reflect the full spectrum of space activities, and includes the voices of all space actors.

To fill this gap frameworks should explicitly include mechanisms for the participation of non-state actors, such as private companies and international organizations, to ensure that all stakeholders have a voice in regulatory development, as well as incorporate adaptive mechanisms to address rapid technological advancements and emerging activities, such as space tourism and resource extraction.

Unfortunately, it is enough to look at the state of national regulations on space related activities, to know that a change on the international arena is not to be expected rapidly. Other than the U.S., which has a long history of collaborating with private companies, countries that recently started venture into space lack the necessary and enforced regulations for private companies. Russia’s and China’s regulations are mostly state centric, as most of their space activities are governed by the state.

One example that stands out among the many nations that have not updated their space laws is the EU. The Joint Communication on an EU Space Strategy for Security and Defense (European Commission, 2023) is an outstanding document, outlining a coordinated approach to utilizing space capabilities for security and defense purposes. It emphasizes the need for resilience, protection of space assets, and fostering an autonomous European space sector. However, even this document

has its challenges, as achieving strategic autonomy requires significant investments and overcoming political and bureaucratic challenges within the EU.

To counter these issues both national and international frameworks should be regularly updated and revised to keep pace with technological advancements and emerging actors. Enforcement mechanisms need to be strengthened on the international level to ensure compliance with space treaties and guidelines and an international framework is needed to manage the extraction and use of space resources in an equitable and sustainable manner. Checks and balances are required to protect the space environment from space debris to ensure a sustainable future for space activities.

The challenges towards such steps in the future are the strong inclinations of states to their national interests, even if that means long-term disadvantages. Military competition is strong, the environment of competition forces states to focus on enhancing their own capabilities. The fragmentation of diverse national regulations also leads to inconsistencies and make operational efforts more difficult. As the private sector grows regulatory frameworks become outdated and the mentality of every man for himself grows.

Realist theory emphasizes the role of powerful states in shaping international norms, potentially marginalizing smaller states and non-state actors, leading to regulations that favor the interests of dominant countries. However, it is clear, that states might not be the ones dictating the pace in space activities anymore. The appearance and domination of SpaceX and its technologies are a clear example. SpaceX conducted 61 launches in 2022, just one launch short of the launches carried out by China in the same year. This is undeniable evidence of the power and influence SpaceX holds, yet the influence of private companies is not reflected in the international treaties.

Furthermore, realist theory views international relations as a zero-sum game, where the gain of one state is seen as a loss for another. This perspective fosters competition, but it is important to note, that any accident in space could be detrimental to all of humanity, as it collectively depends on space technologies and a sustainable and responsible behavior in space should be prioritized by every nation. Security measures should be viewed as a collective effort, emphasis on national security and military capability can hinder long-term collaborative security measures. As opposed to the realist thinking, binding international regulations would far from constrain national autonomies, they would ensure the security of states' infrastructures and technologies as well as their access to resources in space. These shared risks should be approached with global solutions, by including a diverse range of actors and the expertise of all stakeholders.

Transparency initiatives could build confidence among nations and other actors. Sharing data and space situational awareness information could strengthen trust and joint projects and more collaborative research could strengthen ties between actors.

CHAPTER V: CHANGING TIDES IN SPACE

The appearance of new actors in space

Remarkable achievements and ongoing endeavors from nations across the globe characterize the journey of space exploration. This section delves into the space activities of seven countries: the United States, Russia, Europe (represented by the European Space Agency or ESA), China, India, the Republic of Korea (ROK), and the Democratic People's Republic of Korea (DPRK). Each subsection provides an examination of the most important milestones, space strategies, and partnerships of these nations.

The list (see Appendix A) begins with the United States and its space agency the National Aeronautics and Space Administration (NASA), which initiated its first space endeavors as far back as 1958 (Pekkanen & Blount, 2024, p. 229). It continues with another long-standing actor of space activity, Russia, whose space agency, Roscosmos, was established in 1992, following a legacy of space exploration dating back to the late 1950s, highlighted by Yuri Gagarin's historic journey as the first human in space in 1961 (Howell, 2018).

Among the relatively new, or non-traditional actors in space (meaning they did not have major influence in space until decades after the two traditional actors) is the European Union, represented by ESA, which was founded in 1975 and has forged collaborative partnerships with space agencies worldwide that shaped its presence in space (ESA, n.d.) The second largest space economy in the world, China, established its space agency, the National Space Administration (CNSA) in 1993, which emerged as a prominent player in the international arena since the early 2000s (Pekkanen & Blount, 2024, p. 144).

The growing influence of countries such as China, India and South Korea have all contributed to a shift in the space industry. India's Space Research Organisation (ISRO) was established in 1969 (ISRO, n.d.), the South Korean Aerospace Research Institute (KARI) in 1989 (JAXA n.d.) and the North Korean National Aerospace Technology Administration (NATA) in 2013 (NATA, n.d.). India’s space agency the NSIL aims to boost India’s presence in the global space market, including plans to land on the Moon. South Korea’s aspirations are similar, it conducted a lunar mission in 2022, a significant step in its space objective.

The space programs of countries such as North Korea and Iran have caused concern internationally as they continue to advance their technologies. The launch of North Korea’s first

spy satellite in 2023 indicates the countries effort to use space technology for geopolitical influence. The advancement in its space capability is also an indicator of the strengthening ties with Russia.

The entry of these new actors in the community of space faring nations has diversified the landscape, challenging the dominance of traditional and new space powers, as these new actors are rapidly achieving technological parity, particularly in areas like satellite technology, launch capabilities, and lunar exploration. The alliances they form can also shift the balance of power and influence global space politics, as China is strengthening its ties with Russia, while Russia is aiding North Korean technological advancements. India and South Korea are also leveraging their space capabilities to enhance their regional influence and leadership in space diplomacy. However, the increasing presence in space can also lead to escalating tensions as space is militarized and the development of anti-satellite (ASAT) weapons bears potential conflicts.

The realist theory does not fully explain the collaborative potential of emerging spacefaring nations, while employing the concept of space cooperation could fill in this gap, while not dismissing the competitive and geopolitical dynamics. Countries like India and South Korea actively seek partnerships to leverage mutual benefits, such as shared technology and joint missions. Furthermore, emerging space powers use their space capabilities as tools of soft power and diplomacy, promoting peaceful cooperation and international goodwill, which realist theory often overlooks, as well as the potential for mutually beneficial collaborations that can arise from shared goals and resources.

New space actors also pose a number of challenges to the existing order in space. Other than the insufficient traditional regulatory frameworks and cooperative measures, the problems of limited resources, such as orbital slots and radio frequencies, can lead to conflicts and overcrowding in certain space orbits. The surge in the number of launches, particularly by private companies, exacerbates the problem of space debris, an issue not adequately tackled by existing actors.

Furthermore, the commercial ambitions of private companies may not always align with international norms and regulations and the protection of intellectual property rights while ensuring collaborative research and development pose challenges in the regulatory landscape.

In the contemporary space industry, several pioneering companies are leading the charge towards the commercialization of space exploration, so in the last subsection of this section I will introduce some of the most important non-state actors of the field (see Appendix B).

Boeing, with its rich heritage dating back to the 1960s, has been instrumental in various space initiatives; including International Space Station (ISS) resupply missions and the development of human spaceflight capabilities (Petrauskaite, 2022). SpaceX, founded in 2002, has revolutionized space access with its focus on affordability, successful launches for various customers, and ambitious plans for human colonization of Mars (Howell, 2022). Blue Origin, established in 2000, stands at the forefront of reusable space transportation and lunar exploration, with its New Shepard rocket conducting numerous suborbital flights (Sims, 2024). Meanwhile, Virgin Galactic Virgin Galactic, founded in 2004, is pioneering space tourism and suborbital research missions, exemplified by its fully crewed suborbital spaceflight featuring founder Richard Branson (Dinner, 2021). These companies' distinct strategies, partnerships, and recent achievements underscore their significant contributions to shaping the future of space exploration and commercial spaceflight.

Since the turn of the century countries with active space programs have multiplied and so did the number of satellite operations. A large part of this growth can be attributed to the commercial and state driven space operations of newcomers such as China, the European Union, Japan, India, Australia, the United Arab Emirates (UAE), Israel, Pakistan, Turkey, and South Africa. Some of these states are represented by space agencies, others focus on the development of expertise in specific technologies (Pekkanen, 2019, p. 92). There is not only an increase in the number of countries that are expanding their influence to space activities, more and more individuals and entrepreneurs are interested in the potentials that the realm of space economy can offer. The number of such businesses are on the rise, but private actors have made up an important part of space operations from the beginning (companies such as and Boeing, Lockheed Martin, and Airbus have been cooperating with the government of the United States since the beginning of space activities). An important difference today is that businesses do not only support governments to achieve their aims, but they act on their own terms with their own agendas. The advancement of technologies such as small satellites and artificial intelligence are also changing the face of space operations (Pekkanen, 2019, p. 93).

The actors discussed in this study were chosen based on their relevance to European based research, as well as to the current state of affairs in space-politics. This paper does not include the separate space programs of the member states of the EU, as they alone hold little power in this sector and their policies are mainly governed within the organizations they are part of, such as the European Union and the European Space Agency (ESA) .

China is mentioned as a rising space power, as its position cannot be ignored in light of the changing dynamics around space activity. Cooperation with this superpower could tip the scale in the equalization of power in the world. The issue of space security transcends all national borders, and therefore it has the potential to push states to open new doors towards cooperation in this field, and China offers a strong alternative to the traditional Western allies.

The paper will not be mentioning privately owned agencies in each region, as it reviews some examples in the next section. However, the impact of the fast-paced emergence of non-state actors in the space sector is crucial for every nation, as it forces them to reshape their space policies.

The European Union and the ESA

The European Union could be described as a space power. It possesses various space assets such as the Galileo system that operate satellites that provide positioning, navigation and timing services (PNT), as well as the Copernicus program, which is an Earth Observation component. Europe is also developing a new communications satellite infrastructure called IRIS², and is launching new projects in the field of planetary defense research (European Commision, n.d.)

In 2022 the European Union identified a new strategic domain in its Strategic Compass. Space became a focal point in security as the EU developed its first Joint Communication on an EU Space Strategy for Security and Defense by March 2023 in order to ensure the safety of its assets as well as its strategic position to establish its autonomy among spacefaring nations. The increased space activity of two countries in particular concerns Europe the most: Russian and China (European Union External Action, n.d.). This document recognizes the importance of international cooperation, the peaceful use of outer space and the role of transparency and confidence-building measures in order to evade conflicts. However, Europe is more conscious than ever, that the region's interests lie in strengthening its position in space (European Commission, 2023, p. 1).

In the Space Summit of the European Space Agency (ESA) in November 2023 member states came together to discuss the ambitions of European space exploration and research. A modernization towards a more sustainable future was on the agenda, and while Europe recognizes

its necessity to secure access to space, without international cooperation achieving a successful and sustainable future in space related operations is hardly imaginable. The agency is also aware of the fast pace change that is occurring, as a new economy is developing in the low Earth orbit, especially dominated by private companies in both launches as exploration. Due to this shift in space technologies from state to privately owned, ESA announced a competition for European based companies to develop space cargo return services to the International Space Station, not excluding the possibilities for future development into crew vehicles, which could further boost ESA's profile as a space actor (ESA, 2023, p. 1-7).

Another important aspect that Europe pays attention to, is the growing number of outsourced services to commercial investors in the space sector. It announced recently its desire to work more closely with start-ups. Furthermore, as the Joint Communication states, it is within the interest of Europe to partner with entities, that share a common vision of peaceful and responsible behavior in space. Historically the United States has been the partner with whom Europe has its closest ties, however, there is an eagerness for a shift towards cooperation with other like-minded countries. The EU is also dedicated to continue dialogue about cooperation with other international organizations, such as the UN and NATO (European Commission, 2023, p. 15-16).

China

China has taken the title of space superpower from Russia and has been boosting its presence in space since the turn of the century. China's rise as a space power is a significant development in the international space society, but its power is primarily defined in terms of space capacity and not space cooperation. It's space program led by the China National Space Administration (CNSA), has made significant strides, including manned spaceflights, lunar exploration, and the development of its space station, Tiangong, all within the last two decades. China has successfully landed rovers on the Moon and Mars, showcasing its growing capabilities.

Even though China publicly advocates for peace in space, its national focus is on improving its counterspace weaponry and military capabilities in space. Being a superior actor in the realm of space and developing cutting edge technologies is one of the foci of the Chinese space policy (DIA, 2022, p. 8).

China's position as one of the leading space actors in the international sphere is the result of decades of technological and economic advancement. Its journey to its present self has seen a transition from an independent national actor to a bilateral cooperative and finally a multilateral

cooperative one, not only in the space sector. At the start of China's rise to become a space power, it received a considerable amount of help from the Soviet Union for missile system development. Since 1984 China has also been partner in countless cooperative agreements with a multitude of states. Its intent to execute the principles of the 1996 Cooperation Resolution of the United Nations and its very own White Paper on space shows an eagerness towards more cooperative initiatives and provided more economical ways for cooperation (Wu, 2022, p. 1). Now, the China National Space Administration (CNSA), the national space agency is responsible for conducting centralized state-initiated space activities.

In reality China rarely cooperates with states on larger projects, and when it does, they are mostly one sided and smaller scope projects, such as satellite development, launching services, and scientific experimentation on space stations and lunar missions. These are quite immature when compared to the resources and capabilities that China has available. China's space policy is a vital part of its political program and it positions itself in direct competition with the United States in its development of space technologies in the areas of communications, imaging, space exploration and the military. It seeks cooperation mainly from non-western allies, such as the countries of the BRICS alliance. It also prefers more dominant roles in these cooperations, similar to its policy in cooperation in other areas (Frenkel & Blinder, 2020, p. 9-13).

However, the Chang'e 6 Lunar Mission is an example of international cooperation in which China carries instruments from Pakistan, France, Italy, and Sweden to conduct research on the far side of the moon (Anqi & Xiaoci, 2024). The ties of cooperation with Russia have also strengthened when they signed a Memorandum of Understanding (MoU) in March 2021 and has entered into a cooperation for a lunar nuclear power plant as mentioned before.

The Chinese lunar mission is running parallel to the Artemis program of the United States, which is also a project aimed at establishing presence on the moon and is based on intensive international cooperation with both state and commercial partners. These two lunar cooperative platforms together with China's exclusion from the International Space Station (ISS) program further strengthened the competition between the two superpowers and are leading the way towards a more competitive approach to space exploration (Wu, 2022, p. 2-3).

India

China is not the only nation ramping up its space capacities in Asia, India is also increasing its launch frequencies and is taking notes from the technologies of companies such as SpaceX, United Launch Alliance and Arianespace to develop more optimal designs (Sagar, 2018, p. 130).

While this also means that its competitive edge is challenged by such companies, India is developing its commercial space sector with initiatives like New Space India Ltd (NSIL) and the Indian National Space Promotion and Authorization Centre (IN-SPACe). These efforts are increasing India's space capabilities in launch capacity, lunar and Martian missions, satellite deployments, national security infrastructure, and forthcoming human spaceflight and space station endeavors (Goswami, 2022, p. 5).

India's vision for investments in space is outlined in the ISRO Vision 2025 plan from the Vikram Sarabhai Space Centre (VSSC). This comprehensive plan that includes civilian, commercial, and military domains encompass several future objectives, such as the development of satellite-based communication and navigation systems for rural connectivity, security, and mobile services, enhance imaging capabilities for resource management, weather monitoring, and climate change research. The plan also focuses on advancing space science missions, developing heavy lift launchers, reusable launch vehicles, and establishing a human flight program (Goswami, 2022, p. 11). However, in the recent years India has tended to shift toward a more militarized focus in its space policies, prioritizing its national security concerns. This shift was driven by a more defensive space security trend. China's 2007 anti-satellite test prompted India to recognize the need to protect its space assets. Although India had previously advocated for global governance of outer space, it conducted its own anti-satellite test in 2019 under Prime Minister Narendra Modi to establish credible deterrence against potential threats to its space-based assets (Rajagopalan, 2022).

China's increasing influence and assertiveness in the Indo-Pacific region have led to an increase in bilateral and multilateral collaborative initiatives in an effort to diversify Indian cooperative measures. One of these efforts resulted in the revitalization of the Quadrilateral Security Dialogue (QUAD), which is a collaboration between the United States, Australia, Japan, and India. This platform allows these four countries to engage in discussions and cooperation on various regional and global security issues, including that of space (Goswami, 2022, p. 11). India's shift from its traditional nonaligned stance towards non-legally binding space norms is motivated by growing concerns about China's activities (Rajagopalan, 2022).

Republic of Korea (ROK)

In 2022, South Korea launched its first lunar mission and a satellite carried by a national rocket. By 2023, the government of South Korea published a space plan for the next five years, with an emphasis on strengthening the countries space capacities and expanding its commercial space sector into a significant industry. Since the beginning of Korean space activity in 2002 South Korea has matured into a prominent player in the field. Along with the European Space Agency, South Korea belongs to the group of countries that can independently launch into high orbits (the other countries being the United States, the Russian Federation, China, Japan, India, Israel and Iran) (OECD, 2011)

Despite historical alliances and military partnerships, collaboration between South Korea and the United States in the realm of space has been somewhat limited. However, recent policy and geopolitical shifts have diminished previous barriers, particularly with regard to military space endeavors (Wilson & Nicholas, 2023, p. 1). In December 2023 a newly established space forces unit of the USA was inaugurated, marking an intensified commitment by the allies to enhance their capabilities in countering the evolving nuclear and missile threats posed by North Korea. This unit represents the second overseas space component of the U.S. Space Force and has been assigned the responsibilities of surveillance, identification, and tracking of incoming missiles, along with the enhancement of the broader military's proficiency in space operations (Shin, 2023).

Democratic People's Republic of Korea (DPRK)

Somewhat of an easter egg among the other countries that were mentioned is North Korea, as its capacities are very limited in comparison to the other actors, yet its growing cooperation with Russia also increases the countries importance and therefore is worth to mention.

North Korea has managed to launch its first spy satellite Malligyong-1 into orbit in November 2023 after numerous failed attempts. According to official North Korean reports, the launch of such satellite is the legal right of the country, however, this development raised concerns among the international community. South Korea has called attention to the violation of a handful of UN Security Council resolutions (such as Resolution 2087 (2013), 1718 (2006), 1874 (2009) and 2270 (2016)), which all reinforce sanctions and prohibitions against North Korea's nuclear and missile programs. Nevertheless, North Korea has declared plans to launch additional reconnaissance satellites. The increase in the countries space activity is a clear proof that the

capabilities of North Korea is developing and the launched spy satellite, if functional, will improve the country's military and situational awareness capabilities massively. It is worth mentioning, that the successful launch of Malligyong-1 came after a visit of the North Korean head of state Kim Jong Un to Russia, where he toured a Russian space rocket launch site alongside the Russian president (Lendon, Bae & Seo, 2023).

Non-state actors in space

To analyze the impact of new space actors on the dynamics of space cooperation and security it is important to discuss the contributions of companies like SpaceX and other important private companies. The state-centric focus of the relist theory fails to account for the significant role played by these actors and their influence on the space industry. Companies like SpaceX, Blue Origin, and others are driving innovation, expanding access to space, and contributing to national and international space endeavors. The theory underestimates the influence of non-state actors in space, including their ability to forge international partnerships, drive technological advancements, and their inadvertent ability to influence space policy.

The division between military and commercial use of space infrastructure is becoming increasingly blurred as societies rely on space technologies for most aspects of daily life and although the cooperation between nations and companies are nothing new, the more security measures are outsourced to private companies, the more vulnerable those technologies get in the hands of CEOs, whose interests might not represent the that of any nation. Some of the most significant private companies for space operations are SpaceX, Blue Origin, Virgin Galactic, Boeing, but many more have emerged over the last decades, such as Rocket Lab, Northrop Grumman Innovation Systems, Arianespace, Relativity Space, Planet Lab, LandSpace, LinkSpace and the list goes on.

Behind the reason of the many emerging private actors in space are the lower cost of launch systems due to their reusability, the shrinking of satellites and their cargoes and the growing competition of manufacturers. Advances in micro-electronics, computing, and 3D printing have reduced entry barriers for space actors. There is an increasing diversity in space actors, which is rapidly raising security and sustainability concerns. At present regulations could not keep up with the advancement of technologies (Martinez, 2019, p. 65-87) .

The rapid advancement of space technologies poses a competition between state actors as well as between private companies. A notable rivalry in the field of launch systems was between

the companies of two billionaires, the Elon Musk founded SpaceX and Blue Origin, owned by Jeff Bezos. SpaceX accounted for 61 launches in 2022, which is 80% of the total launches of the USA that year. In the same year China carried out 62 launches and the third country with most launches was Russia with 21 launches. Europe was able to carry out only six launches in 2022, one of them a failure (OECD, 2023, p. 68). SpaceX's development of reusable rockets has revolutionized the space industry by significantly reducing the cost of launches. The Elon Must founded company has made significant contributions to space transportation, including providing reliable and cost-effective space transportation services, including cargo and crew missions to the International Space Station (ISS).

The competition of the market also propels the international cooperation between states and private companies, as it is often more economic for states to outsource certain parts of their space projects. At the beginning of space exploration states would only rely on companies from their own nations. This was the case for the cooperation between Boeing and the USA. Currently Boeing is involved in various space projects, including the developing a new spacecraft for transporting astronauts to the ISS. However, in present times it is common for states to step into partnerships with companies worldwide. An example of such is the recent collaboration between the German Bundeswehr and SpaceX, which was tasked to deliver German radar satellites into orbit (Clark, 2022).

Another interesting example of international cooperation between the private sector and states is the collaboration of the Korea Aerospace Industries with the Saudi Space Agency. The Korean company specializes in the design, development, and production of military and civilian aircrafts, helicopters, satellites, and other aerospace technologies and in December 2023 it signed a memorandum of understanding with the space agency of Saudi Arabia (Kim, 2023).

The advancement of space technologies in the private sector and the cooperation between them and state actors are advancing the overall interconnectedness in a global world. The significant investments in space technology and infrastructure by private companies drive economic growth and innovation rapidly, the creation of high-skilled jobs in the aerospace sector is driving economic growth and motivates states to consider larger budgets for their space programs.

Private companies have also taken initiatives to make improvements in the areas of space security. An example that demonstrates the consciousness of the private sector is the effort of start-

up companies towards the removal of space debris. This initiative is a sign of the potential impact private companies can make in space, contrasted with the slow and often ineffective efforts of governments and international organizations (Haas, 2020, p. 3).

CONCLUSION

This thesis aimed to investigate the barriers, challenges, and future prospects for cooperation in space security among both traditional and emerging actors in the space arena, particularly focusing on how these dynamics challenge the realist approach. The findings indicate that while established spacefaring nations continue to hold significant power, the rise of new players, including private companies and non-state entities, has transformed the landscape of space activities. This evolution calls for enhanced collaborative measures to tackle emerging security threats, though it also introduces new complexities in terms of regulation and partnership.

If the space race culminated in cooperation between the United States and Russia, leading to ongoing collaborative efforts such as the International Space Station (ISS), we can anticipate a similar trajectory resulting from the current race for the Moon and its resources. The diverse actors involved and the transcendent nature of space-related threats pave the way for a cooperative mindset. The prospect of colonizing a new planet embodies the notion of humanity's unity, as survival on another planet will transcend nationalistic sentiments. While it's true that access to space resources will favor those with the means to utilize them, reaching the Moon and beyond necessitates a level of competition, reminiscent of the race between the U.S. and the USSR. Both endeavors can be viewed as stages in a continuous cycle of advancement, indicating that we have entered a new chapter in humanity's journey into space.

This new chapter is characterized by evolving motivations and shifting challenges. Technological advancements have accelerated, making space travel more affordable and accessible, leading to a crowded orbital environment filled with satellites and debris. Addressing these new challenges will require nations to recognize the necessity of cooperation for a sustainable future. New treaties and agreements must be drafted, incorporating the voices of diverse stakeholders and acknowledging the influence of private companies. As political, economic, and technological barriers diminish, the competition for lunar resources may lead to a new understanding of humanity as a collective spacefaring species.

The limitations of the realist theory in accommodating the complexities of space activities are becoming increasingly apparent. Space is increasingly viewed as a global common, necessitating cooperative management. Realist theory's state-centric approach fails to address pressing issues such as space debris, traffic management, and sustainable resource use, which require collaborative international efforts. The rapidly evolving nature of space technology

demands integrated policy approaches and international cooperation to ensure that regulations keep pace with advancements. By pooling resources and expertise, countries and companies can develop more sustainable and effective solutions than they could individually. Cooperative security measures and international agreements will enhance global stability.

History has shown us that cooperation often prevails over competition. The collective issues and challenges in space cannot be resolved through autonomous practices, whether defensive or offensive. The shifting alliances characterizing the current landscape must solidify into a coherent cooperative effort if states wish to avoid disasters stemming from a lack of communication. Nations must recognize that their national interests align with the interests of the whole, as the interconnectedness of space technologies affects people across borders. Without effective communication and trust, states risk misinterpreting each other's actions as threats, potentially leading to irreversible disasters in space that could hinder space travel for generations. The existing balance of power can be disrupted at any moment as powerful private companies emerge as influential actors. Their actions may be difficult to predict, as they are not beholden to any nation and operate in a regulatory void in many jurisdictions.

The pressing question remains: will the U.S.-China race for the Moon conclude similarly to the Cold War competition? After propelling each other forward in technological development and securing funding for this pivotal step in humanity’s space exploration, will these superpowers and their allies be able to join forces on the Moon?

Ultimately, this research highlights the urgent need for a shift in the discourse surrounding space security, suggesting that we must move beyond traditional realist frameworks. It is essential for policymakers and international organizations to recognize the roles of these new actors in developing cooperative strategies that can bolster security in outer space.

The scope of this research has major limitations as it primarily relies on secondary literature, which may not fully capture the diverse perspectives of new actors in space and the focus on Euro-centric sources restrict the applicability of the findings to non-Western contexts. Looking ahead, further research should explore the contributions and viewpoints of non-Western actors in space cooperation as well as conducting empirical studies that engage directly with stakeholders in the space sector would also be beneficial. As the dynamics of space activities evolve, it will be crucial to cultivate effective cooperation among a wide range of actors to ensure the security and sustainability of outer space for future generations.

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APPENDIX A

	Russia	US	Europe	China	India	ROK
Start of space activity	Late 1950s/Early 1960s	Late 1950s/Early 1960s	Late 1950s/Early 1960s	Late 1950s/Early 1960s	Late 1950s/Early 1960s	Late 1980s
Space agency	Roscosmos (1992)	NASA (1958)	ESA (1975)	CNSA - China National Space Administration (1993)	ISRO - Indian Space Research Organisation (1969)	KARI - Korea Aerospace Research Institute (1989)
Space strategy document	Federal Space Program (FSP)	National Space Policy, NASA Authorization Acts	European Space Strategy, ESA Convention	China Space Activities White Paper, Five-Year Plans	Indian Space Policy, Five-Year Plans	National Space Development Strategy

APPENDIX B

	Boeing	SpaceX	Blue Origin	Virgin Galactic
Start of Space Activity	1960s (Space Division)	2002	2000	2004
Space Strategy	Boeing participates in various space initiatives, including ISS resupply, human spaceflight, and satellite launches.	SpaceX focuses on affordable space access, human spaceflight, and Mars colonization.	Blue Origin aims for reusable space transportation, lunar exploration, and space tourism.	Virgin Galactic focuses on space tourism and suborbital flights for research and commercial purposes.
Main Partners	NASA, ISS partners (through Boeing's CST-100 Starliner program)	NASA, Commercial satellite operators, International customers (for satellite launches)	NASA, International customers (for satellite launches), Future lunar exploration initiatives	NASA, Italian Air Force, Future space tourists